

Government of Maharashtra

By Speed Post

No.FLD-1225/CR-101/F-10
Revenue and Forest Department,
Mantralaya, Mumbai - 400 032.
Dated:- 14.11.2025.

To,

The Secretary,
Ministry of Environment, Forests & Climate Change,
Government of India,
Indira Paryavaran Bhavan,
New Delhi.

Subject: Forest Land – Thane & Nashik

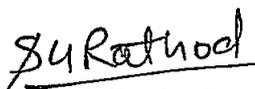
Diversion of 243.74 ha. (Shahapur division 181.45 ha. and West Nashik Division 62.29 ha.) Forest land for Bhavali Pumped Storage Project (1500 MW) Village Kothale & Kalbhode in Tal. Shahapur, Dist. Thane & Village Jamunde, Tal. Igatpuri, Dist. Nashik in the State of Maharashtra (FP/MH/HYD/153240/2022)

- Ref.:** 1. EDS raised on Parivesh Portal by MoEF&CC, New Delhi, on 02.09.2025
2. APCCF & Nodal Officer Letter No. Desk-17/FCA-S2/PID-153240/Thane/1863/2025-26, Dt.13.11.2025.

Respected Sir,

Ministry of Environment, Forest and Climate Change (Forest Conservation Division), Government of India has sought information with respect to proposal for diversion of 243.74 ha. (Shahapur division 181.45 ha. and West Nashik Division 62.29 ha.) Forest land for Bhavali Pumped Storage Project (1500 MW) Village Kothale & Kalbhode in Tal. Shahapur, Dist. Thane & Village Jamunde, Tal. Igatpuri, Dist. Nashik in the State of Maharashtra, vide letter under reference No.1.

2. Additional Principal Chief Conservator of Forests & Nodal Officer, Maharashtra State, Nagpur has submitted compliance report to the Government of Maharashtra vide letter under reference no.2, Compliance Report submitted by the APCCF & Nodal Officer is self-explanatory and attached herewith for further necessary action in the matter.


(Subhash Rathod)

Under Secretary to the Government of Maharashtra

Under Secretary
Revenue and Forests Department
Hutatma Rajguru Chowk
Madam Cama Road, Mantralaya
Mumbai 400 032

Encl : As above.

Copy to:

- 1) Additional Principal Chief Conservator of Forests and Nodal Officer, Nagpur.
- 2) Chief Conservator of Forests (T), Thane & Nashik
- 3) Deputy Conservator of Forest, Shahapur & West Nashik.

OFFICE OF THE PRINCIPAL CHIEF CONSERVATOR OF FORESTS (HEAD OF FOREST FORCE), MAHARASHTRA STATE, NAGPUR

ADDITIONAL PRINCIPAL CHIEF CONSERVATOR OF FORESTS AND NODAL OFFICER, MAHARASHTRA STATE, NAGPUR.

First Floor, 'B' Wing, Van Bhavan, Civil Lines, Nagpur-440001.

Tel no. (0712) 2530166, 2556916, Fax no. (0712) 2550675 E-mail- apccfnodal@mahaforest.gov.in

Sub:- Diversion of 243.74 ha. (Shahpur division 181.45 ha. and West Nashik division 62.29 ha.) Forest land for Bhavali Pumped Storage Project (1500 MW) Village Kothale & Kalbhonde in Tal. Shahapur, Dist. Thane & Village Jamunde, Tal. Igatpuri, Dist. Nashik in the State of Maharashtra

No. Desk-17/FCA-S2/PID-153240/Thane/1863/2025-26
Nagpur - 440 001, Date :- 13/11/2025

To,
The Additional Chief Secretary (Forests),
Revenue & Forest Department,
Mantralaya Mumbai -32

Ref:- 1. Online EDS raised by the Government of India, MoEF&CC, New Delhi on 02/09/2025

2. The Chief Conservator of Forests (T), Thane letter No. Desk-10/FCA/A-20/CR-80/24-25/270, date 07/11/2025.

The Government of India, Ministry of Environment, Forests and Climate Change, New Delhi vide letter under reference No.1 raised certain queries. Accordingly, the Chief Conservator of Forests (T), Thane vide letter under reference no.2 has submitted compliance report for the same as follows:-

Sr. no	Query	Compliance
i	The component wise breakup provided by the State Govt. vide letter dated 05.08.2025 is different from the component wise breakup uploaded in the part-1 of the application form by the project proponent. The State shall examine the matter and ensure that the correct component wise breakup is uploaded in the portal.	The DCF, Shahapur & CCF (T), Thane on 04/11/2025 & 07/011/2025 has submitted compliance report as follows:- The user agency has been updated component wise breakup as per letter of State government vide letter dated 05.08.2025 (Annexure-1.1) in online Form A (Part-I) on the portal and copy of part I has been attached. (Annexure-1.2)
ii	As per component, wise breakup uploaded on the portal an area of 44.9 ha is proposed for Dumping area/job facilities 1&2 and an area of 4.8 ha is for working space, which are non-site-specific activities. The state shall explore and locate such facilities over non forest land.	The DCF, Shahapur & CCF (T), Thane on 04/11/2025 & 07/011/2025 has submitted compliance report as follows:- The user agency has been submitted the following details for consideration: Expert Appraisal Committee (River valley and Hydroelectric projects) in its agenda meeting held on 31.08.2024 sought sub-committee to visit the site 1. During the site visit, the Expert Appraisal Committee (EAC), MoEF&CC noted that the proposed muck disposal sites were appropriately selected. The Committee specifically recommended that <i>"the relocation of muck disposal site may not be insisted while considering the proposal for clearance, since the</i>

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muck disposal site was found to have been selected properly. Further, ecologically better sites were not appeared available in nearby area. Any relocation at this stage might lead to much changes and may lead to more adverse consequences. However, safety measures as contained in EMP and in other documents should be adhered to in toto." (Attached as an **Annexure-2.1**)

2. The earmarked muck disposal sites fall in areas with very low vegetation density, thereby minimizing adverse impact on forest ecology. (**Annexure-2.4**)
3. Suitable non-forest land or private land is not available in proximity of the project area, making relocation to non-forest areas practically unfeasible. (**Annexure-2.4**)
4. An approved comprehensive Muck Management Plan has been prepared and submitted. This includes robust engineering measures (retaining walls, gabion structures, slope stabilization, drainage arrangements) and biological measures (multi-layered plantations, grass slips, native shrubs and tree species, soil enrichment) to ensure environmental protection, slope stability, and long-term ecological restoration of dumping sites. (**Attached as an Annexure-2.2**).
5. Further there are ample examples in case of Hydro projects where the complete project components including Muck Dumping sites and facility areas are located within the forest area.
6. (**Attached as an Annexure-2.3**).
7. In this regard, the User Agency has submitted undertaking and mentioned that the muck disposal sites will be properly stabilized and scientifically reclaimed with vegetation after completion of disposal activities. After commissioning of the project, these sites shall not be used for any non-forestry activity. Therefore, the User Agency has been proposed of such activity in the proposal. This needs to be considered. (**Annexure-2.4**)
8. The **Dy.CF, Shahapur** has submitted **justification with respect of Working space of 4.8 Ha which is stated as under:**
 - The same has to be located in close proximity to the main project working area since there is no private land available nearby Lower reservoir and moving this project facility outside the forest area will exponentially increase men, material & heavy machinery movement causing pollution.
 - The location is carefully planned keeping in view timely completion of the project and maintaining high productivity of all resources.

		<p>➤ During the EAC subcommittee site visit, the overall project layout including individual project components were reviewed and found to be correctly selected ensuring minimum impact on Environment & forest.</p>
iii	<p>As per DSS Analysis of the KML files provided by the State Govt., the total software calculated area in the project is 309 Ha., which includes, forest and non-forest land. Further, for an area of 13.814 Ha, the details are not provided along with the KML file. Accordingly, the State Government shall provide the component wise correct KML files for the project area.</p>	<p>The DCF, Shahapur & CCF (T), Thane on 04/11/2025 & 07/011/2025 has submitted compliance report as follows:-</p> <p>The user agency has updated KML file and has been uploaded in Form A (Part-I).</p> <p>The Area of proposal for diversion of Land is 243.737 ha. (Forest) and 31.08 ha. (Non Forest) Total proposed land 274.817 ha., Which Shows properties of diverted land in KML.</p> <p>But an area of 13.814 ha. has not included in the Proposed area, so it did not shown the properties of in KML.</p> <p>The said area of 13.814 ha. has been excluded as they do not fall in working areas and the patches lies in between working area .The said area needs to be marked properly for better protection. (Annexure-3)</p>
iv	<p>The State Government has recommended the proposal with condition that User Agency shall obtain wildlife clearance and/or ensure compliance of mitigation measures, if required or suggested by the PCCF (Wildlife). Accordingly, the State Government is requested to submit the comments of the PCCF (Wild Life)/CWLW.</p>	<p>The DCF, Shahapur & CCF (T), Thane on 04/11/2025 & 07/011/2025 has submitted compliance report as follows:-</p> <p>In this regard, this office has sought remarks from PCCF (WL) on 29/09/2025. Accordingly, the PCCF (WL), Maharashtra State on 13/10/2025 has informed that the said project does not fall within any Wildlife Sanctuary, Tiger Reserve, National Park and Wildlife Corridor. (Annexure-5)</p> <p>Subsequently, the user agency has submitted that Wildlife Conservation Plan approved by PCCF (WL)/CWLW letter No.2269 dated 17.09.2025 with NoC. The copy of the same is enclosed herewith as (Annexure-4)</p>
5	<p>It has been submitted by the DFO Shahapur and West Nasik that recently the Government of Maharashtra has declared Gut. No. 42 of Village Jamunde, Tehsil- Igatpuri, District- Nashik as part of Igatpuri Conservation Reserve as per notification dated 22.11.2022. The state shall intimate whether the requisite conservation reserve management committee has been formed and whether the requisite approvals as applicable have been obtained or not?</p>	<p>The DCF, Shahapur & CCF (T), Thane on 04/11/2025 & 07/011/2025 has submitted compliance report as follows:-</p> <p>In this regard, this office has sought remarks from PCCF (WL) on 29/09/2025. Accordingly, the PCCF (WL), Maharashtra State on 13/10/2025 has informed that a request has been made to the Government to establish a Management Committee for the Igatpuri Conservation Reserve, but the decision of the Management Committee is yet to be issued from Government level. The copy of the same is enclosed herewith as (Annexure-5)</p>

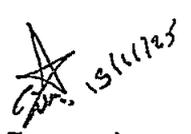
6	<p>The Harishchandra Gad Wildlife Sanctuary and its ESZ is located 2.21 Kms and only 12.5 meters away respectively from the closest point on the boundary of the project. State Government shall ensure that the proposed area is actually outside the boundary of ESZ. A detailed report in this regard shall be submitted.</p>	<p>The DCF, Shahapur & CCF (T), Thane on 04/11/2025 & 07/011/2025 has submitted compliance report as follows:-</p> <p>In this regard, the Principal Chief Conservator of Forests (Wildlife), Maharashtra State vide letter dated 17/09/2025 has mentioned that the proposed project is 2.21 Km from Kalsubai Harishchandra Gad Wildlife Sanctuary and 12.5 M away from its Eco-Sensitive Zone. The PCCF (Wildlife) has sought Wildlife Conservation and Biodiversity Management Plan. Accordingly, the user Agency has submitted site specific Wildlife Conservation and Biodiversity Management Plan approved from PCCF (Wildlife) Maharashtra State. The copy of the same is enclosed herewith as (Annexure No.5, 6 & 7)</p>
7	<p>DFO West Nasik recommended that in the case of land that were allotted prior to 1980, lying in the project area, the user agency shall not utilize/acquire said land parcel without a separate/additional diversion proposal. However, no details of such areas has been provided. A detailed report shall be submitted in this regard. Accordingly, the State Government shall ensure that entire forest land is included in the proposal and a comprehensive proposal is submitted</p>	<p>The DCF, Shahapur & CCF (T), Thane on 04/11/2025 & 07/011/2025 has submitted compliance report as follows:-</p> <p>The user agency has submitted an undertaking. A copy of the same is enclosed herewith as (Annexure-8)</p>
8	<p>The CCF, Nashik in his recommendations recommended that a Wildlife Management and Mitigation Plan must be prepared and implemented in accordance with the guidelines and approval of the Chief Wildlife Warden (CWW), Maharashtra. State Government is requested to provide comments on the same.</p>	<p>The DCF, Shahapur & CCF (T), Thane on 04/11/2025 & 07/011/2025 has submitted compliance report as follows:-</p> <p>The user agency has submitted approved Wildlife Conservation and Biodiversity Management Plan. The copy of the same is enclosed herewith as (Annexure-6 & 7)</p>
9	<p>The CCF Nashik further recommends that a scientifically designed Catchment Area Treatment (CAT) Plan shall be implemented to prevent soil erosion, enhance water retention, and promote vegetative regeneration in the catchment area. However, the copy of the plan approved by the competent authority for the entire area has not been submitted.</p>	<p>The DCF, Shahapur & CCF (T), Thane on 04/11/2025 & 07/011/2025 has submitted compliance report as follows:-</p> <p>The copy of the approved Catchment Area Treatment (CAT) Plan is enclosed herewith as (Annexure-9)</p>
10	<p>The CCF Nashik, has recommended that a detailed study regarding the suitability and safety of tunnel construction must be conducted by a national-level institute of repute, specializing in hydro-geological and tunnel engineering. State Govt. shall provide the details/comments in this</p>	<p>The DCF, Shahapur & CCF (T), Thane on 04/11/2025 & 07/011/2025 has submitted compliance report as follows:-</p> <p>In this regard a detailed study on tunnel construction was conducted by the User Agency from the Central Institute of Mining & Fuel Research (CIMFR), CSIR, Bilaspur to ensure safe</p>

	regard.	execution of tunnels, and the report is attached as herewith. (Annexure-10)																								
11	State Government has mentioned in its covering letter that felling of 69100 trees is involved in the proposal. However, in online Part- II, enumeration of 1,78,677 trees in Shahapur Division and 20,704 trees in West Nashik Division has been submitted. Exact number of trees to be felled needs to be submitted along with tree enumeration list at FRL-2 and FRL-4 meters.	<p>The DCF, Shahapur & CCF (T), Thane on 04/11/2025 & 07/011/2025 has submitted compliance report as follows:-</p> <p>The detailed tree enumeration data has been attached in Part II of Proposal. 69,100 trees are involved in the project area, out of which 63,881 trees are proposed to be felled (0 to FRL -4). The comparative statement submitted by the Dy.CF. Shahapur is shown as under:-</p> <table border="1"> <thead> <tr> <th>Sr No.</th> <th>Trees enumeration online Data</th> <th>West Nashik Division</th> <th>Shahapur Division</th> <th>Total No. of Trees</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Total trees involved (at FRL)</td> <td>7546</td> <td>61554</td> <td>69100</td> <td>0 to FRL Level</td> </tr> <tr> <td>2</td> <td>Trees involved (at FRL-2)</td> <td>6923</td> <td>59477</td> <td>66400</td> <td>0 to -2 Level</td> </tr> <tr> <td>3</td> <td>Trees involved (at FRL-4) to be felled</td> <td>6235</td> <td>57646</td> <td>63881</td> <td>0 to -4 Level</td> </tr> </tbody> </table> <p>The copy of the online Part-II is enclosed herewith as (Annexure-11).</p>	Sr No.	Trees enumeration online Data	West Nashik Division	Shahapur Division	Total No. of Trees	Remark	1	Total trees involved (at FRL)	7546	61554	69100	0 to FRL Level	2	Trees involved (at FRL-2)	6923	59477	66400	0 to -2 Level	3	Trees involved (at FRL-4) to be felled	6235	57646	63881	0 to -4 Level
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12	Further, the State Government shall provide a copy of approval of the National Dam Safety Authority (NDSA) on the recommendations made by the State Dam Safety Organization (SDSO) and submit the same as applicable.	<p>The DCF, Shahapur & CCF (T), Thane on 04/11/2025 & 07/011/2025 has submitted compliance report as follows:-</p> <p>The user agency has submitted that an undertaking which is enclosed (Annexure-12)</p>																								
13	Since both the dams are to be constructed afresh, the justification for the site specificity of the project is required to be provided. The State shall provide the complete details including KML files, forest and non-forest area involved, trees involved along with the reasons for the rejection of various alternatives.	<p>The DCF, Shahapur & CCF (T), Thane on 04/11/2025 & 07/011/2025 has submitted compliance report as follows:-</p> <p>The user agency has submitted that the project is site-specific, with the chosen location minimizing forest land diversion, avoiding critical wildlife habitats, and ensuring optimal engineering feasibility for dam and facility construction. A justification and summary note for site selection is attached with the EDS reply. The necessary documents attached herewith. (Annexure-13)</p>																								
14	It has been mentioned that project is not located near any river/water body. The state shall give a detailed report as to how the requirement of water and electricity will be met.	<p>The DCF, Shahapur & CCF (T), Thane on 04/11/2025 & 07/011/2025 has submitted compliance report as follows:-</p> <p>The user agency has submitted that the electricity requirement of the project will be met by the state Discom, Maharashtra State Electricity Distribution Company Limited (MSEDCL), as per the Power Purchase Agreement (PPA) executed with the Government of Maharashtra. The necessary</p>																								

		documents attached herewith. (Annexure-14.1) Initial filling from self catchment of lower reservoir water use cyclically for energy storage and discharge. The water availability certificate (with one time filling requirement of 17.84 Mcum) dated 21/11/2022 is issued to the proposed lower dam of Bhavali Pumped Storage Project, approval granted by the Water Resources Department, Government of Maharashtra. (Annexure-14.2)
15	The state shall provide the details of the power evacuation plan and in case additional forest land is required for the same a consolidated proposal may be submitted for the entire forest area.	The DCF, Shahapur & CCF (T), Thane on 04/11/2025 & 07/011/2025 has submitted compliance report as follows:- The user agency has submitted that the project is being implemented under a Power Purchase Agreement (PPA) with the Government of Maharashtra, under which the State will supply pumping power, and the generated power will be returned to the State. The power evacuation plan is under review and will be approved by the State Government based on ongoing load flow analysis. The transmission line alignment will be designed to primarily utilize non-forest land, involving only minimal forest area if unavoidable. If any additional forest land is required, a separate forest diversion proposal will be submitted following State Government approval. (Annexure-14.1)

This is for your information and further needful action.

Encl : As above


(Naresh Zurmure)

**Addl. Principal Chief Conservator of Forests
& Nodal Officer**

Copy to the Chief Conservator of Forests (T), Thane for information.

Copy to the Chief Conservator of Forests (T), West Nashik for information.

Copy to the Deputy Conservator of Forests, Shahapur Forest Division, Shahapur for information.

Copy to the Deputy Conservator of Forests, West Nashik Forest Division for information.

Copy to the Authorized Signatory, JSW Energy PSP Two Limited at JSW Centre, Bandra Kurla Complex Bandra (East), Mumbai-400051 for information.



JSW Energy PSP Two Limited

Regd. Office : JSW Centre,
Bandra Kurla Complex,
Bandra (East), Mumbai - 400 051

CIN. : U40106MH2021PLC367136
Phone : +91 22 4286 1000
Fax : +91 22 4286 3000
Website: www.jsw.in

JSW/PSP-Bhavali/FCLand2025/12
Date: 28.10.2025

To,

The Dy. Conservator of Forest
Shahpur Division
Shahpur, District Thane

Sub :- Bhavali Pumped Storage Project (1500 MW) in Thane & Nashik Districts, Maharashtra proposal for Forest Clearance (Online Proposal No. FP/MH/HYD/153240/2022). Reg: Submission of Replies to Essential Details Sought (EDS).

Ref: Your office letter No. Land-10/FCA/2217/2025- dated 17.10.2025 regarding Essential Details Sought (EDS) for the Forest Clearance application.

Respected Sir,

With reference to the above subject, we wish to inform you that all the observations and points raised in your letter dated 17.10.2025 have been duly addressed. The required documentation including cost-benefit analysis, have been incorporated and uploaded on PARIVESH 1.0 portal for your kind perusal.

It is kindly requested to examine our submission for further processing of our proposal and onward submission.

Thanking you,

Yours faithfully,
For JSW Energy PSP Two Limited


[Lalit Parab]
Authorized Signatory



2nd set
14/11/25





महाराष्ट्र शासन
वन विभाग



मुख्य वनसंरक्षक (प्रा.), ठाणे वनवृत्त, ठाणे याचे कार्यालय
सनप्लॉक, कामाक्षीसाल, शिमायसंस, चौथा भूखंड, हरि ओम नगर, मुंबई - 81
दूरध्वनी क्रमांक - 022-25329642 / 25329865
Email: ccfthane@mahaforest.gov.in / ccfthane@gmail.com

Desk-10/FCA/A-20/CR-80/24-25/ 270/2025-26

Dated: 07/11/2025

Letter

To.

The Addl. Principal Chief Conservator of Forests,
and Nodal Officer,
Maharashtra State,
Nagpur-440-001.

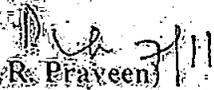
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Jamunde, Tal-Igauri, Dist-Nashik in the State of Maharashtra.

- Ref-1: Government of India, MoEF&CC, New Delhi letter dated 02.09.2025
2: Your office letter no Desk-17/FCA-S1/RID-153240/Thane/1322, dated 04.09.2025
3: Deputy Conservator of Forests, Shahapur letter no. Desk-10/FCA/147, dt.04.11.2025

Government of India & your office has raised 15 queries vide reference No.1 and 2.
Accordingly, Deputy Conservator of Forests, Shahapur has submitted the compliance of the same. This
office agrees with the same.

2.00 Two sets of queries compliance reports are attached herewith for information and further
necessary action.

Encl- As above 2 sets.


(N. R. Praveen)

Chief Conservator of Forests (T.), Thane

Copy to the Chief Conservator of Forests (T.), Nashik for information and necessary action.

Copy to the Deputy Conservator of Forests, Shahapur and West Nashik for information and necessary
action.

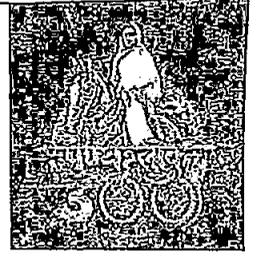
Copy to Authorized signatory, JSW Energy PSP Two Limited at JSW centre, Bandra Kurla Complex,
Bandra (East) Mumbai-400 051 for information and necessary action.



Office of the Deputy Conservator of Forests,
Shahapur Forest Division, Shahapur
Shahapur-Asangaon Road, Old Agra Road, At
Asangaon, Post Taluka Shahapur, District Thane 421
601

Telephone No.: 02527/272096

Email: dcfshahapur@gmail.com,
dycfshahapur@mahaforest.gov.in



No.D-10/FCA/1147 2025-26

Shahapur 421 601 date 04/11/2025

To,

The Chief Conservator of Forests (T.)

Thane.

Subject:- Proposal for diversion of 243.74 ha. (Shahapur division 181.45 and West Nashik diversion 62.29 ha) Forest Land for Bhavall Pumped storage Project (1500MW) Village Kothale and Kalbhonde in Tal. Shahapur Dist. Thane & Village Jamunde Tal. Igatpuri, Dist. Nashik in the State of Maharashtra. (FP/MH/HYD/153240/2022)

- Ref.:-
- 1) Letter From the Government of India, MoEF&CC, New Delhi Dated 02/09/2025.
 - 2) Letter from APCCF & Nodel Officer, Nagpur Dated 04/09/2025.
 - 3) Your Office letter No Desk-10/ FCA/CR-80/24-25/206/2025-26, Dt.04/09/2025
 - 4) This office letter Desk-10/FCA/ 1765/25-26, 18/09/2025
 - 5) compliance letter of Mr.Lalit Parab , DGM- Projects, M/S JSW Egergy PSP Two Limited. 08.10.2025
 - 6) This office letter Desk-10/FCA/ 2217/25-26, 17/10/2025
 - 7) Letter From DCF, West Nashik No.Deck-3/Land/842 dated 17/10/2025.
 - 8) Letter From CCF, Nashik No. Deck-2/Land/C.No.58/24-25/1862/25-26/dt.28/10/2025
 - 9) Letter from Mr.Lalit Parab, DGM- Projects, M/S JSW Egergy PSP Two Limited dated 28.10.2025

The Government of India, MoEF&CC, New Delhi has raised 15 queries vide letter reference No.01 and APCCF & Nodel Officer, Nagpur letter reference No.02. Accordingly, reference letter No.4 has been informed that to submit the Condition wise compliance report by the User Agency.

The User Agency has submitted the point-wise compliance of the shortcomings raised by the GOI MoEF&CC, New Delhi vide letter dated 08.10.2025 to This Office and The office of Deputy conservator of Forest, West Nashik .

According to raised queries user agency M/S JSW Egergy PSP Two Ltd. Submitted compliance report accordingly letter No.05 along with necessary documents / undertakings to Deputy Conservator of Forest, West Nashik. Then submitted that compliance report to Chief conservator of forest, Nashik by reference No.7. They agree and to forward that compliance report to this office by reference No.8.

Accordingly, reference letter No.6 has been informed to the User Agency . Then User Agency M/S JSW Egergy PSP Two Ltd. has submitted the compliance of queries letter No.9 dated 28.10.2025 with necessary documents / undertakings.

According to EDS issued on 2 Sep.2025 By MoEF&CC to submitted the compliance report along with necessary documents / undertakings.

Sr. no	Query raised	Compliance	Page no.
1	The component wise breakup provided by the State Govt. vide letter dated 05.08.2025 is different from the component wise breakup uploaded in the part-1 of the application form by the project proponent. The State shall examine the matter and ensure that the correct component wise breakup is uploaded in the portal.	The user agency has been updated Component wise breakup as per letter of State government vide letter dated 05.08.2025 (Annexure-1.1) in online Form A (Part-I) on the portal and copy of part I has been attached. (Annexure-1.2) And also Submitted Cost Benefit Analysis update Certificate in in online Form A (Part-I) on the portal. (Annexure-1.3)	1-9
2	As per component, wise breakup uploaded on the portal an area of 44.9 ha is proposed for Dumping area/job facilities 1&2 and an area of 4.8 ha is for working space, which are non-site-specific activities. The state shall explore and locate such facilities over non forest land.	The user agency has been submit the following details for consideration: Expert Appraisal Committee (River valley and Hydroelectric projects) in its agenda meeting held on 31.08.2024 sought sub-committee to visit the site 1. During the site visit, the Expert Appraisal Committee (EAC), MoEF&CC noted that the proposed muck disposal sites were appropriately selected. The Committee specifically recommended that "the relocation of muck disposal site may not be insisted upon while considering the proposal for clearance, since the sites were found to be properly selected and ecologically better alternatives were not available in	10-25

nearby areas. Any relocation at this stage may lead to adverse environmental consequences.
(Attached as an Annexure-2.1)

2. The earmarked muck disposal sites fall in areas with very low vegetation density, thereby minimizing adverse impact on forest ecology.
3. Suitable non-forest land or private land is not available in proximity of the project area, making relocation to non-forest areas practically unfeasible.
4. An approved comprehensive Muck Management Plan has been prepared and submitted. This includes robust engineering measures (retaining walls, gabion structures, slope stabilization, drainage arrangements) and biological measures (multi-layered plantations, grass slips, native shrubs and tree species, soil enrichment) to ensure environmental protection, slope stability, and long-term ecological restoration of dumping sites.

(Attached as an Annexure-2.2).

5. Further there are ample examples in case of Hydro projects where the complete project components including Muck Dumping sites and facility areas are located within the forest area.

(Attached as an Annexure-2.3).

6. W.r.t Working space of 4.8 Ha:
The same has to be located in close proximity to the main project working area

since there is no private land available nearby Lower reservoir and moving this project facility outside the forest area will exponentially increase men, material & heavy machinery movement causing pollution.

The location is carefully planned keeping in view timely completion of the project and maintaining high productivity of all resources.

During the EAC subcommittee site visit, the overall project layout including individual project components were reviewed and found to be correctly selected ensuring minimum impact on Environment & forest.

7. The user agency taking an undertaking for mulk disposal area.(Annexure-2.4)

All the submission by user agency are for environmental approval. They haven't submitted alternate land for consideration for the said purpose. This needs to be considered.

3 As per DSS Analysis of the KML files provided by the State Govt., the total software calculated area in the project is 309 Ha., which includes, forest and non-forest land. Further, for an area of 13.814 Ha, the details are not provided along with the KML file. Accordingly, the State Government shall provide the component wise correct KML files for the project area.

The user agency has updated KML file and has been uploaded in Form A (Part-I) Pen driv
The Area of Proposal for diversion of Land e
Is 243.737 ha. (Forest) and 31.08 ha. (Non Forest) Total Proposed land 274.817 ha., Which Shows properties of diverted land in KML.

But an area of 13.814 ha. has not included in the Proposed area , so it did not shown the properties of in KML.
The said area of 13.814 ha.has been excluded as they do not fall in working areas and the patches lie in between working area .The said area needs to be marked properly for better protection.

4	The State government has recommended the proposal with condition that User Agency shall obtain wildlife clearance and/or ensure compliance of mitigation measures, if required or suggested by the PCCF (Wildlife). Accordingly, the State Government is requested to submit the comments of the PCCF (Wild Life)/CWLW.	The user agency has submitted that as Wildlife Conservation Plan approved by PCCF (WL)/CWLW letter No.2269 dated 17.09.2025 with NOC. Project outside PA/ESZ. The necessary documents attached herewith . (Annexure-4)	26-77
5	It has been submitted by the DFO Shahapur and West Nasik that recently the Government of Maharashtra has declared Gut. No. 42 of Village Jamunde, Tehsil-Igatpuri, District- Nashik as part of Igatpuri Conservation Reserve as per notification dated 22.11.2022. The state shall intimate whether the requisite conservation reserve management committee has been formed and whether the requisite approvals as applicable have been obtained or not?	The Igatpuri Conservation Reserve has been declared by the State Govt. vide GR No. WLP/06.22/CR-174/F-1. This GR includes 8849.948 Ha. area which comprises of 13 villages. However, the Conservation Reserve Management Committee has not been constituted till date. The necessary documents attached here with. (Annexure-5)	78-79
6	The Harishchandra Gad Wildlife Sanctuary and its ESZ is located 2.21 Kms and only 12.5 meters away respectively from the closest point on the boundary of the project. State Government shall ensure that the proposed area is actually outside the boundary of ESZ. A detailed report in this regard shall be submitted.	The user agency has submitted that the PCCF (WL)/APCCF (WL) confirmed project is 12.5 m outside ESZ after site visit. The necessary documents attached herewith. (Annexure-6.1) Certified map enclosed. (Annexure-6.2)	80-94
7	DFO West Nasik recommended that in the case of land that were allotted prior to 1980, lying in the project area, the user agency shall not utilize/acquire said land parcel without a separate/additional diversion proposal. However, no details of such areas has been provided. A detailed report shall be submitted in this regard. Accordingly, the State Government shall ensure that entire forest land is included in the proposal and a comprehensive proposal is submitted	The user agency has submitted that Gut Nos. 37 to 41 at Jamunde village have been excluded from the project area. Undertaking is attached herewith. (Annexure-7)	95
8	The CCF, Nashik in his recommendations recommended that a Wildlife Management and Mitigation Plan must be prepared and implemented in accordance with the	The user agency prepared the Wildlife Management and Mitigation Plan for the project was prepared and approved by the Chief Wildlife Warden (CWW), Maharashtra	26-78

	guidelines and approval of the Chief Wildlife Warden (CWW), Maharashtra. State Government is requested to provide comments on the same.	on 16.09.2025. and same has been uploaded on the Parivesh portal Part 1 The necessary documents attached herewith. (Annexure-8)	
9	The CCF Nashik further recommends that a scientifically designed Catchment Area Treatment (CAT) Plan shall be implemented to prevent soil erosion, enhance water retention, and promote vegetative regeneration in the catchment area. However, the copy of the plan approved by the competent authority for the entire area has not been submitted.	Catchment Area Treatment (CAT) Plan prepared and approved by APCCF & Nodal Officer, Nagpur on 26.05.2025. The plan has been uploaded on In FC application on Parivesh. The necessary documents attached herewith. (Annexure-9)	96-107
10	The CCF Nashik, has recommended that a detailed study regarding the suitability and safety of tunnel construction must be conducted by a national-level institute of repute, specializing in hydro-geological and tunnel engineering. State Govt. shall provide the details/comments in this regard.	The user agency has submitted that the overall project design has received approval from central agencies. The Geological Survey of India (GSI) and Central Water Commission (CWC) have confirmed the suitability and safety of the tunnels. The Central Electricity Authority (CEA) has granted concurrence to the Detailed Project Report (DPR) through its letter dated 20.09.2024. Additionally, as recommended by the Chief Conservator of Forest (CCF), Nashik, a detailed study on tunnel construction was conducted by the Central Institute of Mining & Fuel Research (CIMFR), CSIR, Bilaspur on dated 19.05.2025 to ensure safe execution of tunnels, and the report is attached as herewith. (Annexure-10)	108-135
11	State Government has mentioned in its covering letter that felling of 69100 trees is involved in the proposal. However, in online Part- II, enumeration of 1,78,677 trees in Shahapur Division and 20,704 trees in West Nashik Division has been submitted. Exact number of trees to be felled needs to be submitted along with tree enumeration list at FRL-2 and FRL-4 meters.	The detailed tree enumeration data has been attached in Part II of Proposal. 69,100 trees are involved in the project area, out of which 63,881 trees are proposed to be felled (up to FRL -4) Online Part II will attached here with . (Annexure-11) List of Total Number of trees already Submitted in Proporsal separately. (Annexture- 2 Part-4 & 5.)	136-141

		Sr No.	Trees enumerated on online Data	West Nashik Division	Shahapur Division	Total No. of Trees	Remark	
		1	Total trees involved (at FRL)	7546	61554	69100	0 to FRL Level	
		2	Trees involved (at FRL-2)	6923	59477	66400	0 to - 2 Level	
		3	Trees involved (at FRL-4) to be felled	6235	57646	63881	0 to - 4 Level	
12	Further, the State Government shall provide a copy of approval of the National Dam Safety Authority (NDSA) on the recommendations made by the State Dam Safety Organization (SDSO) and submit the same as applicable.	<p>The user agency has submitted that in accordance with Section 8(1) and 8(2) of the Electricity Act, 2003, any hydro generating project must obtain concurrence from the Central Electricity Authority (CEA) after ensuring compliance with dam design and safety norms. The CEA Guidelines for Formulation of Detailed Project Report (DPR) for Pumped Storage Schemes (2024, Version 3.0) were followed in preparing the DPR for the Bhavali Pumped Storage Project, which has been duly concurred by the CEA through its letter dated 24.09.2024. Dam safety aspects were examined by the Central Water Commission (CWC) and CEA. As per Section 4(x) of the Dam Safety Act, 2021, the project dam qualifies as a "specified dam"; hence, separate examination by the National (NDSA) or State Dam Safety Organization (SDSO) is not required at the pre-construction stage and will be addressed during the operational phase.</p> <p>The necessary documents attached herewith. (Annexure-12)</p> <p><u>This is the submission of user agency that is being forwarded for the necessary action. No such copy has been provided.</u></p>						142-156

13	<p>Since both the dams are to be constructed afresh, the justification for the site specificity of the project is required to be provided. The State shall provide the complete details including KML files, forest and non-forest area involved, trees involved along with the reasons for the rejection of various alternatives.</p>	<p>The user agency has submitted that the project is site-specific, with the chosen location minimizing forest land diversion, avoiding critical wildlife habitats, and ensuring optimal engineering feasibility for dam and facility construction. A justification and summary note for site selection is attached with the EDS reply.</p> <p>The necessary documents attached herewith. . (Annexure-13)</p>	157-163
14	<p>It has been mentioned that project is not located near any river/waterbody. The state shall give a detailed report as to how the requirement of water and electricity will be met.</p>	<p>The user agency has submitted that The electricity requirement of the project will be met by the state Discom, Maharashtra State Electricity Distribution Company Limited (MSEDCL), as per the Power Purchase Agreement (PPA) executed with the Government of Maharashtra.</p> <p>The necessary documents attached herewith. (Annexure-14.1)</p> <p>Initial filling from self catchment of lower reservoir; water use cyclically for energy storage and discharge. The water availability certificate (with one time filling requirement of 17.84 Mcum) dated <u>21/11/2022</u> is issued to the proposed lower dam of Bhavali Pumped Storage Project, approval granted by the Water Resources Department, Government of Maharashtra. (Annexure-14.2)</p>	164-183
15	<p>The state shall provide the details of the power evacuation plan and in case additional forest land is required for the same a consolidated proposal may be submitted for the entire forest area.</p>	<p>The user agency has submitted that The project is being implemented under a Power Purchase Agreement (PPA) with the Government of Maharashtra, under which the State will supply pumping power, and the generated power will be returned to the State. The power evacuation plan is under review and will be approved by the State Government based on ongoing load flow analysis.</p> <p>The transmission line alignment will be designed to primarily utilize non-forest land, involving only minimal forest area if unavoidable. If any additional forest land is</p>	-

		required, a separate forest diversion proposal will be submitted following State Government approval. <u>This is the submission of user agency .</u> <u>No official communication regarding</u> <u>The non availability of power evacuation plan and non- availability of the alignment of the line is available with this office.</u>	
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This above information four sets of EDS Proposal and Pen drive with are enclosed herewith for further necessary action.

Encl: - as above.



(Dipesh Malhotra)
Deputy Conservator of Forests,
Shahapur Forest Division, Shahapur

Copy to:- Additional Principal Chief Conservator of Forest & Nodal Officer, Maharashtra State ,
Nagpur For information and ne

Copy to:- Chief Conservator of Forest (T), Nashik circle, Nashik For information .

Copy to:- Deputy Conservator of Forest, West Nashik Division, Nashik For information .

Copy to:- M/s JSW Energy PSP Two Limited, For information.

Chief Conservator Of Forests (Territorial), Nashik
Old Mumbai Agra Road, Ram Ganesh Gadkari Chauk, Trimbak Naka, Nashik 422 002
Tel.no. 0253-2598545. E-mail- ccfnashik2012@gmail.com

No.Deck-2/Land/C.No.58/2024-25/ 1862 /2025-26 Date :- 28/10/2025

LETTER

To,

**Deputy Conservator of Forests (T)
Shahapur**

Subject :- Proposal for seeking prior approval of the Central Government under Section 2 (i) (ii) of the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980 in favour of JSW Energy PSP Two Limited for non-forestry use of 243.74 ha. of forest land (Reserved Forest, Protected Forest and Private Forest) for Bhavali Pumped Storage Project (1500 MW) in Thane & Nashik District in the State of Maharashtra (Online Proposal No.FP/MH/HYD/ 153240/2022) – regarding.

Reference:- 1) Government of India Ministry of Environment, Forests & Climate Change New Delhi's query letter dtd.2-09-2025
2) Deputy Conservator of Forests, West Nashik Division letter No. Desk-3/Land/Campa/842/2025-26, dated 17-10-2025

The Government of India, Ministry of Environment, Forest & Climate Change, Integrated Regional Office (IRO), Nagpur has raised 15 queries vide letter under Reference No. 01

Accordingly, Deputy Conservator of Forests, West Nashik Division has submitted the compliance vide letter under Reference No.2. This office agrees with the same.

2.00 Four sets of queries compliance reports are attached herewith for information and further necessary action.

Encl:- As above 4 sets.


(G.Mallikarjuna)
**Chief Conservator of Forests (T)
Nashik**

Copy submitted to :- Additional Principal Chief Conservator of Forests & Nodal Officer, Maharashtra State, Nagpur for information and necessary action.

Copy forwarded to :- Chief Conservator of Forests (T) Thane for information and necessary action.

Copy forwarded to :- Deputy Conservator of Forests, West Nashik for information and necessary action.

Copy forwarded to :- JSW Energy PSP Two Limited at JSW centre, Bandra Kurla Complex, Bandra (East) Mumbai – 400 051 for information and necessary action.



"वृक्षवल्ली आम्हा सोयरे वनचरे"
दुरध्वनी क्रमांक - 0253-2572730
ई-मेल - dycfnashikwest@mahaforest.gov.in



सत्यमेव जयते
महाराष्ट्र शासन, वन विभाग,
उप वनसंरक्षक पश्चिम भाग, नाशिक यांचे कार्यालय,
संतवाडी वन वसाहत आवार, संभाजी चौक, नाशिक 422002

Letter No. Desk- 3/Land/842/2025-26,

Date: 17/10/2025

To,
The Chief Conservator of Forests (T), Nashik

Subject :- Proposal of JSW Energy PSP Two Ltd. For Diversion of 243.74 ha. Forest Land (Reserved Forest, Protected Forest and Private Forest) For Bhavali Pump Storage Project (1500 MW) In Thane & Nashik District in the State of Maharashtra (Online Proposal NO. FP/MH/HYD/153240/2022).

Reference:- 1. Letter from Government of India, MOEF & CC Dated 02/09/2025
2. Letter from Chief Conservator of Forest office, Desk-2/Land/1488/ Dated 10/08/2025
3. DGM-Project, M/S JSW Energy PSP Two Limited Dated 08/10/2025 (Received 15/10/2025)

This is with reference to the Submission of Replies/Clarifications to EDS issued on 02/Sep/2025 By MOEF&CC Regarding Forest Clearance Proposal of M/s JSW Energy PSP Two Ltd. For Diversion of 243.74 ha. Forest land (comprising Reserved Forest, Protected Forest and Private Forest) under the provisions of the Forest (Conservation) Act, 1980. The M/s JSW Energy PSP Two Ltd., has submitted the compliance report in response of the queries raised, along with necessary documents/undertakings as follows.

Sr. no	Query raised	Compliance	Pa no
1	The component wise breakup provided by the State Govt. vide letter dated 05.08.2025 is different from the component wise breakup uploaded in the part-I of the application form by the project proponent. The State shall examine the matter and ensure that the correct component wise breakup is uploaded in the portal.	The query is related to Shahapur forest division.	1-

2	As per component, wise breakup uploaded on the portal an area of 44.9 ha is proposed for Dumping area/job facilities 1&2 and an area of 4.8 ha is for working space, which are non-site-specific activities. The state shall explore and locate such facilities over non forest land.	The query is related to Shahapur forest division.	10-25
3	As per DSS Analysis of the KML files provided by the State Govt., the total software calculated area in the project is 309 Ha., which includes, forest and non-forest land. Further, for an area of 13.814 Ha, the details are not provided along with the KML file. Accordingly, the State Government shall provide the component wise correct KML files for the project area.	The user agency has updated KML file and has been uploaded in Form A (Part-I).	Pen drive
4	The State government has recommended the proposal with condition that User Agency shall obtain wildlife clearance and/or ensure compliance of mitigation measures, if required or suggested by the PCCF (Wildlife). Accordingly, the State Government is requested to submit the comments of the PCCF (Wild Life)/CWLW.	The user agency has submitted that the Wildlife Conservation Plan has been approved by PCCF (WL)/CWLW letter No.2269 dated 17.09.2025 The Project is outside PA/ESZ. The necessary documents attached herewith.	26-77
5	It has been submitted by the DFO Shahapur and West Nasik that recently the Government of Maharashtra has declared Gut. No. 42 of Village Jamunde, Tehsil- Igatpuri, District-Nashik as part of Igatpuri Conservation Reserve as per notification dated 22.11.2022. The state shall intimate whether the requisite conservation reserve management committee has been formed and whether the requisite approvals as applicable have been obtained or not?	The Igatpuri Conservation Reserve has been declared by the State Govt. vide GR No. WLP/06/22/CR-174/F-1. This GR includes 8849.948 Ha. area which comprises of 13 villages. However, the Conservation Reserve Management Committee has not been constituted till date.	

6	<p>The Harishchandra Gad Wildlife Sanctuary and its ESZ is located 2.21 Kms and only 12.5 meters away respectively from the closest point on the boundary of the project. State Government shall ensure that the proposed area is actually outside the boundary of ESZ. A detailed report in this regard shall be submitted.</p>	<p>The user agency has submitted that the PCCF (WL)/APCCF (WL) confirmed project is 12.5 m outside ESZ after site visit. Certified map enclosed. The necessary documents attached herewith.</p>	78-94
7	<p>DFO West Nasik recommended that in the case of land that were allotted prior to 1980, lying in the project area, the user agency shall not utilize/acquire said land parcel without a separate/additional diversion proposal. However, no details of such areas has been provided. A detailed report shall be submitted in this regard. Accordingly, the State Government shall ensure that entire forest land is included in the proposal and a comprehensive proposal is submitted.</p>	<p>The user agency has submitted that Gut Nos. 37 to 41 at Jamunde village have been excluded from the project area. Undertaking is attached herewith.</p>	95
8	<p>The CCF, Nashik in his recommendations recommended that a Wildlife Management and Mitigation Plan must be prepared and implemented in accordance with the guidelines and approval of the Chief Wildlife Warden (CWW), Maharashtra. State Government is requested to provide comments on the same.</p>	<p>The user agency prepared the Wildlife Conservation Plan for the project was prepared and approved by the Chief Wildlife Warden (CWLW), Maharashtra on 17.09.2025 and same has been uploaded on the Parivesh portal Part 1. The necessary documents attached herewith.</p>	26-77
9	<p>The CCF Nashik further recommends that a scientifically designed Catchment Area Treatment (CAT) Plan shall be implemented to prevent soil erosion, enhance water retention, and promote vegetative regeneration in the catchment area. However, the copy of the plan approved by the competent authority for the entire area has not been submitted.</p>	<p>Catchment Area Treatment (CAT) Plan prepared and approved by APCCF & Nodal Officer, Nagpur on 26.05.2025. The plan has been uploaded in FC application on Parivesh. The necessary documents attached herewith.</p>	96-107
10	<p>The CCF Nashik, has recommended that a detailed study regarding the suitability and safety of tunnel construction must be conducted by a national-level institute of repute, specializing in hydro-geological and tunnel engineering. State Govt. shall provide the details/comments in this regard.</p>	<p>The user agency has submitted that the overall project design has received approval from central agencies. The Geological Survey of India (GSI) and Central Water Commission (CWC) have confirmed the suitability and safety of the tunnels. The Central Electricity Authority (CEA) has</p>	108-135

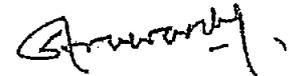
		granted concurrence to the Detailed Project Report (DPR) through its letter dated 20.09.2024. Additionally, as recommended by the Chief Conservator of Forest (CCF), Nashik, a detailed study on tunnel construction was conducted by the Central Institute of Mining & Fuel Research (CIMFR), CSIR, Bilaspur on dated 19.05.2025 to ensure safe execution of tunnels, and the report is attached herewith.																					
11	State Government has mentioned in its covering letter that felling of 69100 trees is involved in the proposal. However, in online Part- II, enumeration of 1,78,677 trees in Shahapur Division and 20,704 trees in West Nashik Division has been submitted. Exact number of trees to be felled needs to be submitted along with tree enumeration list at FRL-2 and FRL-4 meters.	The detailed tree enumeration data has been attached in Part II of the Proposal. Felling of 63881 trees (57646+6235) lying below FRL- 4 m. is necessary for the Project.	136-141																				
		<table border="1"> <thead> <tr> <th>Sr</th> <th>Trees enumeration Data</th> <th>West Nashik Division</th> <th>Shahapur Division</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Total trees involved (at FRL)</td> <td>7,546</td> <td>61,554</td> <td>69100</td> </tr> <tr> <td>2</td> <td>Trees involved at FRL-2</td> <td>6,923</td> <td>59,477</td> <td>66400</td> </tr> <tr> <td>3</td> <td>Total trees to be felled will be (at FRL-4)</td> <td>6,235</td> <td>57,646</td> <td>63881</td> </tr> </tbody> </table>	Sr	Trees enumeration Data	West Nashik Division	Shahapur Division	Total	1	Total trees involved (at FRL)	7,546	61,554	69100	2	Trees involved at FRL-2	6,923	59,477	66400	3	Total trees to be felled will be (at FRL-4)	6,235	57,646	63881	
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		Act, 2021, the project dam qualifies as a "specified dam"; hence, separate examination by the National (NDSA) or State Dam Safety Organization (SDSO) is not required at the pre-construction stage and will be addressed during the operational phase. The necessary documents attached herewith.	
13	Since both the dams are to be constructed afresh, the justification for the site specificity of the project is required to be provided. The State shall provide the complete details including KML files, forest and non-forest area involved, trees involved along with the reasons for the rejection of various alternatives.	The user agency has submitted that the project is site-specific, with the chosen location minimizing forest land diversion, avoiding critical wildlife habitats, and ensuring optimal engineering feasibility for dam and facility construction. A justification and summary note for site selection is attached with the EDS reply. The necessary documents attached herewith.	157-164
14	It has been mentioned that project is not located near any river/waterbody. The state shall give a detailed report as to how the requirement of water and electricity will be met.	The user agency has submitted that initial filling from self catchment of lower reservoir; water use cyclically for energy storage and discharge. The water availability certificate (with one time filling requirement of 17.84 Mcum) dated 21/11/2022 is issued to the proposed lower dam of Bhavali Pumped Storage Project, approval granted by the Water Resources Department, Government of Maharashtra. The electricity requirement of the project will be met by the state Discom, Maharashtra State Electricity Distribution Company Limited (MSEDCL), as per the Power Purchase Agreement (PPA) executed with the Government of Maharashtra. The necessary documents attached herewith.	165-182
15	The state shall provide the details of the power evacuation plan and in case additional forest land is required for the same a consolidated proposal may be submitted for the entire forest area.	The user agency has submitted that the project is being implemented under a Power Purchase Agreement (PPA) with the Government of Maharashtra, under which the State will supply pumping power, and the generated power will be returned to the State. The power evacuation plan is under review and will be approved by the State Government based on ongoing load flow analysis. The transmission line alignment will be	

		designed to primarily utilize non-forest land, involving only minimal forest area if unavoidable. If any additional forest land is required, a separate forest diversion proposal will be submitted following State Government approval. The necessary documents attached herewith.
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This above information is submitted for further necessary action.

Encl: - (Proposal in 5 copies)



(Siddesh Sawardekar)
Deputy Conservator of Forests,
West Nashik Division

Copy to:- Deputy Conservator of Forest, Shahapur Division, Tal-Thane For information and necessary action.

Copy to:- M/s JSW Energy PSP Two Limited, For information.



Energy PSP Two Limited
Regd. Office: JSW Centre,
Bandra Kurla Complex,
Bandra (East), Mumbai – 400 051.

JSW/PSP-Bhavali/FCLand2025/07

CIN: U40106MH2021PLC367136
Phone: 022-4286 1000
Fax: 022-4286 3000

Date – 8th Oct, 2025

To,
The Dy. Conservator of Forest
Shahpur Division
Shahpur

Sub :- Submission of Replies/Clarifications to shortcoming issued on 02/Sep/2025 By MOEF&CC Regarding Forest Clearance Proposal of JSW Energy PSP Two Ltd. For Diversion of 243.74 ha. Forest land (Reserved Forest, Protected Forest and Private Forest) For Bhavali Pump Storage Project (1500 MW) In Thane & Nashik District in the State of Maharashtra (Online Proposal NO. FP/MH/HYD/153240/2022).

Ref. – 1. कक्ष-13(3)/20/जमीन / 1765 /2025-26 Dated – 18/09/2025
2. No.:Desk-17/FCA-SI/PID-153240/Thane/1322/24-25 Nagpur-440 001, Dated: 04/09/2025
3. क्रमांक - कक्ष-13(3)/20/जमीन / 1765 /2025-26

Dear Sir/Madam,

Please find the attached replies/clarification of shortcoming raised by the Ministry of Environment, Forest and Climate Change (MoEF&CC) dated 02/09/2025. The relevant annexures corresponding to each shortcoming have been indicated in the reply and a separate set of annexures is enclosed herewith.

Kindly acknowledge the attached Annexures

Yours Sincerely,
M/s JSW Energy PSP TWO LIMITED

Authorized Signatory

Lalit Parab
DGM – Projects.

Cc – 1. Chief Conservator of Forest (T), Thane
2. APPCCF-cum-Nodal Officer, Govt. of Maharashtra, Nagpur.



Part of O.P. Jindal Group



Energy PSP Two Limited
Regd. Office: JSW Centre,
Bandra Kurla Complex,
Bandra (East), Mumbai – 400 051.

JSW/PSP-Bhavali/FCLand2025/08

CIN: U40106MH2021PLC367136
Phone: 022-4286 1000
Fax: 022-4286 3000

Date – 8th Oct, 2025

To,
The Dy. Conservator of Forest
West Nashik Division
Nashik

Sub :- Submission of Replies/Clarifications to EDS issued on 02/Sep/2025 By MOEF&CC Regarding Forest Clearance Proposal of JSW Energy PSP Two Ltd. For Diversion of 243.74 ha. Forest land (Reserved Forest, Protected Forest and Private Forest) For Bhavali Pump Storage Project (1500 MW) In Thane & Nashik District in the State of Maharashtra (Online Proposal NO. FP/MH/HYD/153240/2022).

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2. No.:Desk-17/FCA-SI/PID-153240/Thane/1322/24-25 Nagpur-440 001, Dated: 04/09/2025
3. जा.क्र.कक्ष-३/जमिन/कॅम्पा/ 1279 / सन २०२५-२ – Dated 24/09/2025

Dear Sir/Madam,

Please find the attached replies/clarification of shortcoming raised by the Ministry of Environment, Forest and Climate Change (MoEF&CC) dated 02/09/2025. The relevant annexures corresponding to each shortcoming have been indicated in the reply and a separate set of annexures is enclosed herewith.

Kindly acknowledge the attached Annexures

Yours Sincerely,
M/s JSW Energy PSP TWO LIMITED

Authorized Signatory

Lalit Parab
DGM – Projects.

Cc – 1. Chief Conservator of Forest (T), Nashik
2. APPCCF-cum-Nodal Officer, Govt. of Maharashtra, Nagpur.



Part of O.P. Jindal Group



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Following are information asked by the MOEF&CC and our comments:

	Observation / Shortcoming	Clarification & req. Doc Annexures
1.	The component wise breakup provided by the State Govt. vide letter dated 05.08.2025 is different from the component wise breakup uploaded in the part-1 of the application form by the project proponent. The State shall examine the matter and ensure that the correct component wise breakup is uploaded in the portal.	Component wise breakup has been updated in Form A (Part-I) in FC Application on the portal. Attached as an Annexure-1. Component wise breakup.
2	As per component, wise breakup uploaded on the portal an area of 44.9 ha is proposed for Dumping area/job facilities 1&2 and an area of 4.8 ha is for working space, which are non-site-specific activities. The state shall explore and locate such facilities over non forest land.	We would like to submit the following details for consideration: Expert Appraisal Committee (River valley and Hydroelectric projects) in its agenda meeting held on 31.08.2024 sought sub- committee to visit the site 1. During the site visit, the Expert Appraisal Committee (EAC), MoEF&CC noted that the proposed muck disposal sites were appropriately selected. The Committee specifically recommended that <i>"the relocation of muck disposal site may not be insisted upon while considering the proposal for clearance, since the sites were found to be properly selected and ecologically better alternatives were not available in nearby areas. Any relocation at this stage may lead to adverse environmental consequences"</i> . (Attached as an Annexure-2.1) 2. The earmarked muck disposal sites fall in areas with very low vegetation density, thereby minimizing adverse impact on forest ecology. 3. Suitable non-forest land or private land is not available in proximity of the





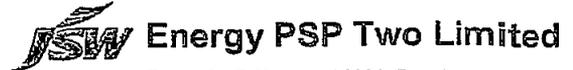
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		<p>project area, making relocation to non-forest areas practically unfeasible.</p> <ol style="list-style-type: none">4. An approved comprehensive Muck Management Plan has been prepared and submitted. This includes robust engineering measures (retaining walls, gabion structures, slope stabilization, drainage arrangements) and biological measures (multi-layered plantations, grass slips, native shrubs and tree species, soil enrichment) to ensure environmental protection, slope stability, and long-term ecological restoration of dumping sites. (Attached as an Annexure-2.2).5. Further there are ample examples in case of Hydro projects where the complete project components including Muck Dumping sites and facility areas are located within the forest area. (Attached as an Annexure-2.3).6. W.r.t Working space of 4.8 Ha: The same has to be located in close proximity to the main project working area since there is no private land available nearby Lower reservoir and moving this project facility outside the forest area will exponentially increase men, material & heavy machinery movement causing pollution. The location is carefully planned keeping in view timely completion of the project and maintaining high productivity of all resources. During the EAC subcommittee site visit, the overall project layout including individual project components were reviewed and found to be correctly selected ensuring minimum impact on
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		Environment & forest.
3	As per DSS Analysis of the KML files provided by the State Govt., the total software calculated area in the project is 309 Ha., which includes, forest and non-forest land. Further, for an area of 13.814 Ha, the details are not provided along with the KML file. Accordingly, the State Government shall provide the component wise correct KML files for the project area.	Updated KML file will be submitted in Form A (Part-I) N.A.
4	The State government has recommended the proposal with condition that User Agency shall obtain wildlife clearance and/or ensure compliance of mitigation measures, if required or suggested by the PCCF (Wildlife). Accordingly, the State Government is requested to submit the comments of the PCCF (Wild Life)/CWLW.	Wildlife Conservation Plan for the project area has already been prepared by Project proponent. The same duly approved by PCCF(WL)/CWLW, Maharashtra on 29.11.24 along with No Objection Certificate (NoC) with certified map, confirming that no Wildlife Sanctuary, National Park, or Eco-Sensitive Zone (ESZ) falls within or adjacent to the project area. The Harishchandra Gad Wildlife Sanctuary and its ESZ is located 2.21 Kms and only 12.5 meters away respectively from the boundary of the project. Accordingly, no separate wildlife clearance is required, and the approved Conservation Plan along with PCCF (Wildlife)'s NoC ensures compliance with the condition imposed by the State Government. State Forest Department (Nodal Officer), SG, MoEF&CC In view of above, PCCF (Wildlife)/CWLW's comments can be submitted to SG for submission to MoEF&CC. Additionally, The particular of the Project as submitted by DCF Shahpur and DCF West Nashik point no 11, state that vide letter dated 23/05/2022 of MoEF&CC (Wildlife Division), If the project area is falling within conservation reserve, it does not require consideration by the standing committee of NBWL as per Ministry's Guidelines dated 06/05/2022 Attached as an Annexure Annexure-4.1_WLCP Approval & Certified Map. Conservation plan approval Bhavali PSP





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		<p>Annexure-4.2_ Revised Wildlife Conservation & Bio Diversity Management Plan Approved by PCCF (WL) & Chief Wildlife Warden as recommended by CCF Nashik.</p> <p>Annexure-4.3_Particulars of project_DCF Shahapur along with the guidelines Ministry's Guidelines dated 06/05/2022</p>
5	<p>It has been submitted by the DFO Shahapur and West Nashik that recently the Government of Maharashtra has declared Gut. No. 42 of Village Jamunde, Tehsil-Igatpuri, District- Nashik as part of Igatpuri Conservation Reserve as per notification dated 22.11.2022. The state shall intimate whether the requisite conservation reserve management committee has been formed and whether the requisite approvals as applicable have been obtained or not?</p>	<p>As on date, the Conservation Reserve Management Committee for the subject area is yet to be formed/notified by the State Government. Hence, the comments of Conservation Reserve Management Committee cannot be obtained.</p>
6	<p>The Harishchandra Gad Wildlife Sanctuary and its ESZ is located 2.21 Kms and only 12.5 meters away respectively from the closest point on the boundary of the project. State Government shall ensure that the proposed area is actually outside the boundary of ESZ. A detailed report in this regard shall be submitted.</p>	<p>The PCCF (Wildlife)/CWLW, Maharashtra has approved the Wildlife Conservation Plan and issued a No Objection Certificate (Vide letter Email no. Room-23(2)/WL/survey/Sr.no.163/4366/2024-25dated 29/11/2024) confirming that the project does not fall within any Sanctuary, National Park, or ESZ.</p> <p>The APCCF WL West, Mumbai has confirmed after site visit by DCF Wildlife Nashik that the project area is outside 12.5 meter away from ESZ.</p> <p>The DCF West Nashik clarified in the particular of the project that No project area falls within any protected Area. And the Kalsubai Harishchandra Gad WLS and its ESZ is located 2.21 kms and 12.5 m away respectively from the close point on the boundary of the project. site visit report that the Project nearest point is outside the notified boundary of the Sanctuary and its ESZ.</p> <p>Attached as an Annexure – 6 Annexure 6.1 - PCCF wildlife letter</p>





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		<p>Annexure 6.2 -APCCF WL West Mumbai Letter Annexure 6.3-DCF Shahapur and West Nashik, Particular copy Annexure 6.4 -Revised PCCF (WL) approval letter attached Annexure 6.5 -Certified Map mentioning The Project Boundary located outside the ESZ. Annexure 6.6- DFO Wildlife Nashik letter to APCCF WL Nagpur</p>
7	<p>DFO West Nasik recommended that in the case of land that were allotted prior to 1980, lying in the project area, the user agency shall not utilize/acquire said land parcel without a separate/additional diversion proposal. However, no details of such areas has been provided. A detailed report shall be submitted in this regard. Accordingly, the State Government shall ensure that entire forest land is included in the proposal and a comprehensive proposal is submitted.</p>	<p>The Area allotted prior 1980 consist Gut no 37-41 at Jamunde Village is already excluded from project area. And respective undertaking also submitted to DCF West Nashik by user Agency.</p> <p>Attached as an Annexure – 7. Undertaking of the not acquisition of land under Gut no 37-41.</p>
8	<p>The CCF, Nashik in his recommendations recommended that a Wildlife Management and Mitigation Plan must be prepared and implemented in accordance with the guidelines and approval of the Chief Wildlife Warden (CWW), Maharashtra. State Government is requested to provide comments on the same.</p>	<p>The required Wildlife Management and Mitigation Plan has been prepared and approved by Chief Wildlife Warden (CWW), Maharashtra on 29.11.2024 and Revised Wildlife Conservation & Bio Diversity Management Plan Dated 16.09.2025, Approved by PCCF (WL) & Chief Wildlife Warden as recommended by CCF Nashik had uploaded on Parivesh portal Part 1.</p> <p>Attached as an Annexures-</p> <p>Annexure-4.1- WLCP Approval & Certified Map. Conservation plan approval Bhavali PSP</p> <p>Annexure-4.2_Revised Wildlife Conservation & Bio Diversity Management Plan Dated 16.09.2025, Approved by PCCF (WL) & Chief Wildlife Warden as recommended by CCF Nashik.</p>
9	<p>The CCF Nashik further recommends that a scientifically designed Catchment Area Treatment (CAT) Plan shall be implemented to prevent soil</p>	<p>The required Catchment Area Treatment Plan has been prepared by Project proponent and approved by APCCF & Nodal Officer Nagpur, Maharashtra on</p>





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	erosion, enhance water retention, and promote vegetative regeneration in the catchment area. However, the copy of the plan approved by the competent authority for the entire area has not been submitted.	26.05.2025. The same has been uploaded on in FC application on Parivesh. Attached as an Annexure – 9. CAT Plan copy signed by Nodal Officer.
10	The CCF Nashik, has recommended that a detailed study regarding the suitability and safety of tunnel construction must be conducted by a national-level institute of repute, specializing in hydro-geological and tunnel engineering. State Govt. shall provide the details/comments in this regard.	The overall project design has been concurred by the central agencies, including, suitability/safety of tunnels, approved by Geological Survey of India (GSI) and Central Water Commission (CWC). DPR concurrence accorded by Central Electricity Authority (CEA) vide letter dtd. 24.09.2024 (Attached as an Annexure_10.1) Further as recommended by CCF Nashik, the detailed study for tunnel construction has been carried out by Central Institute of Mining & Fuel Research (CIMFR), CSIR, Bilaspur on 19.05.2025 for safe execution of tunnels. The Report is appended as (Attached as an Annexure_10.2).
11	State Government has mentioned in its covering letter that felling of 69100 trees is involved in the proposal. However, in online Part- II, enumeration of 1,78,677 trees in Shahapur Division and 20,704 trees in West Nashik Division has been submitted. Exact number of trees to be felled needs to be submitted along with tree enumeration list at FRL-2 and FRL-4 meters.	As per Part II, III, IV and V, the exact number of trees to be felled is 63,881, while the total number of trees involved is 69,100. Accordingly, the data has been prepared earlier and recommended by the State Government. Shahapur Forest Division Total trees involve up to FRL=61554 Total trees involve up to FRL-2=59477 Total trees involve up to FRL-4= 57646 (To be Felled) West Nashik Forest Division Total trees involve up to FRL=7546 Total trees involve up to FRL-2=6923 Total trees involve up to FRL-4= 6235 (To be Felled) Therefore the total numbers of trees involved in project area (Shahapur and West Nashik Forest Division)= 61554+7546 = 69100. And the total numbers of trees to be felled upto FRL-4 in the project area (Shahapur and West Nashik Forest Division)= 57646+6235 = 63881





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12	<p>Further, the State Government shall provide a copy of approval of the National Dam Safety Authority (NDSA) on the recommendations made by the State Dam Safety Organization (SDSO) and submit the same as applicable.</p>	<p>As per section 8(1) of the Electricity Act, 2003, any generating company intending to set up a hydro generating station shall prepare and submit a scheme to the Central Electricity Authority (CEA) for its concurrence (Attached as an Annexure 12.1). Furthermore, as per Section 8(2) of the Electricity Act, 2003 the Authority shall, before concurring to any scheme submitted to it, ensure compliance with the prescribed norms regarding dam design and safety. Accordingly, the CEA had released the Guidelines for Formulation of Detailed Project Reports (DPR) for Pumped Storage Schemes, 2024 (Version 3.0) (Attached as an Annexure 12.2). The DPR of Bhavali Pumped Storage Project has been prepared in strict adherence to these guidelines. Dam safety aspects is examined by the Central Water Commission (CWC)/CEA, the same has been concurred by CEA vide letter dtd. 24.09.2024. (Attached as an Annexure 10.1)</p> <p>Furthermore, Dam Safety Act, 2021, under Section 4(x), defines a “specified dam” as a dam constructed before or after the commencement of this Act (Attached as an Annexure 12.3). Therefore, there is no separate requirement for examination by the NDSA or SDSO at pre-construction stage. The same shall be taken up during operational phase.</p>
13	<p>Since both the dams are to be constructed afresh, the justification for the site specificity of the project is required to be provided. The State shall provide the complete details including KML files, forest and non-forest area involved, trees involved along with the reasons for the rejection of various alternatives.</p>	<p>Site-Specificity: The project location is site specific, selected site minimize forest land diversion, avoid critical wildlife habitats, and ensure optimal engineering feasibility for the construction of both dams and associated facilities. The Justification alongwith summary note regarding site selected attached with this EDS reply. Further, in the Parivesh 1.0 portal of MoEf&CC, there is no option for uploading the kml file.</p> <p>Attached as an Annexure – 13.</p>





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14	It has been mentioned that project is not located near any river/waterbody. The state shall give a detailed report as to how the requirement of water and electricity will be met.	<p>It is submitted that the water for the one-time initial filling of the upper reservoir shall be sourced from the self-catchment of the lower reservoir and will be used cyclically for energy storage and discharge. Evaporation and seepage losses will be periodically recouped from the catchment of the lower reservoir, which is planned on Chornai Nala in the upper catchment of Bhatsa dam.</p> <p>In response to the requirements for construction water and electricity:</p> <ol style="list-style-type: none">1. The electricity requirement of the project will be met by the State Discom, Maharashtra State Electricity Distribution Company Limited (MSEDCL), as per the Power Purchase Agreement (PPA) executed with the Government of Maharashtra. Attached as an Annexure –14.12. The water required for the project will be sourced in accordance with the approval granted by the Water Resources Department, Government of Maharashtra. Attached as an Annexure –14.2
15	The state shall provide the details of the power evacuation plan and in case additional forest land is required for the same a consolidated proposal may be submitted for the entire forest area.	<p>The project is being developed as per the Power Purchase Agreement (PPA) signed with the Government of Maharashtra, (Attached as an Annexure-14.1) wherein pumping power will be provided by the State and the generated power will be supplied back to the State. The power evacuation/connectivity plan is subject to approval by the State Government based on the ongoing load flow analysis.</p> <p>Accordingly, alignment will be chosen in such as way that proposed line pass through non-forest land or</p>





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		<p>that bare-minimum Forest land is involved for transmission line.</p> <p>In case additional Forest land is required for power evacuation, a separate and consolidated forest diversion proposal shall be submitted as per the State Government's connectivity approval. It is further submitted that, since power evacuation falls under the <i>linear category</i> as per the Forest (Conservation) Act, 1980, the final approval of forest diversion will be accorded at the level of the State Government separately.</p>
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Government of Maharashtra

By Speed Post

No.FLD-1225/CR-101/F-10

Revenue and Forest Department,
Mantralaya, Mumbai - 400 032.

Dated:- 05.08.2025.

To,

The Secretary,
Ministry of Environment, Forests & Climate Change,
Government of India,
Indira Paryavaran Bhavan,
New Delhi.

Subject: Forest Land – Thane & Nashik

Diversion of 243.74 ha. (Shahapur division 181.45 ha. and West Nashik Division 62.29 ha.) Forest land for Bhavali Pumped Storage Project (1500 MW) Village Kothale & Kalbhode in Tal.Shahapur, Dist. Thane & Village Jamunde, Tal. Igatpuri, Dist. Nashik in the State of Maharashtra (FP/MH/HYD/153240/2022)

The Additional Principal Chief Conservator of Forests & Nodal Officer, Maharashtra State, Nagpur has submitted proposal for diversion of 243.74 ha. (Shahapur division 181.45 ha. and West Nashik Division 62.29 ha.) Forest land for Bhavali Pumped Storage Project (1500 MW) Village Kothale & Kalbhode in Tal.Shahapur, Dist. Thane & Village Jamunde, Tal. Igatpuri, Dist. Nashik in the State of Maharashtra.

The details of forest land proposed for diversion are as under:-

Sl. No.	Purpose	Village	Tehsil	District	Survey No.	Gut No.	Area (in ha.)	Legal Status
1	Lower Dam & Reservoir	Kothale	Shahapur	Thane	40	25	9.080	Protected Forest
2	Lower Dam & Reservoir				51	24	0.600	Protected Forest
					53pt	23	35.240	Reserved Forest
3	TRC				53pt	23	1.640	Reserved Forest
4	TRT (Underground)				53pt	23	4.200	Reserved Forest
5	Approach Road				53pt	23	20.932	Reserved Forest
6	HRT (underground)				53pt	23	4.500	Reserved Forest
7	Power House (Underground)				53pt	23	2.000	Reserved Forest
8	ADIT/MAT (underground)				53pt	23	0.230	Reserved Forest
9	Cable & Ventilation	53pt	23	0.084	Reserved Forest			

10	Dumping Area and Job Facilities				53pt	23	27.030	Reserved Forest
11	Service Corridor				53pt	23	2.064	Reserved Forest
12	Lower Dam & Reservoir	Kal-bhonde	Shahapur	Thane	--	62, 66/2, 66/1, 67/4, 71/1, 71/7, 71/6, 71/2, 70/3, 72/3, 72/2, 70/2, 70/1, 73/2, 72/1, 73/1, 86	36.180	Private Forest (Deemed RF)
12	ADIT/MAT (underground)				--	86	0.760	Private Forest (Deemed RF)
13	Dumping Area and Job facilities				--	86, 75/1, 75/2, 75/3, 75/4, 75/5, 75/6, 74	13.880	Private Forest (Deemed RF)
14	Working Space	Kal-bhonde	Shahapur	Thane		86, 77/1, 77/2	4.800	Private Forest (Deemed RF)
15	Approach Road				--	68/16, 68/14, 68/12, 68/13, 68/6, 68/1, 68/3, 70/4, 67/3, 71/3, 71/5, 69/3, 70/2, 70/3, 86, 78/1, 2, 3, 73/1, 76, 77/1, 77/2, 80/2	18.230	Private Forest (Deemed RF)

(A) Total Forest Area (Shahapur Forest Division)								181.45	
1	Upper Dam & Reservoir	Jamunde	Igatpuri	Nashik	--	42	58.42	Reserved Forest	
2	Approach Road to Upper Dam				--	42	0.77	Reserved Forest	
3	HRT (Underground)				--	42	2.18	Reserved Forest	
4	Saddle Dam				--	42	0.11	Reserved Forest	
5	Service Corridor				--	42	0.81	Reserved Forest	
(B) Total Forest Area (West Nashik Forest Division)								62.29	
Grand Total (A)+ (B)								243.74	

2. Justification of Site Specificity

The Pumped Storage Project is essentially a site specific project because it requires a particular type of topographical and geological conditions. The sites of elevation variance are required to construct reservoirs of desired capacity. Reservoir location should compulsorily fulfill the geo-technical criteria needed for establishing the pumped storage project. Since this project requires water as a means to store energy, the project has to be in close proximity of the water source. For this project, initially, the proposed site was identified by the Government of Maharashtra. The Government of Maharashtra has entered into an agreement with JSW Group by signing the Memorandum of Understanding for setting up of the extant project.

3. Deputy Conservator of Forests, Shahapur and West Nashik have certified that:-

- 3.1) No suitable alternate non forest land is available for the purpose of project and demand for the forest land is bare minimum
- 3.2) The land proposed for diversion has been put under Eco-Value Class-I, with the density of vegetation is 0.1 to <0.7 and 0.5.
- 3.3) As per the enumeration, the felling of 63881 trees is involved in the project. The girth with tree enumeration details are as follows:-

(Tree Girth in cm)												
Division	Range	Below 30 cm	31-45 cm	46-60 cm	61-75 cm	76-90 cm	91-105 cm	106-120 cm	121-150 cm	Above 150cm	Actual Felling upto FRL-4	Total involved tress in the project
Shahapur	Washala	25110	13547	3906	2243	1201	722	371	410	178	47688	50673
	Dolkhamb	4899	2021	1705	663	385	120	39	126	0	9958	10881
West Nashik	Igatpuri	2400	1916	669	345	224	166	98	170	247	6235	7546
Total		32409	17484	6280	3251	1810	1008	508	706	425	63881	69100

- 3.4) The proposed area is not included in the area of any National Park/Wildlife Sanctuary/Kalsubai Harishchandra Gad Wildlife Sanctuary, but part of Igatpuri Conservation Reserve.

3.5) The Kalsubai Harishchandra Gad Wildlife Sanctuary and its ESZ is located 2.21 Kms and 12.5 m. away respectively from the closest point on the boundary of the project. The area of the project falls within the notified area of Igatpuri Conservation Reserve.

3.6) The Divisional Forest Officer Ratnagiri (Chiplun) has inspected an area of 245.735 ha. as below:-

Sr. No.	Village	Survey No.	Area (in ha.)
1	Choravane, Tal. Khed, Dist.Ratnagiri	71,72,73,74,75,91,92,93,94,95,96, 97,98,101,102,103,104,113,114	245.735
Total Area			245.735

Of Village Choravane, Tal. Khed, Dist. Ratnagiri to be transferred to the Forest Department as alternate land for compensatory afforestation in lieu of diversion of 243.74 ha. forest land under Van (Sanrakshan Evam Samvardhan), Adhiniyam, 1980 for 1500 MW Bhavali Pump Storage Project purpose at Village Kothale, Kalbhonde, Tal. Shahapur, Dist. Thane and Village Jamunde, Tal. Igatpuri, Dist. Nashik proposed by JSW Energy PSP Ltd. is suitable for forest management purpose. The area is free from encroachment. The area is at moderate slopes with dense tree growth and covered by bushes and climbers with 0.5 density. The area is included in the proposed Eco-Sensitive Zone of Western Ghat of Maharashtra. The land is acceptable for compensatory afforestation as per the guidelines issued by Government of India, dated 21/08/2023. The Compensatory Afforestation Scheme for 30.00 ha. and Protection plan of land is proposed in 245.7350 ha. Non-forest which is enclosed on

3.7) There is no violation of the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980 and their guidelines.

3.8) The Deputy Conservator of Forests, Shahapur & West Nashik have certified that the proposed project is not likely to affect any monument sites of cultural, historical, religious archaeological or recreational importance.

4. The User Agency has submitted an undertaking:-

4.1) to defray the cost of Compensatory Afforestation.

4.2) to defray the cost of Net Present Value

4.3) The complete compliance of the FRA, 2006 shall be ensured by way of prescribed certificate from the concerned District Collector

5. Deputy Conservator of Forests, Shahapur Forest Division, Shahapur has recommended the proposal for approval under Section-2 of the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980.

The proposal is recommended for acceptance on following grounds:

1. Demand for the power is on steady rise with an average annual rate of 8-9% in the country. The project aims at augmentation of present installed capacity of hydro

power in the country by 1500 MW. The Government of Maharashtra has executed Memorandum of Understanding with the project proponent for development of the extant project.

2. The Hydro Energy Project is an established, proven and cost effective technology for clean and cheap electricity. Demand for the power is on steady rise in the State of Maharashtra. The project has potential to bridge the gap between demand and supply of electricity in Maharashtra.

3. The project will generate significant employment opportunities for the people of Maharashtra for the decades together and will create infrastructure facilities to accelerate socio-economic development of the region.

4. The project is site specific and requirement of Forest Land is assessed to barest minimum & unavoidable for the project. Hence, recommended for acceptance.

6. Deputy Conservator of Forests, West Nashik Forest Division, Nashik has recommended the proposal for approval under Section-2 of the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980.

'The project involves construction of tunnel work as one of the component which may necessitate stability studies from national level institution. Also in the case of land that were allotted prior to 1980, lying in the project area, the user agency shall not utilize/acquire said land parcel without a separate/additional diversion proposal. Considering the above, project is recommended for approval (62.29 ha.)'

7. Recommendation of the Chief Conservator of Forests (T), Thane:-

The Chief Conservator of Forests (T.), Thane on 05/05/2025 has recommended for acceptance this proposal for diversion of 243.74 ha. (Shahapur division 181.45 ha. and West Nashik Division 62.29 ha.) Forest land for Bhavali Pumped Storage Project (1500 MW) Village Kothale & Kalbhode in Tal. Shahapur, Dist. Thane & Village Jamunde, Tal. Igatpuri, Dist. Nashik in the State of Maharashtra.

8. Recommendation of the Chief Conservator of Forests (T), Nashik:-

This project is recommended subjected to the following conditions:-

- 1) *A Wildlife Management and Mitigation Plan must be prepared and implemented in accordance with the guidelines and approval of the Chief Wildlife Warden (CWW), Maharashtra.*
- 2) *A scientifically designated Catchment Area Treatment (CAT) Plan shall be implemented to prevent soil erosion, enhance water retention, and promote vegetative regeneration in the catchment area.*
- 3) *The User Agency must ensure strict compliance with the provisions of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, along with its applicable Rules.*

- 4) *A detailed study regarding the suitability and safety of tunnel construction must be conducted by a national-level institute of repute, specializing in hydro-geological and tunnel engineering.*
- 5) *It must be ensured that access to nearby agricultural fields, water resources, and human habitations is not obstructed during either the construction or operational phases of the project.*

The User Agency shall take all possible measures to minimize tree felling wherever feasible.

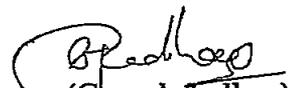
9. Additional Principal Chief Conservator of Forests & Nodal Officer, Maharashtra State, Nagpur, has recommended the proposal subject to the conditions, given in his recommendations, under Section-2 (ii) of the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980. His recommendations are enclosed in the proposal.

10. The Principal Chief Conservator of Forests (HoFF), Maharashtra State, Nagpur has recommended the proposal subject to the conditions, given in his specific recommendations, under Section-2 (ii) of the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980. His specific recommendations are enclosed in the proposal.

11. In the circumstances explained in aforesaid paragraphs and enclosures, the State Government recommends that the said forest land may be allowed to be diverted under Section-2 (ii) of the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980, subject to conditions proposed by the Principal Chief Conservator of Forests (HoFF) and Addl. PCCF & Nodal Officer, Nagpur along with the following condition.

- i) User Agency shall obtain wildlife clearance and/or ensure compliance of mitigation measures, if required or suggested by the PCCF (Wildlife).
- ii) User Agency shall submit NOC of the Private landholders of the proposed land along with Stage-I compliance and compensate them as per prevalent Acts and Rules in this regard.
- iii) The non-forest land proposed for CA shall be transferred and mutated in the name of Forest Department and notified as RF/PF prior to Stage-II approval.

The matter may kindly be placed before the Government of India for approval under Section-2 of the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980.


(Ganesh Jadhao)

Under Secretary to the
Government of Maharashtra

Under Secretary
Revenue and Forests Department
Hutatma Rajguru Chowk
Madam Cama Road, Mantralaya
Mumbai 400 032

Encl: A) Set of case papers

B) The following documents are enclosed:-

1. Prescribed form as per Rules.
2. Area Statement

- L
3. Commitment from the Applicant for defraying the cost of Net Present Value & Compensatory Afforestation
 4. Site Inspection Report.
 5. Certificate in Part V.

Copy:

1. Secretary, Ministry of Environment, Forests & Climate Change, New Delhi.
2. Principal Chief Conservator of Forests (HoFF), M.S., Nagpur.
3. Principal Chief Conservator of Forests (Wildlife), M.S., Nagpur.
4. Principal Chief Conservator of Forests & C.E.O, Maha-CAMPA, Nagpur.
5. Additional Principal Chief Conservator of Forests and Nodal Officer, Maharashtra State Nagpur with reference to his letter No.Desk-17/Nodal/S1/PID-153240/Thane/357/25-26, Dt.19.05.2025.
6. Chief Conservator of Forests (T), Thane / Nashik
7. Deputy Conservator of Forests, Shahapur Forest Division, Shahapur
8. Deputy Conservator of Forests, West Nashik Forest Division, Nashik
9. Authorized Signatory, JSW Energy PSP Limited, Mumbai
10. Select File (F-10)

Forest Land – Thane & Nashik

Diversion of 243.74 ha. (Shahapur division 181.45 ha. and West Nashik Division 62.29 ha.) Forest land for Bhavali Pumped Storage Project (1500 MW) Village Kothale & Kalbhode in Tal.Shahapur, Dist. Thane & Village Jamunde, Tal. Igatpuri, Dist. Nashik in the State of Maharashtra (FP/MH/HYD/153240/2022)

PART - V

(To be filled up by the Secretary in charge of Forest Department or by any other authorized officer of the State Government not below the rank of an Under Secretary)

1. Recommendation of the State Government

The proposal is recommended
vide Government letter
No.FLD-1225/C.R.101/F-10
Dated:- 05.08.2025


(Ganesh Jadhao)

Under Secretary to the Government of Maharashtra

Under Secretary
Revenue and Forests Department
Hutatma Rajguru Chowk
Madam Cama Road, Mantralaya
Mumbai 400 032

Place: Mumbai.

Date:-05.08.2025

AREA STATEMENT

Forest Division: Shahapur								
Purpose/ Item	Village / Tehsil /District	Forest Land			Non- Forest Land			Total Area (In Ha.)
		Suy. Nos.	Area (In Ha.)	Legal Status	Suy. Nos.	Area (In Ha.)	Legal Status	
Lower Dam & Reservoir	Kothale/ Shahapur/ Thane	40 (GN 25)	9.080	Protected Forest	--	--	--	9.080
Lower Dam & Reservoir	Kothale/ Shahapur/ Thane	51 (GN 24)	0.600	Protected Forest	--	--	--	0.600
		53 pt (GN 23)	35.240	Reserved Forest	--	--	--	35.240
TRC	Kothale/ Shahapur/ Thane	53 pt (GN 23)	1.640	Reserved Forest	--	--	--	1.640
TRT (Underground)	Kothale/ Shahapur/ Thane	53 pt (GN 23)	4.200	Reserved Forest	--	--	--	4.200
Approach Road to Lower Dam	Kothale/ Shahapur/ Thane	53 pt (GN 23)	20.932	Reserved Forest	--	--	--	20.932
HRT (Underground)	Kothale/ Shahapur/ Thane	53 pt (GN 23)	4.500	Reserved Forest	--	--	--	4.500
Power House (Underground)	Kothale/ Shahapur/ Thane	53 pt (GN 23)	2.000	Reserved Forest	--	--	--	2.000
ADIT/ MAT (Underground)	Kothale/ Shahapur/ Thane	53 pt (GN 23)	0.230	Reserved Forest	--	--	--	0.230
Cable & Ventilation	Kothale/ Shahapur/ Thane	53 pt (GN 23)	0.084	Reserved Forest	--	--	--	0.084
Dumping Area and Job Facilities	Kothale/ Shahapur/ Thane	53 pt (GN 23)	27.030	Reserved Forest	--	--	--	27.030
Service Corridor	Kothale/ Shahapur/ Thane	53 pt (GN 23)	2.064	Reserved Forest	--	--	--	2.064
Total			107.600		--	--	--	107.60
Lower Dam & Reservoir	Kalbhone / Shahapur/ Thane	62 66/2 66/1	36.180	Private Forest (Deemed RF)	--	--	--	36.180



		71/1 71/7 71/6 71/2 70/3 72/3 72/2 70/2 70/1 73/2 72/1 73/1 86					
ADIT/ MAT (Underground)	Kalbhonde / Shahapur/ Thane	86	0.760	Private Forest (Deemed RF)			0.760
Dumping Area and Job Facilities	Kalbhonde / Shahapur/ Thane	86 75/1 75/2 75/3 75/4 75/5 75/6 74	13.880	Private Forest (Deemed RF)			13.880
Working Space	Kalbhonde / Shahapur/ Thane	86 77/1 77/2	4.800	Private Forest (Deemed RF)			4.800
Approach Road	Kalbhonde / Shahapur/ Thane	68/16 68/14 68/12 68/13 68/6 68/1 68/3 70/4 67/3 71/3 71/5 69/3 70/2 70/3 86 78/1,2, 3 73/1 76 77.1 77.2 80/2	18.230	Private Forest (Deemed RF)			18.230
Total			73.850	-	-	-	73.850

Div. Conservation of Forests
Forest Division

वनपरीक्षण अधिकारी
डोकखोव



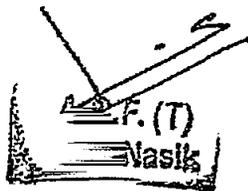
सहाय्यक वन संरक्षक
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वनसर्वेक्षक
वनविभाग शहापुर

वनसर्वेक्षक
वनविभाग शहापुर

Forest Division: West Nashik								
Purpose	Village / Tehsil / District	Forest Land			Non- Forest Land			Total Area (in Ha.)
		Suy. Nos.	Area (in Ha.)	Legal Status	Suy. Nos.	Area (in Ha.)	Legal Status	
Upper Dam & Reservoir	Jamunde/ Igatpuri/ Nashik	42	58.42	Reserved Forest	53	0.980		
					52	0.087		
					28	0.386		
					51	2.240		
					50	2.700		
					48	0.095		
					49	2.240		
					46	2.950		
					47	4.390		
					43	4.620		
					45	3.540		
44	5.260							
Approach Road to Upper Dam	Jamunde/ Igatpuri/ Nashik	42	0.77	Reserved Forest	21	0.040		
					22	0.109		
					26	0.080		
					28	1.687		
					52	0.014		
HRT (Underground)	Jamunde/ Igatpuri/ Nashik	42	2.18	Reserved Forest	--	--	--	
Saddle Dam	Jamunde/ Igatpuri/ Nashik	42	0.11	Reserved Forest	--	--	--	
Service Corridor	Jamunde/ Igatpuri/ Nashik	42	0.81	Reserved Forest	--	--	--	
Total			62.29	--		31.08	--	93.37



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[Handwritten signature]
Deputy Conservator of Forests
West Nashik.

FORM - A

Form for seeking prior approval of Central Government under section 2 of the Forest(Conservation) Act,1980 for Diversion of fresh forest area

PART - I
(To be filled up by User Agency)**A. General Details****A-1. Project Details**

- (i). Proposal No. : FP/MH/HYD/153240/2022
 (ii). Name of Project for which Forest Land is required : Diversion of Forest Land for Bhavali Pumped Storage Project (1500 MW) in Thane & Nasik Districts of Maharashtra State
 (iii). Short narrative of the proposal and Project/scheme for which the forest land is required : The JSW Energy PSP Two Limited, Mumbai is intending to construct a Pumped Storage Project (1500 MW) in Thane & Nasik Districts of Maharashtra State in furtherance of MoU signed in between JSW Energy & Government of Maharashtra.
 (iv). State : Maharashtra
 (v). Category of the Proposal : Hydel
 (vi). Shape of forest land proposed to be diverted : Hybrid
 (vii). Estimated cost of the Project(Rupees in lacs) : 905809
 (viii). Area of forest land proposed for diversion(In ha.): 243.74
 (ix). Non-forest land required for this project(in ha.): 31.08
 (x). Total period for which the forest land is proposed to be diverted(in years): 99

A-2. Details of User Agency

- (i). Name : JSW ENERGY PSP TWO LIMITED
 (ii). Address1 : JSW Centre, Bandra Kurla Complex, Bandra East, Mumbai
 (iii). Address2 : NIL
 (iv). State : Maharashtra
 (v). District : Mumbai City
 (vi). Pin : 400051
 (vii). Landmark : NIL
 (viii). Email address : lalit.parab@jsw.in
 (ix). Landline Telephone No. : 0-22-
 (x). Fax No. : 0-
 (xi). Mobile No. : 9970162724
 (xii). Website (if any) : www.jsw.in
 (xiii). Legal status of User Agency : Others

A-3. Details of Person Making Application

- (i). First Name: Lalit
 (ii). Middle Name: NIL
 (iii). Last Name: Parab
 (iv). Gender: Male
 (v). Designation: Asstt. General Manager,
 (vi). Address 1: JSW Centre, Bandra Kurla Complex, Bandra East- 51
 (vii). Address 2: NIL
 (viii). State: Maharashtra
 (ix). District: Mumbai City
 (x). Tehsil: Kurla
 (xi). Pin: 400051
 (xii). Landmark: BKC
 (xiii). Email Address: bhavali.psp@jsw.in
 (xiv). Landline Telephone No.: 0-
 (xv). Fax No.: NIL
 (xvi). Mobile No.: 9970162724
 (xvii). Copy of documents in support of the competence/authority of the person making this application to make application on behalf of the User Agency:

B. Details of land required for the Project

- B-1. Details of proposal seeking prior approval of Central Government under the Act for diversion of forest land for the Project already submitted in the past

List of proposal submitted In Past							
S.no	Proposal Status,	Proposal No.	Moef File No.	Area Proposed for Diversion(Ha.)	Area Diverted(Ha.)	Date of In-Principle Approval	Date of Final Approval
NIL							

B-2. Details of forest land proposed to be diverted

B-2.1 Details of Divisions involved

Details of Divisions involved			
S.no	Division Name	Forest Land(ha.)	Non-Forest Land(ha.)
1.	Shahapur	181.45	0
2.	West Nashik(Nashik)	62.29	31.08
Total		243.74	31.08

B-2.2 Details of Districts involved

District wise breakup			
S.no	District Name	Forest Land(ha.)	Non-Forest Land(ha.)
1.	Thane	181.45	0
1.	Nashik	62.29	31.08
Total		243.74	31.08

B-2.3 Village wise breakup

Villages wise breakup			
S.no	Village	Forest Land(ha.)	Non-Forest Land(ha.)
1	Kalbhonde	73.85	0
2	Kothale	107.6	0
3	Jamunde	62.29	31.08
Total		243.74	31.08

B-2.4 Component wise breakup

Component wise breakup			
S.no	Component	Forest Land(ha.)	Non-Forest Land(ha.)
1	TRT (Underground)	4.2	0
2	Cable & Ventilation	0.084	0
3	Upper Dam & Reservoir	58.42	29.15
4	Lower Dam & Reservoir	81.1	0
5	Working Space	4.8	0
6	Pothhead Yard	0	0
7	Fire Fighting Tank	0	0
8	Saddle Dam	0.11	0
9	ADIT/ MAT (Underground)	0.99	0
10	Approach Road to Upper Dam	0.77	1.93
11	Service Corridor	2.874	0
12	HRT (Underground)	6.68	0
13	Power House (Underground)	?	0
14	Approach Road to Lower Dam	39.162	0
15	TRC	1.64	0
16	Dumping Area & Job facilities-1	18.335	0
17	Dumping Area & Job facilities-2	22.575	0
Total		243.74	31.08

C. Maps of forest land proposed to be diverted

Division 1. : West Nashik(Nashik)	
(i).	Area of forest land proposed to be diverted(in ha.) : 62.29
(ii).	Nature of the Project: Hybrid

(a). No. of patches : One

Patch wise details		
Patch No.	Area of Patch(in ha.)	Kml File of Patches (To view KML file on google the same may be downloaded and then open if in google earth install in your computer.)
1.	62.29	 View File

(b). No. of Segments : One

Segment wise details		
Segments	Segment Area(in ha.)	Kml File of Segments (To view KML file on google the same may be downloaded and then open if in google earth install in your computer.)
1.	0	 View File

(iii). Copy of Survey of India Toposheet Indicating boundary of forest land proposed to be diverted: 

(iv). Scanned copy of the Geo-referenced map of the forest land proposed to be diverted prepared by using GPS or Total Station: 

Division 2. : Shahapur

(i). Area of forest land proposed to be diverted(in ha.) : 181.45

(ii). Nature of the Project: Hybrid

(a). No. of patches : One

Patch wise details		
Patch No.	Area of Patch(in ha.)	Kml File of Patches (To view KML file on google the same may be downloaded and then open if in google earth install in your computer.)
1.	181.45	 View File

(b). No. of Segments : One

Segment wise details		
Segments	Segment Area(in ha.)	Kml File of Segments (To view KML file on google the same may be downloaded and then open if in google earth install in your computer.)
1.	0	 View File

(iii). Copy of Survey of India Toposheet Indicating boundary of forest land proposed to be diverted: 

(iv). Scanned copy of the Geo-referenced map of the forest land proposed to be diverted prepared by using GPS or Total Station: 

D. Justification for locating the Project in forest land and details of alternatives examined:

(i). Copy of note containing justification for locating the Project in forest land: 

(ii). Whether a copy of map indicating location of alternative examine is required to be provided: No

(a). Reason for not providing such map: Project is site specific.

E. Employment likely to be generated

(i). Whether the Project is likely to generate employment?: Yes

(ii). Permanent/Regular Employment(Number of persons): 750

(iii). Temporary Employment(Number of person-days): 4250

F. Displacement of People due to the Project, if any

(i). Whether Project involves displacement?: No

G. Details of Cost-Benefit analysis for the Project

(i). Whether the Project requires Cost-Benefit analysis?: Yes

(a). Copy of Cost-Benefit analysis: 

H. Status of Environmental Clearance

(i). Whether the Project requires Clearance under the Environment (Protection) Act 1986 ? : Yes

(a). Status of the Environmental Clearance to the Project: EC under process

(ii). Environmental Clearance File No.: J-12011/08/2022-IA.I (R)

I. Status of Wildlife Clearance

(i). Whether the Project or a part thereof is located in any Protected Area or their Eco sensitive zone? : No

J. Applicability of special provisions governing Scheduled Areas

(i). Whether the Project or a part thereof is located in a Scheduled Area? : Yes

K. Status of settlement of rights under the Forest Rights Act, 2006 on the forest land proposed to be diverted

(i). Whether the process for settlement of Rights under the Forest Rights Acts 2006 on the forest land proposed to be diverted has been completed? : Yes

(a). Copy of documentary evidence in support of settlement of rights under the Forest Rights Act, 2006 on the forest land proposed to be diverted: 

L. Details of land identified for Compensatory Afforestation

(i). Whether non-forest or Revenue forest land is required to be provided by User Agency?: Yes

(ii). Whether the area of non-forest land or Revenue forest land required to be provided by User Agency for raising Compensatory Afforestation is less than area of forest land proposed to be diverted ? : No

(iii). No. of districts involved for raising Compensatory Afforestation: 1

(iv). No. of patches: One

District 1. : Ratnagiri	
(a). Village:	Chorvane
(b). Area(in ha.):	245.735
(c). Copy of KML file of the patch:	 View File
(d). Khasra details:	71 to 75, 91 to 98, 101 to 104, 113, 114
(e). Present owner:	Others
(f). Copy of ownership proof:	
(g). Copy of Mou/agreement executed between the Present owner and the User Agency:	
(h). Copy of non encumbrance certificate for the forest land:	

(v). Scanned copy of the map of the land Identified for creation of Compensatory Afforestation prepared by using GPS or Total Station: 

(vi). Copy of Survey of India Toposheet in 1:50,000 scale indicating location of the land identified for creation of Compensatory Afforestation: 

M. Hydel/Irrigation/Multipurpose Project

(i). Installed power generation capacity of the Project(in MW): 1500

(ii). Total command area of the Project(in ha.): 0

(a). Copy of the approval of competent authority to the Catchment Area Treatment Plan (CAT Plan): 

(b). Copy of the approved CAT plan: 

Additional information Details

Documents		
S.No	Documents	Remarks
1		Area Statement of the project
2		All Villages Map
3		Kalbhonde Village Map
4		Jamunde Village Map
5		Kothale Village Map
6		Protected Area Distance Map
7		Vegetation Density Map
8		UA Certificates
9		EDS-2 reply_Annexure 2.1 EAC members site visit Report
10		EDS-2 Reply_Annexure 2.3 Other Hydro project FC approval in Muck site
11		EDS-4 Reply_Annexure 4.1 and 4.2 Approved certificate and certified map alongwith Wildlife Conservation Plan
12		EDS-5 Reply_Annexure 5 DCF Shahpur has mentioned in particulars of the projects (point no.11) dated 02.07.2025 alongwith Guidelines 05.05.2022.
13		EDS-6 Reply_Annexure 6.1_PCCF(WL) letter dated 29.11.2024
14		EDS-6 Reply_Annexure 6.2 APCCF(WL) Mumbai letter to CWLW Nagpur dated 14.11.2024
15		EDS-6 Reply_Annexure 6.4 Revised PCCF WL approval letter 16.09.2025 for WLCP
16		EDS-6 Reply_Annexure 6.5 Certified Map mentioning the project boundary located outside the Wildlife and its ESZ approval letter 16.09.2025 for WLCP
17		EDS-6 Reply_Annexure 6.6 DFO Wildlife Nashik letter to APCCF WL Nagpur
18		EDS-7 Reply_Annexure 7 User agency Undertaking regarding not acquiring of land under Gut no. 37 to 41.
19		EDS-10 Reply_Annexure-10.1_CEA concurrence letter dated 24-09-2024
20		EDS-12 Reply_Annexure-12.1_ Excerpt of National Electricity Act,2003
21		EDS-12 Reply_Annexure 12.2_Examination_and_Concurrence_of_DPR_PSP_July2024_Version_3.0
22		EDS-12 Reply_Annexure-12.3_ Excerpt of National Dam Safety Act, 2001
23		EDS-14 Reply_Annexure-14.1 Power Purchase Agreement (PPA) executed with the Government of Maharashtra
24		EDS-14 Reply_Annexure-14.2 Approval granted by the Water Resources Department, Government of Maharashtra for Water requirement.
25		EDS-10 Reply_Annexure-10.2_the detailed study for tunnel construction has been carried out by Central Institute of Mining & Fuel Research (CIMFR), CSIR, Bilaspur on 19.05.2025
26		In response to EDS letter issued by DCF Shahpur Dt 18.09.2025 and DCF West Nashik dt. 24.09.2025. The EDS reply is submitted.
27		EDS-2 Reply_Annexure 2.2 Approved Comprehensive Muck Management Plan and undertaking for Dumping area Non utilization for Non forest activity
28		In response to EDS letter issued by DCF Shahpur Dt 17.10.2025 The EDS reply is submitted.

Print page

Full title of the Project: Diversion of Forest Land for construction of Bhavali Pumped Storage Project (1500MW) in Thane & Nasik Districts of Maharashtra State
 File No.: F.P. MH/11YD-153240-2022
 Date of Proposal: 06/03/2022

(Sr. No. 10 of Checklist)

COST BENEFIT ANALYSIS

COST BENEFIT ANALYSIS FOR BHAVALI PUMPED STORAGE PROJECT

Name of Project:

Bhavali Pumped Storage Project (1500 MW), Maharashtra State

Project Proponent:

JSW Energy PSP Two Limited, Mumbai

Area of the Project:

The proposal involves surface as well as underground components. The certain Surface Components have overlaps with other Surface Components. Similarly, few underground Components have overlaps with other Underground Components. The certain Underground Components also have overlaps with the Surface Components. An analysis of an effective area involved in the proposal has been carried out and shown in the table annexed hereto as Annexure- I.

About 275.00 Ha. (includes 243.74 Ha. Forest Land) in Igatpuri & Shahapur Tehsils of Nasik & Thane Districts, respectively.

Cost of the Project:

Rs. 9058.09 Cr.

Expected Project Life:

50 Years

Computations for Net Present Value (NPV) of Forest Land proposed for diversion:

Sr. No.	Eco-Value Class	Density Class	Area (In Ha)	Rate of NPV (In Rs)	NPV (In Rs)
1	Eco- Class I Tropical Moist Deciduous Forest	Open Forest (OF)	73.850	11, 16, 900.00	8, 24, 83, 065.00
2	Eco- Class I Tropical Moist Deciduous Forest	Dense Forest (DF)	107.600	14, 36, 670.00	15, 45, 85, 692.00
3	Eco- Class I Tropical Moist Deciduous Forest	Dense Forest (DF)	62.290	14, 36, 670.00	8, 94, 90, 174.30
Grand Total			243.740 Sny: 243.74		32, 65, 58, 931.30 Sny: 32.66 Cr.

COST OF FOREST DIVERSION:

Sr. No.	Parameters	MoEF&CC Guidelines	Statistics for Bhayali PSI	Total Cost (Rs. in Cr.)
1	Ecosystem Services losses due to proposed forest diversion	Ecosystem Services losses due to proposed forest diversion shall be the NPV of the Forest Land being diverted as prescribed by the MoEF&CC	The NPV of the Forest Land proposed to be diverted for the project is: NPV = Rs. 32.66Cr. Ecosystem Services losses- NPV = Rs. 32.66Cr.	32.66
2	Loss of Animal Husbandry productivity, including loss of fodder	To be quantified & expressed in monetary terms or 10% of NPV applicable, whichever is maximum	The NPV of the Forest Land proposed to be diverted for the project is: NPV = Rs. 32.66Cr. Loss of Animal Husbandry productivity, including loss of fodder= 10% of NPV = Rs. 3.266 Cr.	3.266
3	Cost of human re-settlement	To be quantified and expressed in monetary terms as per approved R&R Plan	The proposed project involves construction of upper and lower reservoirs. Based on the studies carried out, the project will involve in acquiring small portion of private land. Detailed socio-economic analysis of the people, property loss likely to be impacted by the construction of the project is planned in DPR stage.	NIL
4	Loss of Public Facilities and Administrative Infrastructure (Road, Buildings, Schools, Dispensaries, Electric Lines, Railway, etc.) on Forest Land, which would require Forest Land if these facilities were diverted due to the project.	To be quantified and expressed in monetary terms on actual cost basis at the time of diversion	The project does not envisage loss of public facilities and administrative infrastructure which would require Forest Land if these facilities were diverted due to the project.	NIL
5	Possession Value of the Forest Land diverted	30% of the Environmental Costs (NPV) due to loss of forests or Circle Rates of adjoining area in the district should be added as a cost component as possession	The NPV of the Forest Land proposed to be diverted for the project is: NPV = Rs. 32.66Cr.	9.798

		value of the forest Land, whichever is maximum	Possession Value of the Forest Land diverted (PV) is: PV 30% of NPV Rs. 9 798 Cr.	
6	Cost of suffering to Oustees.	The Social Cost of rehabilitation of oustees (in addition to the cost likely to be incurred in providing residence, occupation and Social Services as per R&R Plan) be worked out as 1.5 times of what oustees should have earned in two years had he not been shifted.	The project does not envisage displacement of any individual or settlement or rehabilitation of oustees. However, the detailed socio-economic analysis of the people, propertyless likely to be impacted by the construction of the project is planned in DPR stage.	Nil.
7	Habitat Fragmentation Cost	While the relationship between fragmentation and forest goods & services is complex. For the sake of simplicity, the cost due to fragmentation has been pegged at 50% of NPV applicable as a thumb rule.	The NPV of the Forest Land proposed to be diverted for the project is: NPV 32.66 Habitat Fragmentation Cost (HFC) 50% of NPV HFC Rs. 16.33 Cr.	16.33
8	Compensatory Afforestation and Soil & Moisture Conservation Cost	The actual cost of Compensatory Afforestation and Soil & Moisture Conservation and its maintenance in future at present discounted value.	The actual cost of Compensatory Afforestation and Soil & Moisture Conservation and its maintenance in future at present discounted value is: Rs. 0.0829 Cr. per Ha. = 243.74 x 0.0829 = 20.21 Cr.	20.21
Total				82.264

BENEFITS OF FOREST DIVERSION:

Sr. No.	Parameters	MoEF&CC Guidelines	Statistics for Bhavali PSP	Total Benefits (Rs. In Cr.)
1	Increase in productivity attribute to the specific project	To be quantified & expressed in monetary terms avoiding double counting.	The Bhavali PSP (1500 MW) would contribute planned peak power generation, there would be direct revenue to the State of Maharashtra and the Government of India. <ul style="list-style-type: none"> Total energy generation units: 4044.06 MU Total energy consumption: 5120.53 MU 	84550

			<ul style="list-style-type: none"> • Rate of saleable energy: Rs. 7.98/- per Unit • Rate of pumping energy: Rs. 3.0/- per Unit • Cost of saleable net energy: Rs. 1691 Cr. per Annum 	
2	Benefits to economy due to the specific project	The Incremental Economic Benefit in monetary terms due to the activities attributed to the specific project.	<p>Power is among the most critical components of infrastructure development; crucial for the economic growth and welfare of developing nations like India. The existence and development of adequate infrastructure is essential for sustained growth of the economy. Investment in hydel project, which produces the cheapest, cleanest and environment friendly energy, brings in several benefits to Agriculture, Industry, commerce, health, education, environment, etc. sectors. The Incremental Economic Benefits, in monetary terms, due to the activities attributed to this project are hereby worked out on the basis of statistics published by the RBI & World Bank for India for FY 2019-20. The details are furnished below:</p> <ol style="list-style-type: none"> i. Gross Investment Rate of India (GIR)= 27.3% ii. Growth Rate of India, which is GDP= 8.68% which <p>Therefore, the ICOR = $GIR / GDP = 27.3 / 8.68 = 3.14$</p> <p>The Increment to Output would be: = Investment/ ICOR = 9050 Cr./ 3.14 = 2882.17 Cr.</p>	2882.17
3	No. of population benefited due to specific project.	As per the detailed Project Report.	<p>The project falls within territorial limits of Kothale, Kalbhonde & Jamunde villages. The all villages having total population of 2819 (2011 Census Data) The Work Profile of these villages are as under: About 1619 workers engaged in Main Work (Employment or Earning more than 6 Months), 429 were cultivators (Marginal activity providing livelihood for less than 6 months-owner or co-owner) while 330 were Agricultural labourer.</p>	2819 - nos.

			<p>The entire population of these villages will be directly & fully benefitted from the extant project. The other surrounding Revenue Villages in the Nasik & Thane District will also have access to the resources and infrastructure facilities developed for the project.</p> <p>The people not only from the State, but also from the country will have privilege to draw the socio-economic benefits from the project and its ancillary activities, during pre-construction, construction, operational and maintenance periods till the validity of O & M life of the project.</p> <p>The benefits considered under this category, though worth millions of Rupees, cannot be expressed in monetary term as they depend on the State/ National Policies and other circumstances, prevailing from time to time. The detailed facts & figures of population likely to be benefitted by the construction of the project are to be worked out at DPR stage.</p>	
4	Economic benefits due to direct and indirect employment due to the project	As per the detailed Project Report.	<p>The all villages having total population of 2819 (2011 Census Data) will be directly & fully benefitted from the extant project.</p> <p>1. For at least 8 months direct employment: $2819 \times 8 = 22552$ Man-days per Annum $22552 \times 1200 = \text{Rs. } 2,70,62,400.00.$ Per Annum. Say Rs. 2.71 Cr. Per Annum</p> <p>2. The people from the other part of the State/ Country, having special skills, expertise will have privilege to draw the economic benefits from the project and jobs ancillary to it, during pre-construction, construction, operational and maintenance periods till the validity of O & M life of the project.</p>	135.50 + "n" no. of employment benefits.

			The benefits considered under this category, though worth millions of Rupees, cannot be expressed in monetary term as they depend on the State National Policies and other circumstances, prevailing from time to time	
5	Economic benefits due to Compensatory Afforestation	Benefits from such CA accruing over next 50 years monetized and discounted to the present value should be included as benefits of CA. *For benefits of CA, the guidelines of the Ministry for NPV estimation may be consulted.	Forest Land proposed for diversion: 243.74 Ha. The CA will be done on equivalent area i. e. 243.74 Ha. and about 2, 70, 795 trees will be planted. The NPV rate considered for the land is Rs. 11, 16, 900.00 per Ha.	27.22
Total				90413.89

BENEFIT/ COST RATIO:

Total Benefit (Rs. in Cr.)	Total Cost (Rs. in Cr.)	B/C Ratio
90413.89	Cost of Forest Diversion: 82.264 - Standard Project Cost: 9058.09 Total: 9140.354	9.89: 1

Date: 06 02 2025
Place: Mumbai
Office Seal:



(Lalit Parab)

Authorized Signatory
JSW Energy PSP Two Limited, Mumbai



सत्यमेव जयते

Government of India
Ministry of Environment, Forest and Climate Change
IA Division
(River Valley and Hydroelectric Projects)



Minutes of 22ND MEETING OF THE EXPERT APPRAISAL COMMITTEE meeting River Valley and Hydroelectric Projects held from 10/01/2025 to 10/01/2025 Date: 22/01/2025

MoM ID: EC/MOM/EAC/580839/1/2025
Agenda ID: EC/AGENDA/EAC/580839/1/2025
Meeting Venue: INDIRA PARYAVARAN BHAWAN, NEW DELHI
Meeting Mode: Physical
Date & Time:

10/01/2025	10:30 AM	05:30 PM
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1. Opening remarks

The 22nd meeting of the EAC for River Valley & Hydro-electric Projects organized by the Ministry of Environment, Forest and Climate Change, Indira Paryavaran Bhawan, Jor Bagh Road, New Delhi, was held on Physical Mode, under the Chairmanship of Prof. G. J. Chakrapani.

2. Confirmation of the minutes of previous meeting

The Minutes of the Meeting held on 21st EAC meeting on 31st December, 2024 were confirmed.

3. Details of proposals considered by the committee

Day 1 -10/01/2025

3.1. Agenda Item No 1:

3.1.1. Details of the proposal

Proposed Expansion of Tembhu Lift Irrigation Project Taluka Karad, District Satara, Maharashtra by Department of Irrigation located at SATARA, MAHARASHTRA

Proposal For		Fresh EC	
Proposal No	File No	Submission Date	Activity (Schedule Item)
IA/MH/RIV/482689/2024	J-12011/48/2023-IA.I (R)	06/01/2025	River Valley/Irrigation projects (1(c))

22.4.3 The EAC deliberated on the information submitted and as presented in the meeting and observed that the proposal is for grant of corrigendum in amendment in Terms of Reference (ToR) to the project for Sukhpura Off-Stream Closed Loop Pumped Storage Project (OCPSP)-2560 MW in an area of 788.6761Ha in Village Sukhpura, Lakshmikhara, and Nahargarh etc, Sub District Rawatbhata, District Chittaurgarh, Rajasthan by M/s Greenko Energies Private Limited.

The project/activity is covered under Category A of item 1 (c) 'River Valley projects' of the Schedule to the Environmental Impact Assessment Notification, 2006 and requires appraisal at Central level by the sectoral EAC in the Ministry.

The Ministry granted the Terms of Reference (ToR) for the proposed project vide letter dated 28.02.2020. Subsequently, an amendment to the ToR was granted on 03.08.2022 for changes in water requirement and land area.

The Expert Appraisal Committee (EAC) noted that, due to further revised details regarding land area requirements and minor adjustments in component sizing and levels, another amendment to the ToR was granted by MoEF&CC on 04.12.2024. It was further noted that due to inadvertent submission of incorrect information regarding the ToR date by the Project Proponent (PP), the wrong date, i.e., 28.02.2020, was mentioned in the Minutes of the 19th EAC meeting and the corresponding ToR letter.

22.4.4 The EAC, after examining the information submitted and detailed deliberations recommended the proposal grant of corrigendum in amendment in Terms of References as proposed by the PP to Sukhpura Off-Stream Closed Loop Pumped Storage Project (OCPSP)-2560 MW in an area of 788.6761Ha in Village Sukhpura, Lakshmikhara, and Nahargarh etc, Sub District Rawatbhata, District Chittaurgarh, Rajasthan by M/s Greenko Energies Private Limited, under the provisions of EIA Notification, 2006 and as amended with subject to the following additional conditions:

- i. All ToR points mentioned in the ToR letter dated 28.02.2020 and amendment in TOR dated 03.08.2022 and shall remain unchanged.
- ii. EIA/EMP, collection of baseline data, other statutory clearance and the public hearing shall be carried out as per revised layout.
- iii. Validity of ToR shall be counted from original date of grant to ToR i.e. 28.02.2020.

22.4 Additional Agenda item:

Site visit Report on Proposed Bhavali Pumped Storage Project" (1500MW) at Village Jamunde, Tehsil Igatpuri, District Nashik and villages Kalbhonde and Site visit Report on Proposed Bhavali Pumped Storage Project" (1500MW) at Village Jamunde, Tehsil Igatpuri, District Nashik and villages Kalbhonde and Kothale, Tehsil Shahpur Thane (Maharashtra)

14
21

The Member Secretary, EAC informed that the Terms of Reference (TOR) was granted by the MoEF&CC, vide letter no. J-12011/08/2022-IA.I(R), 27.06.2022 and accordingly, Public hearing were conducted on 10.01.2024 for Nashik District and on 13.02.2024 for Thane District (Maharashtra). Final EIA report was submitted to MoEF&CC on 18.06.2024 and an EDS was generated on 03.07.2024, in which clarification w.r.t. change in project area from ToR was asked. Reply of the same has been submitted on 23.07.2024 with proper justification for change in the project area. Thereafter, proposal was considered by Expert Appraisal Committee (EAC) in the 14th meeting conducted on dated 30.08.2024. In meeting, it was recommended that the Sub-committee of EAC shall conduct a site visit prior to reconsideration for EC.

The Sub-committee comprising of Ajay Kumar Lal, Member EAC (Hydro & River Valley project) and Dr. P. R. Sakhare, Scientist-E Representative from MoEF&CC undertook site visit to the proposed Bhavali Pumped Storage Project" on 02.01.2025 and 03.01.2025. The sub-committee visited the upper dam, upper reservoir, lower dam, lower reservoir, muck disposal areas of Bhavali PSP.

The Sub-committee after detailed deliberation observations and recommendations are as follows:

- i. The selected location is topologically stable and non prone to landslides as such. It is not therefore so fragile or sensitive. The proposed project is not likely to cause considerable negative impacts on the geological conditions; rights and interests of people related to water resources of downstream locations if the conditions and safeguards imposed vide the TOR granted are complied with fully and comprehensibly. Further, the Project Proponent is also to ensure strict compliance of the assurances given during public hearing.
- ii. ~~The relocation of muck disposal site may not be insisted on while considering the proposal for clearance since the muck disposal site was found to have been selected properly. Further, ecologically better sites were not appeared available in nearby areas. Any relocation at this stage might lead to much changes and may lead to more adverse consequences. However, safety measures as contained in EMP and in other documents should be adhered to in toto.~~
- iii. Water for operation of project will be sourced from self-yield from catchment area. There will be no dependency on the nearby streams and already established dams/reservoirs as confirmed and assured by the proponent. As stated above, since there are not much agricultural or drinking requirements in or nearby areas, the dam intervention should not be a matter of concern. Nevertheless, project proponent, as assured, will ensure maintenance of e-flow and minimum threshold water availability all year around.

- iv. Nalla passing through the lower reservoir is a non-perennial and was containing very thin layer of water at the time of visit. However, as per the discussion held with the PP, natural flow of nallas/streams will not be restricted/diverted. Provision of ungated slipways has been considered to maintain natural flow of non-perineal nallas/streams.
- v. Out of total forest area of 243.74ha, 160.21ha is reserved forest,73.85 ha is deemed forest and 9.68 ha is protected forest. The forest density in the proposed forest land involved in the project site is approx. 150 trees/la. A total of around 35000 trees and saplings are likely to be sacrificed. Therefore, it is important to insist on submitting the case under FCA and receive stage-I clearance at the earliest by the Project Proponent.
- vi. PP has started the CER/CSR activities in the affected villages which includes the construction of public toilets, classrooms in the Govt. School, Mid-day Meal kitchens, and distribution of study materials, Shoes etc. to the students, blankets to the villagers.
- vii. Wildlife conservation and biodiversity management plan has been approved by CWLW on 29.11 .2024 with a cost of Rs. 326.50 Lakhs.

The EAC after detailed deliberation accepted the site visit report and suggested to forward the recommendations to the PP for appropriate response.

The detailed site visit report is annexed at **Annexure-I**.

Annexure I

Site visit Report on Proposed Bhavali Pumped Storage Project² (1500MW) at Village Jamunde, Tehsil Igatpuri, District Nashik and villages Kalbhonde and Kothale, Tehsil Shahpur Thane (Maharashtra)

In compliance to the MoEF&CC office order no. J-12011/08/2022-IA.I(R) (E-183170) dated 30.12.2024 the Sub-committee comprising of Ajay Kumar Lal, Member EAC (Hydro & River Valley project) and Dr. P. R. Sakhare, Scientist E Representative from MoEF&CC undertook site visit to the proposed Bhavali Pumped Storage Project² on 02.01.2025 and 03.01.2025. The sub-committee visited the upper dam, upper reservoir, lower dam, lower reservoir, muck disposal areas of Bhavali PSP. The attendees of the site visit included project proponent authorised representatives, their consultants, local staff and a few locals.

Background

The proposed Bhavali Pumped Storage Project (5X250MW+2X125MW) is a self-identified, green field project by the JSW Energy PSP Two Ltd, a subsidiary of JSW Energy Limited. The need for Bhavali PSP in Nashik and Thane district, Maharashtra, has been considered in context of the focus of State Government to stabilize the grid by installation of Pumped Storage project which leads to increase the share of renewable energy which is available in plenty within the state in general and in the country as whole. The project is an off-stream project, where water will be recycled between the proposed upper and lower reservoir in one daily cycle of peaking (7.78 hour) and one daily pumping cycle (8.79-hour). The total land requirement for the project has been assessed as 278.92 ha of which private land is 35.18 ha and forest land is 243.74 ha. Forest land diversion case has been submitted vide FP/MH/HYD/153240/2022, dated 06.03.2022 on Pariyesh Portal.

In this background, Terms of Reference (TOR) was granted by the MoEF&CC, vide letter no. J-12011/08/2022-IA.I(R), 27.06.2022 and accordingly, Public hearing were conducted on 10.01.2024 for Nashik District and on 13.02.2024 for Thane District (Maharashtra). Final EIA report was submitted to MoEF&CC on 18.06.2024 and an EDS was generated on 03.07.2024, in which clarification w.r.t. change in project area from ToR was asked. Reply of the same has been submitted on 23.07.2024 with proper justification for change in the project area. Thereafter, proposal was considered by Expert Appraisal Committee (EAC) in the 14th meeting conducted on dated 30.08.2024. In meeting, it was recommended that the Sub-committee of EAC shall conduct a site visit prior to reconsideration for EC. The sub-committee undertook site visit on 2nd and 3rd January, 2025 to assess ground conditions and likely environmental impacts due to project intervention.

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General Observations

Topography : Located in the north western edge of the Deccan Plateau along Sahyadri Range of the Western Ghat, the proposed project area is hilly terrain-with undulating rocky (mainly volcanic basalt) subsurface and having thin layer of dominant reddish brown top soil. Slope of the land varies unevenly from comparatively flattened near proposed upper reservoir (5-15 %) to steeper (30-45 %) at the proposed lower reservoir area.

Vegetative cover : Hard strata with sparse bushy covering of ground has resulted in devoid natural thick greening. The area was found to have a few barren patches too. Some patches contain good forest cover while majority covered with mixed species bushes and scrub as undergrowth. Proposed lower reservoir and dam axis site support moderately dense (40%) forest having adequate number of trees mainly *Terminalia bellirica*, *Anogeissus latifolia*, *Madhuca longifolia*, *Adina cordifolia* etc. Upper Reservoir site cover is mixed moist subtropical sub type with less canopy density and open forest (10-20 %). NTFPs such as herbal and commercial leaves, *amla mahua, ber*, etc are found but not in abundance. Soil being shallow with rocky base, the vegetative growth and productivity is sluggish resulting in not much variability in floral diversity. First hand assessment of faunal diversity could not be possible in a day visit. At a glance, no evidence of big mammals or cats could be traced or found. Available documents and certificates relating to their presence, movements or corridors will lead to drawing conclusions on this aspect.

Water availability and impact on flow of water : The area records an average annual rainfall of 3000 mm which is much above normal and therefore it can be termed as wet region. Notwithstanding, due to impervious rocky land surface water infiltration or holding capacity is not befitting. However since water requirement is not being high (no cropping or habitation as such around) water scarcity is not an issue in spite of non poundage or storage. The rivulet on which the dam is proposed is in gorge shape cross sections and appears to be seasonal massive carrier of water during monsoon. During lean season, as at present, it has thin volume of water flowing.

Human Settlement and Habitation : The area mostly being a reserve and protected forest land and in interior of the Tehsil, only scattered few houses in a couple of villages were noticed in the fringe connecting areas. In addition, agricultural or cultivated lands were found to be nominal. Rehabilitation and Resettlement issues therefore are not of much concern.

Specific Observations and Recommendations

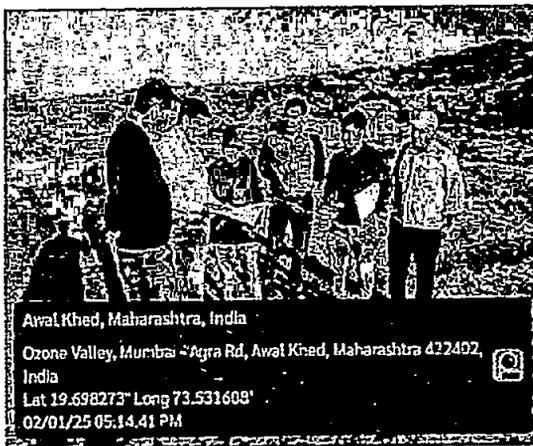
1. The selected location is topologically stable and non prone to landslides as such. It is not therefore so fragile or sensitive. The proposed project is not likely to cause considerable negative impacts on the geological conditions; rights and interests of people related to water resources of downstream locations if the conditions and safeguards imposed vide the TOR granted are complied with fully and comprehensively. Further, the Project Proponent is also to ensure strict compliance of the assurances given during public hearing.
2. The relocation of muck disposal site may not be insisted on while considering the proposal for clearance since the muck disposal site was found to have been selected properly. Further, ecologically better sites were not appeared available in nearby areas. Any relocation at this stage might lead to much changes and may lead to more adverse consequences. However, safety measures as contained in EMP and in other documents should be adhered to in-toto.
3. Water for operation of project will be sourced from self-yield from catchment area. There will be no dependency on the nearby streams and already established dams/reservoirs as confirmed and assured by the proponent. As stated above, since there are not much agricultural or drinking requirements in or nearby areas, the dam intervention should not be a matter of concern. Nevertheless, project proponent, as assured, will ensure maintenance of e-flow and minimum threshold water availability all year around.
4. Nalla passing through the lower reservoir is a non-perennial and was containing very thin layer of water at the time of visit. However, as per the discussion held with the PP, natural flow of nallas/streams will not be restricted/diverted. Provision of ungated slipways has been considered to maintain natural flow of non-perennial nallas/streams.
5. Out of total forest area of 243.74 ha, 160.21 ha is reserved forest, 73.85 ha is deemed forest and 9.68 ha is protected forest. The forest density in the proposed forest land involved in the project site is approx. 150 trees/ha. A total of around 35000 trees and saplings are likely to be sacrificed. Therefore, it is important to insist on submitting the case under FCA and receive stage-I clearance at the earliest by the Project Proponent.
6. PP has started the CER/CSR activities in the affected villages which includes the construction of public toilets, classrooms in the Govt. School, Mid-day Meal kitchens, and distribution of study materials, Shoes etc. to the students, blankets to the villagers.

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7. Wildlife conservation and biodiversity management plan has been approved by CWLW on 29.11.2024 with a cost of Rs. 326.50 Lakhs.

Photographs of the site visit:

Upper Reservoir (2nd Jan 2024)



Lower Reservoir (3rd Jan 2024)



09.01.25 (A K Lal)

Signature of member

[Handwritten Signature]
 09/01/2025
 Signature of MoEFCC
 Representative

ANNEXURE

ATTENDANCEATTENDANCE SHEET22nd MEETING OF EXPERT APPRAISAL COMMITTEE (EAC)(River Valley & Hydroelectric Sector)

DATE & TIME : 10th January 2025 from 10:30 AM to 2:30 PM
 VENUE : Narimada Conference Hall Ground Floor Jal Wing
 Indira Paryayaran Bhawan New Delhi

Sl. No.	Name of Member	Role	Signature
			[10.01.2025]
1.	Prof. G.J. Chakrapani	Chairman	G. J. Chakrapani
2.	Shri. Ajay Kumar Lal	Member	Online
3.	Dr. Udaykumar R. Y.	Member	Online
4.	Dr. Mukesh Sharma	Member	
5.	Dr. J.V. Tyagi	Member	Online
6.	Shri Kartik Sapre	Member	Online
7.	Dr. A.K. Sahoo	Member	Online
8.	Dr. B.K. Das	Member	Online
8.	Dr. J. A. Johnson	Member	
9.	Shri Rajeev Varshney	Member	Rajeev
10.	Representative of CWC	Member	Online
11.	Shri Yogendra Pal Singh	Member Secretary	Y. P. Singh

Approval of the Chairman

Re: [WARNING: ATTACHMENT(S) MAY CONTAIN MALWARE]Fwd: Draft MOM of the 22nd EAC meeting held on 10.1.2025-reg.

CG Chakrapani GovindaJoseph <govind.chakrapani@es.iitr.ac.in>
Wed, 22 Jan 2025 10:20:19 AM +0530 *
To "Yogendra Pal Singh" <yogendra78@nic.in>
Cc "chakrapani govind" <chakrapani.govind@gmail.com>

Approved.
Chakrapani

From: "Yogendra Pal Singh" <yogendra78@nic.in>
To: "Chakrapani GovindaJoseph" <govind.chakrapani@es.iitr.ac.in>, "chakrapani govind" <chakrapani.govind@gmail.com>
Sent: Wednesday, January 22, 2025 10:07:13 AM
Subject: [WARNING: ATTACHMENT(S) MAY CONTAIN MALWARE]Fwd: Draft MOM of the 22nd EAC meeting held on 10.1.2025-reg.

Dear Sir,

The draft MOM of the 22nd EAC meeting was circulated to all members of the EAC. No comments received so far. Accordingly, the draft MOM of 22nd EAC meeting held on 10.01.2025 is attached herewith for approval please.

With Regards,

Yogendra Pal Singh
Scientist 'F'
Government of India
M/o Environment, Forest and Climate Change
Room No. 236, 2nd Floor, Vayu Wing
Indira Paryavaran Bhawan
Jor Bagh, New Delhi-110003
Tele-fax: 011-20819364



Muck Management Plan for Bhavali PSP

General

The excavation shall result in large quantity of excavated material i.e. muck which shall have to be evacuated, disposed at designated sites and roller compacted or laid on mild slopes pari-passu with the excavation work. In the present case, the total quantity of muck / debris, to be generated (Table 10.27) due to the project, shall be 6450897 cum, out of which 3607606 cum shall be consumed on the project leaving 2843291cum, which with 42% swell factor shall amount to 4037474 cum, to be disposed-off away from sites to make available the clear site for construction activities. The muck, which is suitable for use as, rockfill material, coarse aggregate, backfill and for construction/widening of the road shall be properly stacked.

Component Wise Details of the Muck Generation and Management.

S.N.	Project Component	Quantity of rock excavation (Cum)	Quantity of overburden (Cum)	Total Quantity (cum)	Quantity of Muck to be used(cum)	Quantity of Disposable Muck with 42% swell (cum)	Dumping site.
1	Upper Dam	2733413	83669	2817082	1539427	1814269	D-1
2	Lower Dam	129974	14442	144416	73200	101127	D-1
3	Upper Intake & Approach Channel	225740	0.00	225740	127134	140020	D-1
4	Lower Intake & Tail Race Channel	2413526	0.00	2413526	1359271	1497043	D-2,D-1
5	HRT	19532	0.00	19532	11000	12115	D-1
6	PH & Transformer Cavern	368552	0.00	368552	207564	228602	D-1
7	Pressure Shaft	171192	0.00	171192	96413	106186	D-1
8	MAT	101907	0.00	101907	57393	63210	D-1
9	CAT	12634	0.00	12634	7115	7837	D-1
10	ADITS	16544	0.00	16544	9317	10262	D-1
11	TRT	167236	0.00	167236	94185	103732	D-2
12	Valve Chamber	24643	0.00	24643	13879	15285	D-1
13	Roads	20785	24434	45219	11706	47589	D-1
Total		6405678	45219	6450897	3607606	4037474	



Muck Disposal Sites

Two permanent muck disposal sites with total land requirement of 44.09 ha to be in forest land have been identified keeping in view the land availability, lead consideration, the quantity of the muck, landscape, cost effectiveness, nearness to source of generation absence of ground and surface water, relief and scope for afforestation works. The location of muck disposal sites is displayed in Figure 10.29 and details in Table 10.28.

Muck Disposal Site Details

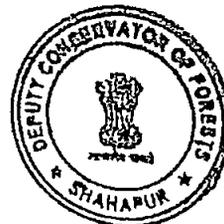
S.N.	Dumping Site	Area (ha)				Capacity (lakh cum)	Quantity to be dumped (lakh cum)
		Private	Govt.	Forest	Total		
1	D-1	-	-	22.3	22.3	28.684	28.00
2	D-2	-	-	22.6	22.6	12.885	12.37
Total		-	-	44.9	44.9	41.569	40.37

Muck Disposal Site-1

The muck disposal sites D-1 is located on right of powerhouse and WCS. It shall be approachable through proposed haul road from Upper dam. The muck site lies in forest land. The muck site is about 1003 m long and has capacity to store 28.684 lakh cum of muck against which 28.00 lakh cum shall be dumped. The plan and plot of typical x-section with supporting structure at the toe is shown in the given figures.

Muck Disposal Site-2

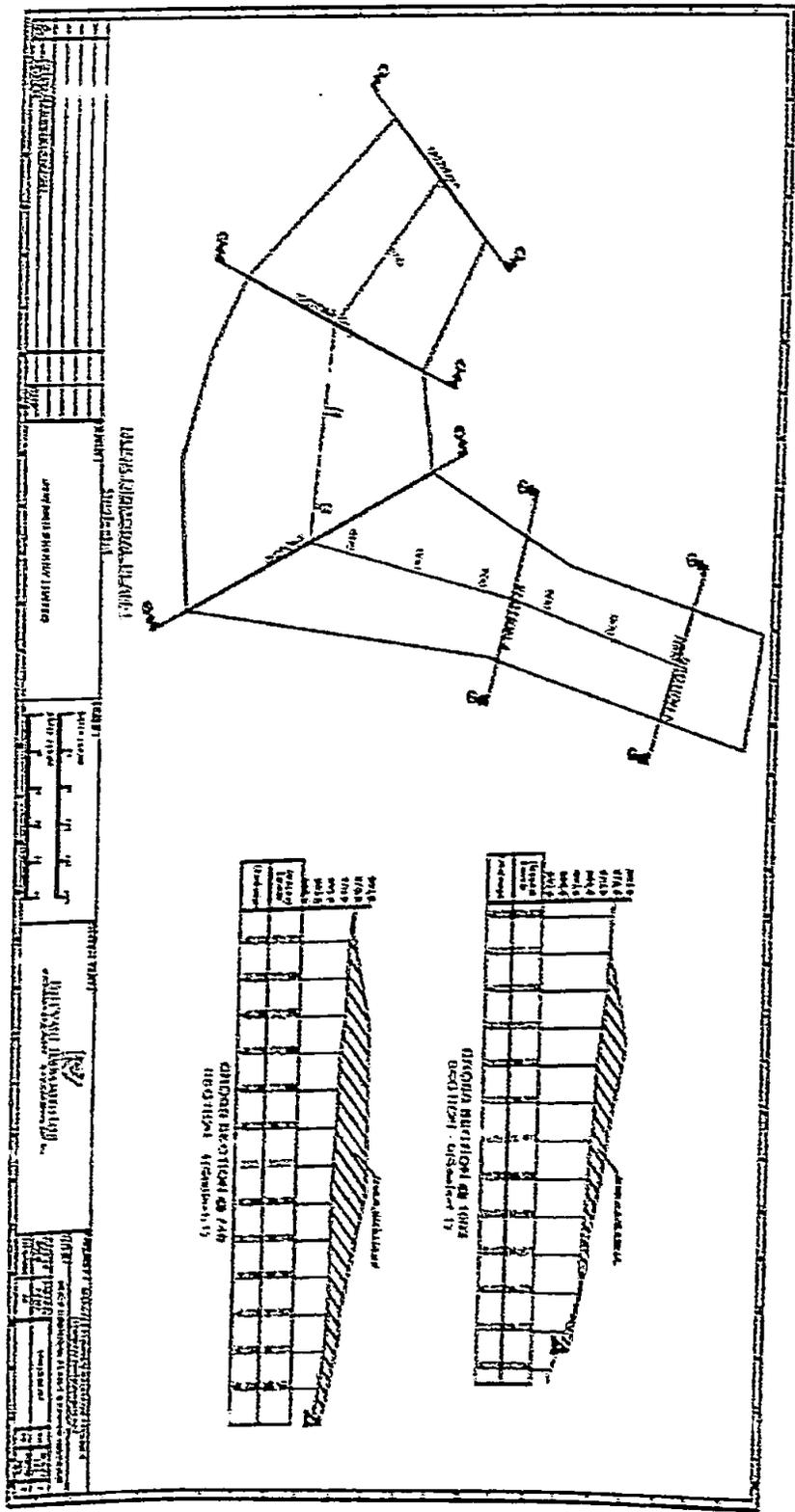
The muck disposal sites D-2 is located on left of powerhouse and WCS. It shall be approachable through proposed haul road from lower dam. The muck site lies in forest land. The muck site is about 1003 m long and has capacity to store 12.885 lakh cum of muck against which 12.37 lakh cum shall be dumped. The plan and plot of typical x-section with supporting structure at the toe is shown in the given figures.





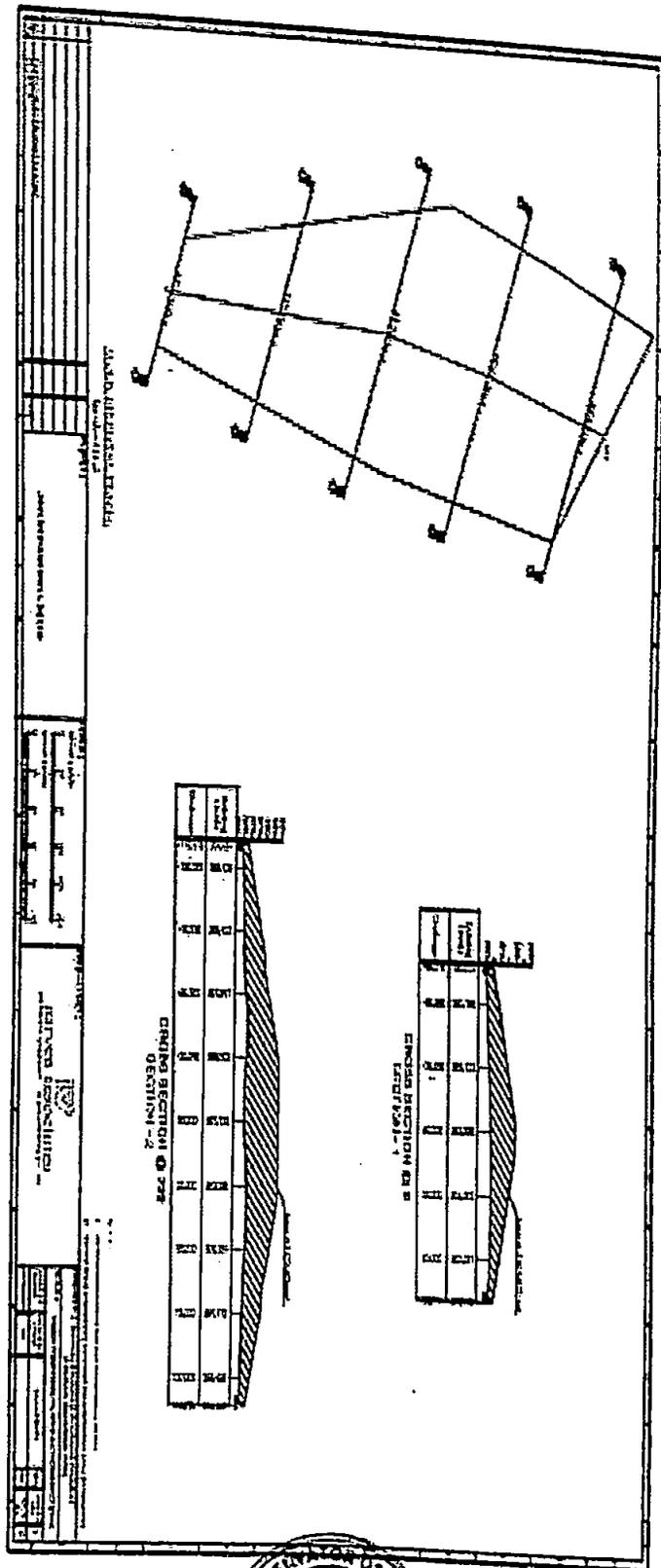
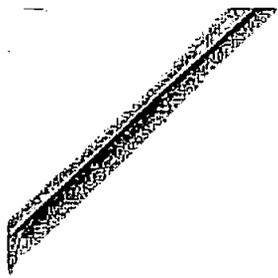
Location of Muck Disposal Site



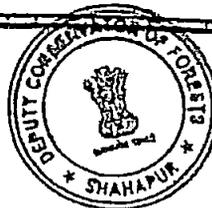


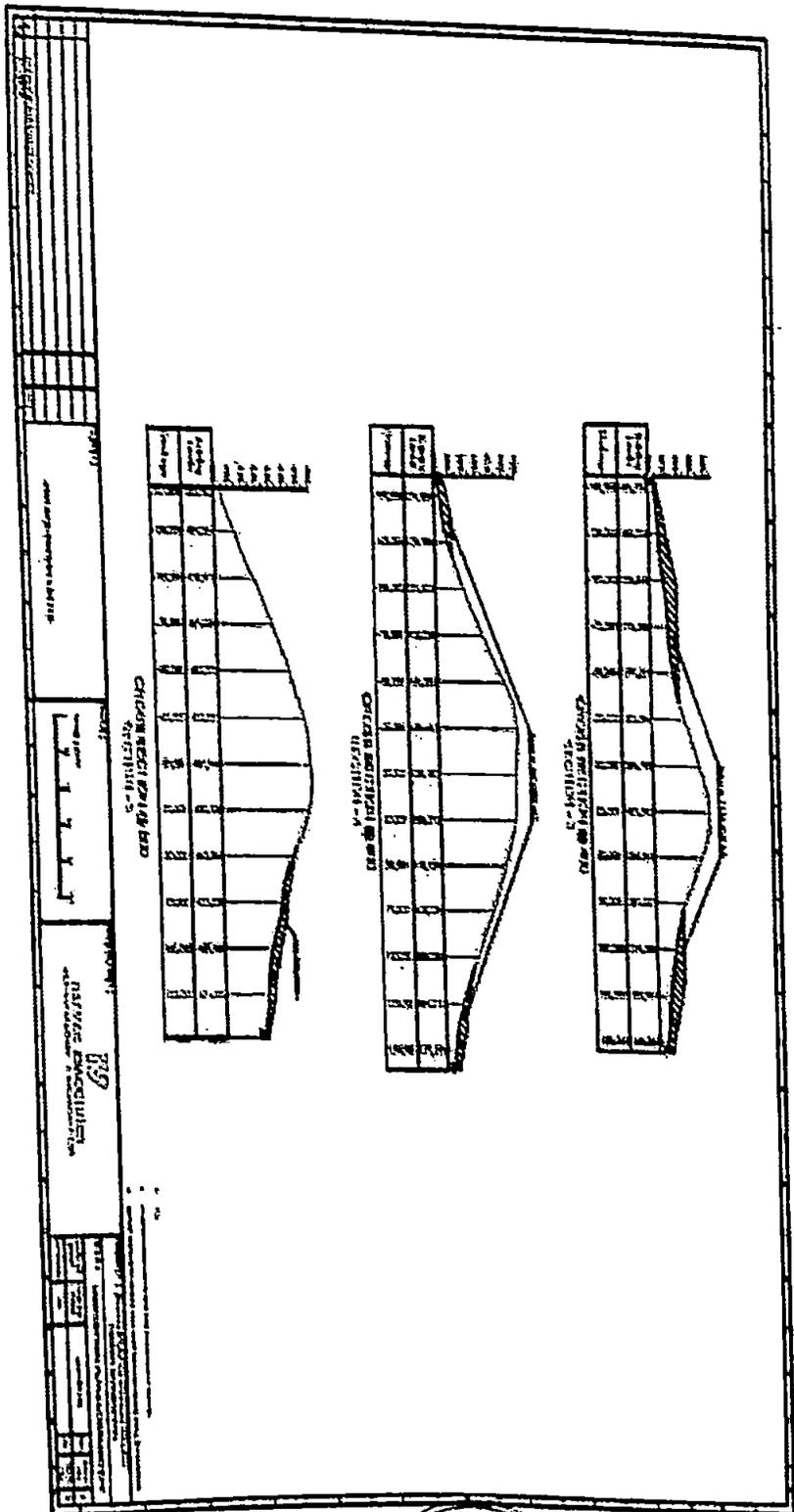
Typical Cross-section of Muck Disposal Site D-1





Typical Cross-section of Muck Disposal Site D-2



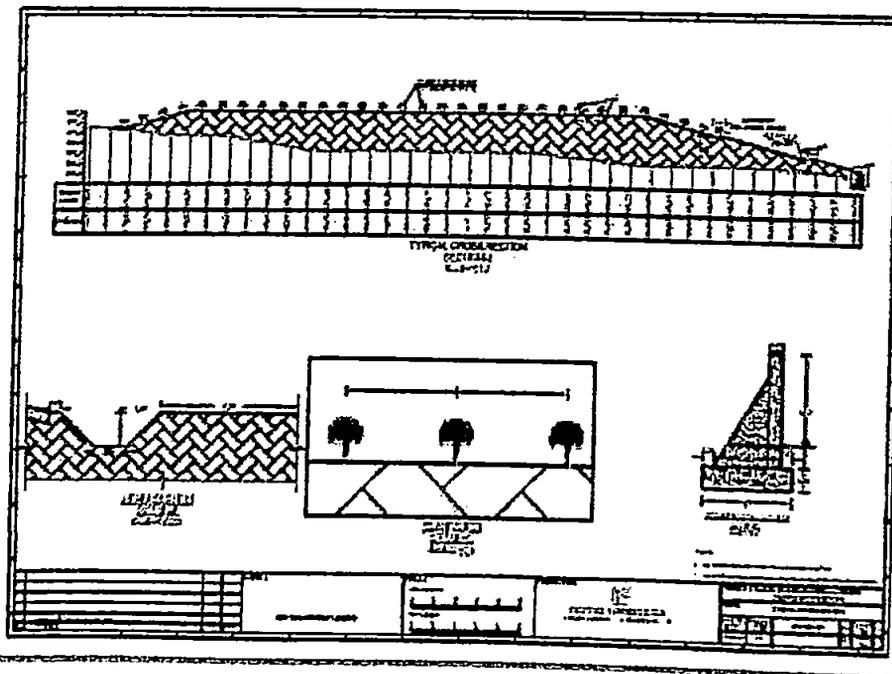


Implementation of Engineering & Biological Measures

As already explained engineering measures like providing of GI wire crates and retaining walls and compaction of muck will provide stability to the profile of muck piles.

Engineering Measures

It has been observed that after excavation the disposal of muck creates problem as it is susceptible to scattering unless the muck disposal yards are supported with engineering measures such as retaining structures, crate walls and gabions. All the dumping sites need proper handling to avoid spilling of muck either on the adjoining and or into the river water while dumping and in the post dumping stages. The muck disposal sites shall be developed from below the ground level by providing RCC Retaining wall 6m high. All muck disposal sites are away from waterbody. After construction of retaining wall, the muck brought in dumpers shall be dumped and manually spread behind the wall. The muck shall be laid with vertical angle not exceeding 280 in such a manner that rock mass is properly stacked behind the wall with minimum of voids. The muck pile shall be later covered with geo-Geo-coir textile properly held to the ground by steel wire U-nails and rehabilitated by afforestation of herbs and shrubs. Geo-coir textile should also be provided on surface of muck piles where top surface is to be vegetated.



Typical Section of Retaining Wall and Plantation on Muck Pile



Biological Measures

Biological measures, however, require special efforts as the muck disposed in disposal yards will in general be devoid of nutrients and soil contents to support vegetation. The selection of soil for spreading over such an area would require nutrient profiling of soil for different base elements. Suitable admixture of nutrients would be done before placing the soil on the top surface of muck disposal areas to have administered growth of forest canopy.

Plantation Technique

In view of the peculiar site conditions particularly the soil conditions, the planting technique for all the categories of the plants must be very site specific and suited to the stress conditions as anticipated and discussed above. The planting substrates would need to be considerably improved to support the plants in their initial stages of establishment. The moisture retention capability, availability of nutrients and soil aeration, permeability and porosity would require intervention and assistance.

Multistoried and multipurpose plantations are proposed to be raised on the muck dumping sites as also in roadside strips using grasses, shrubs and bushes in the under story and trees in the upper story. Nursery raised grass slips, seedlings of shrubs & bushes and tree species would be planted in the area combined with grass sowing in patches. In addition, cuttings of bushes and shrubs can also be planted to supplement the nursery raised stock, but this would substitute requirement of raising the nursery of these species. Intimate mixture of species would be avoided right at the planning stage and would be strictly followed during planting. Each patch should contain maximum of two species. Grasses would be mixed by groups in rows, shrubs and bushes by group again in rows.

Grass slip planting and grass seed sowing would be done in strips at 0.10 m x 0.10 m spacing in the prepared staggered patches of 1 m x 0.5 m with a depth of 0.30 m. Soil mixture would be used while filling the patches. Balance dug up soil/muck will be stacked along the patch on the downhill side for rainwater tapping and enhanced percolation in the patch. Number of such patches in each hectare is proposed at 500.

Shrubs and bushes would be planted in elongated strips of 1.5 m x 0.5 m with a depth of 0.45m. Soil mixture would be used while filling the patches. Balance dug up soil/muck will be stacked along the patch on the downhill side for water tapping and better percolation in the patch. These would be staggered throughout the area numbering 500 per hectare. Each patch would have two rows of planting with staggered spacing between plants in a row as 15 cm and distance between rows as 15 cm.

Planting of trees would be done in contour staggered pits of 0.60 m x 0.60 m x 0.60 m size numbering 800 per hectare. Out of these 800 plants, about 200 plants per hectare are meant for planting along the periphery of the area. If the periphery gets filled up with lesser numbers, the remainder would be planted in the core/main area. Soil mixture would be used while filling the pits. Balance dug up soil/muck will be stacked on downhill side of the pit for trapping the rainwater and allowing it to percolate in the pit.



It is proposed to use soil mixture in the pits & patches consisting of soil imported from nearby areas mixed with compost or humus or vermin-compost or all of these. The ratio for the mix would be 5 parts: Compost/manure 2 parts: Sand 2 parts and humus or vermin-compost 1 part. This will make nutrients available for the plants in the preliminary stages and help increase soil aeration, porosity & permeability and improved moisture available for the plants.

The stabilization sites from the time of execution of biological measures would be protected with barbed wire fencing on 2m high RCC posts and provided with inspection paths. Since the muck dumping sites are being provided with either RCC walls or the wire crate (gabion) wall on the valley side (towards river) which is not negotiable by animals and human beings, fencing would not be required along the entire perimeter. Hence, it would be done on the vulnerable sections i.e., towards the hillside only.

The proposed costs include nursery costs for initial planting and for mortality replacement.

The biological measures shall be taken up towards the end of construction. The plantations would be maintained for a period of 5 years by irrigating the plantation during dry seasons, mortality replacement and repair of fencing & inspection paths within the area. The task of irrigation would be performed by the watch & ward (chowkidar) provided in the cost estimate.

Species for Plantation

Afforestation with suitable plant species of high ecological and economic value and adaptable to local conditions will be undertaken at the rate of 800 plants per hectare in accordance with canopy cover requirement. The major plant species which can be used in the area shall belong to indigenous species.

Cost Model for Plantation

The cost model for plantation on muck dumping sites is given in table:

Cost Model for Plantation on Muck Dumping Sites (For 1 hectare)

S. No.	Particular	Qty.	Unit	Rate (Rs.)	Amount (Rs.)
A.	PALANTATION:				
(1)	GRASS SLIP PLANTING AND GRASS SEED SOWING:				
1	Preparation of soil mixture (soil, sand, humus & compost) including digging, purchase, carriage to the site of work and mixing at site.	75.00	Cum.	850.00	63750
2	Digging of staggered patches 1 m x 0.50 m x 0.30 m @ 500 patches/ha.	75.00	Cum.	50.00	3750
3	Filling of staggered patches with imported soil mixture.	75.00	Cum.	15.00	1125



1	Preparation of soil mixture (soil, sand, humus & compost) including digging, purchase, carriage to the site of work and mixing at site.	182.25	Cum.	850.00	15491
2	Digging of pits (45cm x 45cm x 45cm) in periphery of area.	200	No.	4.45	890
3	Filling of pits (45cm x 45cm x 45 cm) with imported soil mixture.	200	No.	1.27	254
4	Extracted of plants from nursery beds.	200	No.	0.25	50
5	Carriage of plants from nursery to the work site over average distance of 10 km uphill carriage.	200	Nos. per Km.	0.17	340
TOTAL					19915

(II) SHRUBS AND BUSHES PLANTATION:

1	Preparation of soil mixture (soil, sand, humus & compost) including digging, purchase, carriage to the site of work and mixing at site.	182.25	Cum.	850.00	15491
2	Digging of elongated patches 1.5 x 0.50 m x 0.45 m @ 500 patches/ha.	168.75	Cum.	5000	9100
3	Filling of elongated patches with imported soil mixture.	168.75	Cum.	15.00	2501
4	Extraction of shrubs & bushes from nursery beds @ 50 per patch.	25000	Per plant	0.15	3750
5	Carriage of shrubs & bushes from nursery to work site.	25000	Per plant	0.15	3750
6	Planting of the extracted shrubs & bushes un above patches @ 50 per patch.	25000	Per plant	0.20	5000
7	Cost of shrubs & bushes (in nursery).	25000	Per plant	1.00	25000
TOATL					191906

(III) FOUR LINE STRIP PLANTATION (TREE SPECIES):

1	Preparation of soil mixture (soil, sand, humus & compost) including digging, purchase, carriage to the site of work and mixing at site.	18.225	Cum.	850.00	15491
2	Digging of pits (45cm x 45cm x 45cm) in periphery of area.	200	No.	4.45	890
3	Filling of pits (45cm x 45cm x 45 cm) with imported soil mixture.	200	No.	1.27	254
4	Extracted of plants from nursery beds.	200	No.	0.25	50
5	Carriage of plants from nursery to the work site over average distance of 10 km uphill carriage.	200	Nos. per Km.	0.17	340



6	Planting of extracted plants in above pits including ramming.	200	No.	0.26	172
7	Mulching of plants with grass.	200	No.	0.28	56
8	Cost of plants (In nursery).	200	No.	1.90	200
TOTAL.					17453
(IV)	PLANTATION OF TREE SPECIES IN BLANK AREA:				
1	Preparation of soil mixture (soil, sand, humus & compost) including digging, purchase, carriage to the site of work and mixing at site	54,675	Cum.	850.00	46474
2	Digging of pits (45cm x 45cm x 45cm) for B/L plantation.	600	No.	4.45	2670
3	Filling of pits (45cm x 45cm x 45cm) for B/L plantation with imported soil mixture.	600	No.	1.27	762
4	Extraction of plants from nursery beds.	600	No.	0.25	150
5	Carriage of plants from nursery to the work site over an average distance of 10 Km uphill carriage.	600	No. per Km.	0.17	1020
6	Planting of B/L plants in pits including ramming.	600	No.	0.86	516
7	Mulching of B/L plants with grass.	600	No.	0.28	168
8	Cost of plants (In nursery).	600	No.	4.00	2400
TOTAL					54160
(V)	MAINTENANCE:				
1	1st year maintenance.	1	Ha.	4000	4000
2	2nd year maintenance.	1	Ha.	3600	3600
3	3rd year maintenance.	1	Ha.	3200	3200
4	4th year maintenance.	1	Ha.	2800	2800
5	5th year maintenance.	1	Ha.	2000	2000
TOTAL					14600
TOTAL (I) through (V)					372032
Say					3,72,000



Cost Estimate for Muck Management Plan

The cost estimate for muck management plan indicating engineering, biological, bio-technological measures and maintenance is provided in the given Table.

Summary of Cost Estimate for Muck Management Plan

A. Engineering Measures					
1	RCC retaining wall 6m high with 30cm thick counterfort at 3m c/c for dump yard 1 and 2 in about 1003m and 1400m respectively.				
(a)	Concrete M20, A20				
	Stem: $0.6 \times 3.6 \times 2043 = 4413$ cum	4413	cum	9221	406.92
	Stem: $\frac{1}{2} (0.3+0.6) \times 5.4 \times 2043 = 4965$ cum				
	Counterfort: $\frac{1}{2} (5.4 \times 1.8) \times 0.3 = 991$ cum	5956	cum	18084	1077.08
(b)	Steel Reinforcement = $10369 \times .08 = 830$ MT	830	MT	79178	657.18
Sub-total (A)					2141.18
B. Biological Measures					
1.	Plantation of muck disposal sites	21.04	ha	372000	78.27
2.	Barbed wire fencing on 2m high RCC posts	21.04	ha	100000	21.04
3.	Providing and laying Geo-coir textile	10.8	ha	1000000	108.00
4.	Cost of portable pump with accessories	4	No.	300000	20.00
5.	Cost of sprinkler system of irrigation	21.04	ha	50000	10.52
6.	Watch & ward 2 Chowkidars. for 3 years	72	month	15000	10.80
Subtotal (B)					248.63
Grand Total (A) + (B)					2389.81
Say Rs.					23.9 Cr

[Handwritten signature]



[Handwritten signature]
 Dy. Conservator of Forests
 Gandhinagar Forest Division,
 Gandhinagar.

F. No. 8-78/2010-FC
Government of India
Ministry of Environment & Forests
(FC Division)

Paryavaran Bhawan,
C.G.O Complex, Lodhi Road,
New Delhi - 110510.
Dated: 14th November, 2012.

To

The Principal Secretary (Forests),
Government of Himachal Pradesh,
Shimla.

Sub: Diversion of 63.5015 ha of forest land for construction of 402 MW Shongtong-Karcham Hydro Electric Project in favour of Himachal Pradesh Power Corporation Limited (HPSEB) in Kinnaur Forest Division in Kinnaur district of Himachal Pradesh.

Sir,

I am directed to refer to the State Government's letter no. Ft.48-1942/2009 (FCA) dated 04.09.2010 on the subject cited above seeking prior approval of the Central Government under the Forest (Conservation) Act, 1980. After careful consideration of the proposal by the Forest Advisory Committee constituted under section-3 of the said Act, in-principle approval was granted vide this Ministry's letter of even number dated 22.03.2011 subject to fulfillment of certain conditions. The State Government has furnished compliance report in respect of the conditions stipulated in the in-principle approval and has requested the Central Government to grant final approval.

2. In this connection, I am directed to say that on the basis of the compliance report furnished by the Nodal officer (FCA) of the State Government vide letter nos. Ft.48-1942/2009(FCA) dated 10.05.2011, Ft.48-1942/2004(FCA) dated 25.08.2012 and Ft.48-1942/2004(FCA) dated 16.10.2012, permission of the Central Government for diversion of 63.5015 ha of forest land for construction of 402 MW Shongtong-Karcham Hydro Electric Project in favour of Himachal Pradesh Power Corporation Limited (HPSEB) in Kinnaur Forest Division in Kinnaur district of Himachal Pradesh under the provisions of Section 2 of Forest (Conservation) Act, 1980 is hereby granted subject to fulfillment of the following conditions:

1. Legal Status of the diverted forest land shall remain unchanged.
2. The Compensatory Afforestation (CA) will be raised and maintained over double the area proposed for diversion in a degraded forest land (i.e. 128 ha) at the cost of User Agency.
3. The User Agency shall pay additional NPV, if so determined, as per the final decision of Hon'ble Supreme Court of India.

4. All the funds received from the User Agency under the project shall be transferred to Ad-hoc CAMPA pertaining to the State.
5. The State Government shall ensure that minimum flow of 15% is maintained at all time.
6. The user agency shall set up Ecological Monitoring Unit to monitor the impact of the project on flora and fauna of the area.
7. The user agency shall keep the effect of camping labourers on the flora and fauna during the construction phase of 48 months at minimum by providing alternate fuel for cooking and heating.
8. The entire reservoir created due to submergence shall be declared Reserve Forest under Indian Forest Act, 1927 within six months. However, regulated fishing shall be allowed. Nodal Officer shall submit compliance report in this regard.
9. Catchment Area Treatment Plan should be implemented at the project cost under the supervision of the State Government.
10. Green belt of adequate width shall be raised by the user agency around the reservoir at the cost of the project.
11. The user agency shall facilitate a basin level study on the impact of HEPs on the flora & fauna of the area as per the TOR submitted to MoEF.
12. The user agency shall carry out muck disposal at pre-designated sites in such a manner so as to avoid its rolling down.
13. The dumping area for muck disposal shall be stabilized and reclaimed by planting suitable species by the user agency at the cost of project under the supervision of State Forest Department. Retaining walls and terracing shall be carried out to hold the dumping material in place. Stabilization and reclamation of such dumping sites shall be completed before handing over the same to the State Forest Department in a time bound manner as per Plan.
14. The User agency will consult other organisations having experience in construction of roads in hilly areas such as BRO to avoid frequent road blockade due to land slides etc and shall provide breast walls and retaining walls wherever necessary.
15. The Forest Department shall regenerate equivalent amount of degraded forest area, in addition to the condition no. 1. As the user agency does not have qualified manpower and control on forest area to execute the same, they have paid for the same to the CF, Rampur. The Forest Department shall implement the same and submit a compliance report.
16. The User Agency shall submit annual self monitoring report indicating status of compliance to the conditions stipulated in the approval, to the State Government and the concerned Regional Office of the Ministry.

Sky

17. All other conditions including standard conditions applicable to the proposals under Forest (Conservation) Act, 1980 and under different rules regulations and guidelines including Environmental Clearance and rehabilitation shall be complied with before transfer of forest land

Yours faithfully,

(Shiv Pal Singh)
Sr. Assistant Inspector General of Forests

Copy to:-

1. The Principal Chief Conservator of Forests, Himachal Pradesh, Shimla.
2. The Nodal Officer (FCA), Forest Department, Himachal Pradesh, Shimla.
3. The Conservator of Forests (Central), Northern Regional Office, Chandigarh.
4. User Agency.
- ✓ 5. Monitoring Cell of FC Section.
6. Guard File.

Shiv Pal Singh
(Shiv Pal Singh)
Sr. Assistant Inspector General of Forests



Energy PSP Two Limited

Regd. Office: JSW Centre,
Bandra Kurla Complex,
Bandra (East), Mumbai - 400 051,
CIN: U40106MH2021PLC367136
Phone: 022-4286 1000
Fax: 022-4286 3000

Undertaking for Muck disposal area

We hereby undertake that:

1. The proposed muck disposal sites have been carefully selected in consultation with the concerned authorities and duly reviewed during the EAC, MoEF&CC site visit. The sites are located in areas with very low vegetation density and minimal ecological sensitivity.
2. In view of the unavailability of suitable non-forest or private land in proximity to the project area, relocation of muck disposal to non-forest land is not feasible.
3. A Comprehensive Muck Management Plan has been prepared and approved, which includes appropriate engineering and biological measures for slope stabilization, erosion control, and long-term ecological restoration.
4. The muck disposal sites will be properly stabilized and scientifically reclaimed with vegetation after completion of disposal activities. After commissioning of the project, these sites shall not be used for any non-forest activity.

We affirm that this undertaking is submitted in good faith and in compliance with the conditions prescribed for the project.

Place: NASHIK

Date: 08/10/2025

Yours Sincerely,

Mr. Lalit Parab.

DGM- Projects.

Authorized Signatory,

For JSW ENERGY PSP TWO LIMITED



Annexure 3

KML file

pen drive



वन विभाग

प्रधान मुख्य वनसंरक्षक (वनबल प्रमुख) महाराष्ट्र राज्य, यांचे कार्यालय



O/o Principal Chief Conservator of Forests (HoFF), Maharashtra State

Phone No.- 0712-2560953

अपर प्रधान मुख्य वनसंरक्षक (वन्यजीव) महाराष्ट्र राज्य,

E-mail - pccfwlmgp@mahaforest.gov.in

Additional Principal Chief Conservator of Forest (Wildlife) Maharashtra State.

Website - www.mahaforest.gov.in

"Van Bhavan", 3rd Floor, Ramgiri Road, Civil Lines, Nagpur - 440 001.

पत्र-ई मेल क्रमांक :- कक्ष-२३(२)/वजी/सर्व्हे/प्र.क्र.१६३/२१६९/२०२५-२६ दिनांक १६/०९/२०२५

प्रति,

मुख्य वनसंरक्षक (प्रादेशिक),

नाशिक.

विषय :- Request for issuance of "Certificate and Certified map" mentioning that the project boundary is located outside the ESZ/WLS and no Tiger/Elephant Corridor/Critical polluted area falls in 10 kms of the proposed Bhavali Pumped Storage Project (1500 MW) Nashik and Thane Districts, Maharashtra.

- संदर्भ :-**
- पर्यावरण, वने व हवामान बदल मंत्रालय, भारत सरकार, (Impact Assessment Division), नवी दिल्ली यांचेकडील पत्र क्र. J-१२०११/०८/२०२२-IA.I (R) दिनांक २७/०६/२०२२ रोजीचे पत्र.
 - अपर प्रधान मुख्य वनसंरक्षक (वन्यजीव) पश्चिम, मुंबई यांचे कार्यालयीन पत्र क्र. कक्ष-३/जमीन/FCA/ प्र.क्र.१२०/६२६/२०२४-२५, दिनांक १४/११/२०२४.
 - अपर प्रधान मुख्य वनसंरक्षक (वन्यजीव) पश्चिम, मुंबई यांचे कार्यालयीन पत्र क्र. कक्ष-३/जमीन/FCA/ प्र.क्र.१२०/६३६/२०२४-२५, दिनांक १८/११/२०२४.
 - या कार्यालयाचे पत्र क्र. कक्ष-२३(२)/वजी/सर्व्हे/प्र.क्र.१६३/४३७७, दिनांक २९/११/२०२४.
 - या कार्यालयास उद्देशुन लिहीलेले आपले कार्यालयीन पत्र क्र. कक्ष-२/जमीन/प्र.क्र.५८/२८२, दिनांक १९/०६/२०२५.

केंद्र शासनाने सदर प्रस्तावाचे अनुषंगाने संदर्भ पत्र-१ अन्वये A. Environmental Management and Biodiversity Conservation मधील अनु क्र. vi वर खालीलप्रमाणे अट घालून दिलेली होती.

vi. Certificate and certified map from Chief Wildlife Warden shall be submitted mentioning that project boundary is located outside the Eco-Sensitive Zone (ESZ)/ Wildlife Sanctuary and no Tiger/elephant corridor /critically polluted area falls within 10 km. of Project site.

वरील अट क्रमांक vi नुसार प्रस्तावित प्रकल्प क्षेत्राचे हद्दीपासून २.२१ कि.मी. अंतरावर कळसूबाई हरिश्चंद्रगड वन्यजीव अभयारण्य आहे. तसेच सदर अभयारण्याच्या पर्यावरण संवेदनशील क्षेत्रापासून प्रकल्प क्षेत्राच्या हद्दीचे अंतर १२.५ मी. आहे. उपरोक्त संदर्भिय पत्र-२ अन्वये प्राप्त झालेल्या अहवालानुसार

उपवनसंरक्षक (वन्यजीव), नाशिक यांनी सदर प्रकल्प क्षेत्र व परिसर हे राष्ट्रीय व्याघ्र संवर्धन प्राधिकरण (NTCA) च्या संकेत स्थळावर असलेल्या निर्णय समर्थन प्रणाली (DSS) वर तपासणी करून, सदर क्षेत्र व्याघ्र भ्रमण मार्गाचा भाग नसल्याचे कळविले होते. तसेच सदर क्षेत्र हत्ती भ्रमण मार्ग देखील नसल्याचे या कार्यालयास कळविले होते.

प्रकरणी संदर्भिय पत्र-३ अन्वये प्राप्त झालेला नकाशा मुख्य वन्यजीव रक्षक, तथा अपर प्रधान मुख्य वनसंरक्षक (वन्यजीव), महाराष्ट्र राज्य यांचेकडून सांक्षाकन करून यासोबत सहपत्रीत करण्यात आलेला होता. तसेच सदरचा प्रकल्प हा Hydro Project या प्रकारातला असल्यामुळे व सदरचे क्षेत्र कळसुबाई हरिश्चंद्रगड वन्यजीव अभयारण्याचे पर्यावरण संवेदनशील क्षेत्रापासून १२.५ मी. अंतरावर येत असल्यामुळे, आपलेकडून वन्यजीव संवर्धन आराखडा मागविण्यात आलेला होता.

सदर प्रकरणी रु. ३२६.५० लक्ष रक्कमेचा वन्यजीव संवर्धन आणि जैवविविधता व्यवस्थापन आराखड्यास या कार्यालयाचे संदर्भ पत्र ४ अन्वये मान्यता प्रदान करण्यात आलेली होती.

आता, विषयांकित प्रकरणी आपले कार्यालयीन संदर्भ पत्र ५ अन्वये जे.एस.डब्ल्यू. एनर्जी, पीएसपी -२, लि. मुंबई यांचेकडून उपरोक्त २४३.७४ हे. वनजमीन वन (संवर्धन) अधिनियम १९८० अंतर्गत वळतीकरण व परवानगी मिळणेकामी प्राप्त झालेनंतर सदर प्रस्तावाचे अवलोकन तसेच वळतीकरण क्षेत्राचे स्थळ निरीक्षण केले असता, प्रकल्प यंत्रणेकडून सादर करण्यात आलेला वन्यजीव व्यवस्थापन आराखडा हा प्रत्यक्षात स्थळावर असलेल्या परिस्थितीनुसार (Site Specific) आढळून न आल्यामुळे सुधारित वन्यजीव व्यवस्थापन आराखडा शिफारसीसह या कार्यालयास प्राप्त झालेला आहे. त्याचा तपशील खालील प्रमाणे आहे.

Cost of Wildlife and Biodiversity Management Plan

Sr. No.	Activities	Amount (in rs. Lakhs)
1.	Removal of invasive species eg. Lantana, glyricidia, etc.	20.00
2.	Fodder Development work in Igatpuri subdivision	25.00
3.	Raising nursery for fodder species	15.00
4.	Construction of Watch Tower in Igatpuri CR	10.00
5.	Camera traps for wildlife monitoring	15.50
6.	GPS equipment	10.00
7.	Rescue equipment for HWC in Igatpuri and Sinnar	10.00
8.	First Aid Kits to Schools	10.00
9.	Provision of Rescue Vehicle /Patrolling Vehicle (2)	30.00
10.	Training of Staff /capacity building for HWC	15.00
11.	Management of Vulture restaurant	10.00

12.	Equipment and instruments for Rapid Rescue Team	15.00
13.	Awareness signages in CR	10.00
14.	Awareness about wildlife issues in schools	5.00
15.	Monitoring of implementation by CWLW office	5.00
16.	Protection hut(s) in CR	15.00
17.	Water holes with Solar Pump in CR	10.00
18.	Rescue equipment for HWC	25.00
19.	Training of staff/capacity building for HWC	25.00
20.	Awareness about wildlife issues in schools	16.00
21.	Habitat development works	30.00
Total cost		326.50

वरील बाबनिहाय सुधारित रू. ३२६.५० लक्ष रक्कम असलेला वन्यजीव संवर्धन आणि जैवविविधता व्यवस्थापन आराखडा वन्यजीव व्यवस्थापनाच्या दृष्टीने पोषक स्वरूपाचा असल्यामुळे, त्यांस मान्यता प्रदान करण्यात येत आहे.



(एम. श्रीनिवास राव)
मुख्य वन्यजीव रक्षक तथा
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प्रतिलिपी : उपवनसंरक्षक (वन्यजीव), नाशिक यांना माहितीस व आवश्यक पुढील कार्यवाहीस अग्रेषित.

प्रतिलिपी : JSW Energy PSP Two Limited, JSW Centre, Bandra Kurla Complex, Bandra East, Mumbai-400051 यांना माहितीस व आवश्यक पुढील कार्यवाहीस अग्रेषित.

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WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

**BHAVALI PUMPED STORAGE PROJECT
(5 X 250 MW+2X125MW),
Nashik & Thane District,
Maharashtra.**

Section 1(c)(i) River Valley Project, Category "A"

August, 2024

Project Proponent:



**JSW Energy PSP Two Limited
JSW Centre, Bandra Kurla Complex,
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Maharashtra**

Submitted By:



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UID: EQMS/EIA/VPSP/1(c)A/PR-682/21092022



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**WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN****ABBREVIATION**

CA	Compensatory Afforestation
CAT	Catchment Area Treatment
cumec	cubic meter per second
EIA	Environmental Impact Assessment
ESZ	Environmental Sensitive Zone
GLC	Ground Level Concentration
GW	Giga Watt
ha	Hectare
HH	Household
IUCN	International Union for Conservation of Nature
KIADB	Karnataka Industrial Area Development Board
km	Kilo meter
m	meter
masl	meter above sea level
MoEF&CC	Ministry of Environment, Forest and Climate Change
MU	Million Unit
MW	Mega Watt
NO _x	Nitrogen Oxide
NSL	Natural Surface Level
PM _{2.5}	Particulate Matter with a diameter of 2.5micron or less
PM ₁₀	Particulate Matter with a diameter of 10 micron or less
PSP	Pump Storage Project
RCC	Reinforced Cement Concrete
RF	Reserve Forest
RoW	Right of Way
SO ₂	Sulphur Dioxide
sq.km	Square kilometre
µg/m ³	micro gram per cubic meter
WCS	Water Conductor System
WLS	Wildlife Sanctuary
WPA	Wildlife Protection Act
ZSI	Zoological Survey of India



1 INTRODUCTION

1.1 BACKGROUND

The JSW Energy has set a vision of becoming a 10 GW company by 2025 and 20 GW company by 2030, with all the incremental capacity additions coming predominantly from the Renewable Energy sources. The bold and ambitious plan of the company further reinforces its position as a leader in the energy transition, with its renewable's portfolio currently at 30%, growing to 68% of total energy portfolio by 2025, and to about 84% by 2030. With renewable capacity additions already on blueprint, JSW Energy would become Carbon neutral well before 2030.

1.2 NEED FOR THE PROJECT

As per the recent study carried out by Central Electricity Authority on Optimal Generation Capacity mix for 2029-30, the likely All India installed capacity in 2029-30 is estimated to be 8,17,254 MW which includes 2,04,911 MW Coal, 25,080 MW Gas, 71,128 MW Hydro, 18,980 MW Nuclear and 4,35,155 MW Renewable Energy Sources. Thus, the clear focus of the Central Government is to increase the share of renewable energy (like solar, wind and NCE's). Flexible Energy Generation Assets that have a capability to supply both Base Load & Peaking Power efficiently and economically are the need of the future and the necessary solution to address the dynamic evolving energy needs of India.

The Pump storage offers multiple benefits to a power system. In addition to providing energy storage, pumped storage can provide power immediately and can be rapidly adjusted to respond to changes in energy demands. The importance for Bhavali PSP, indicative installed capacity 1500 MW, in Nashik and Thane district, Maharashtra, has therefore been considered in context of the focus of State Government to increase the share of renewable energy which is available in plenty within the state in general and in the country as whole.

1.3 BRIEF DESCRIPTION OF PROJECT, LOCATION AND IMPORTANCE

1.3.1 Brief Description of Project

The project envisages creation of an upper reservoir (gross storage:12.35 MCM & live storage:11.08 MCM) by constructing 962.47 m long dam comprising of 822.47 m long Geomembrane faced rockfill dam (GRFD) with maximum height of 48.64 m from foundation, 60 m long and 61 m height ungated spillway with 4 bays of 12.5 m each; 4 blocks of 20 m length each non-overflow section of maximum height of 49.57 m from foundation, two each on either side of spillway. 80 m long saddle dam (maximum height 10 m from foundation) to reduce backwater to enter ESZ area. The lower reservoir (gross storage:13.26 MCM; live storage: 11.71 MCM) shall be created by constructing concrete gravity dam 365.5 m long at top with maximum height of 48.15 m from foundation and 104 m long, 74 m high (from foundation) ungated spillway with 8 bays of 10.5 m each. Diffuser type Intake structure with 3 intakes (25.5 m x 10.5 m) of



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42.44 m length shall be provided. The water conductor system shall comprise of 67.96 m long three intake tunnels of 7 m diameter each with design discharge of 131.74 cumec each. 5.1 m diameter, followed Steel lined pressure shaft 3 nos. of independent, 5.1 m diameter with length varying from 1568.09 m to 1594.89 m, six 3.8 m diameter branch pressure shaft after first bifurcation of design discharge 65.96 cumec each; two 2.9 m diameter 46.83 m long steel lined branch pressure shaft after second bifurcation of design discharge 32.98 cumec each. Underground powerhouse (167 m x 22 m x 52.9 m) housed with 7 No's. Francis vertical shaft reversible pump-turbine (5 X 250 MW & 2 X 125 MW) discharging into circular draft tube 5.20 m and 4.0 m diameter for large and small unit; two four meter diameter concrete lined branch tail race tunnel for 32.98 cumec discharge after 3rd bifurcation; six 5.2 meter diameter concrete lined branch tail race tunnel for 65.78 cumec discharge after 4th bifurcation; followed by three 7 m diameter main tail race tunnel with length varying from 621.17 m to 646.57 m, each discharging 131.74 cumec, 105 m long trapezoidal tail race pool followed by 560 m long trapezoidal tail race channel.

The project will generate 1500 MW by utilizing a design discharge of 394.84 cumecs that includes, 65.78 cumec with rated head of 425.23 m (for larger unit of 250 MW) and 32.98 cumec with rated head of 424.03 m (for smaller unit of 125 MW) for 7.78 hr. The PSP will utilize 1680 MW to pump 0.391 TMC of water to the upper reservoir in 8.79 hours. Annual energy generation by Bhavali PSP in turbine mode is 4044.06 MU whereas annual energy consumed in pump mode is 5120.53 MU.

1.3.2 Project Location

The upper reservoir of the project shall be in village Jamunde, Tehsil Igatpuri, District Nashik while the lower reservoir in Village Kalbhonde, Tehsil Shahpur, District Thane, Maharashtra. The project site is located at 50 kms from the District Headquarters Nashik and is approachable from Mumbai via Shahapur by NH-160. Nearest railway head is in Igatpuri. The project layout map marked on toposheet is shown in **Figure 1.1** and Google image in **Figure1.2**.

1.3.3 PROTECTED AREA

Kalsubai Harichandragad Wildlife Sanctuary exists within 10 km of project boundary. However, no part of the project lies within Eco-sensitive zone of the Sanctuary. The nearest project boundary is about 12.5 m from ESZ boundary. (**Annexure-1**).

1.3.4 Land Requirement of Project

The total land requirement under the project for upper and lower rock fill dam, reservoir & other works, has been assessed as 278.92 ha of which Private land is 35.18 ha, and Forest land is 243.74 ha. The acquisition of the land shall be in consonance with "The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013", (RFCTLARRA 2013). The component wise land requirement is shown in **Table 1.1**.



Table 1.1: Land use & Land cover of Study Area

S.N.	Component	Land Requirement (ha)		
		Forest	Non-forest	Total
1	Upper Dam & Reservoir	58.42	30.08	88.5
2	Approach Road to Upper Dam	0.77	5.10	5.87
3	Lower Dam & Reservoir	81.10	0.00	81.10
4	Approach Road to Lower Dam	37.83	0.00	37.83
5	HRT (Underground)	4.77	0.00	4.77
6	Powerhouse (Underground)	1.853	0.00	1.853
7	TRT (Underground)	4.2	0.00	4.2
8	Tail Race Channel	1.64	0.00	1.64
9	Adit/ MAT (Underground)	0.99	0.00	0.99
10	Cable & Ventilation	0.084	0.00	0.084
11	Dumping Area and Job Facilities - 1	22.3	0.00	22.3
12	Dumping Area and Job Facilities - 2	22.6	0.00	22.6
13	Working Space	4.80	0.00	4.80
14	Service Corridor	2.27	0.00	2.27
15	Saddle Dam	0.11	0.00	0.11
Total		243.737	35.18	278.917
Say		243.74	35.18	278.92

About 243.74 ha forest land shall be required for construction of project as shown in Annexure-2.

1.3.5 Cost of Project

The basic cost of project is Rs. 8964.02 Crores.

1.3.6 Conditions Imposed in First Stage Forest Clearance or EC

The forest land diversion case was submitted by the Company vide PROPOSAL NO. FP/MH/HYD/153240/2022, dated 06.03.2022. The first stage clearance is not yet accorded for the diversion of 243.74 ha forest land. The prior Environmental Clearance is yet to be granted.

1.3.7 Need for Preparation of Biodiversity and Wild Life Conservation & Management Plan

MOEF&CC, New Delhi, Vide ToR Letter NO. J-12011/08/2022-IA. I(R), Dated 27th June 2022, has prescribed that Biodiversity and Wildlife Conservation & Management Plan for conservation and preservation of endemic, rare and endangered species of flora and fauna to be prepared in consultation with State Forest Department.



JSW Energy PSP Two Limited

Project- Bhavali Pumped Storage Project (5 X 250 MW+2x125mw) in Nashik &Thane District,
Maharashtra

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN



Figure 1.2 : Google Image of Project Area showing Project Layout

2 PROJECT AND IMPACT AREA

2.1 DESCRIPTION OF PROJECT AREA

The project area lies in Northern Western Ghats (Sahyadri Mountain) and comprises of varied topography. The distinct physiographic units are the main system of Sahyadri hill ranges with plains of Darna River valley and Bhatsa river, Tributary of the western flowing Ulhas river, separated by the hill ridge forming boundary between Nashik and Thane Districts. The elevation of the study area varies between 250 metres and 1470 metres. The general slope of this plateau is towards the east. The study area, covered in Survey of India topo-sheet 47E/10 in 1:50,000 scale, is not entirely rocky or hilly but has smooth plains and smooth undulating lands as well. Geographically, the landscape of the study area consists of two natural regions, separated by the Sahayadri hill ranges which has Godavari basin in its North and Western flowing Ulhas Basin in South. The photographic view of proposed upper and lower reservoirs is depicted in **Figure 2.1** and **Figure 2.2**.

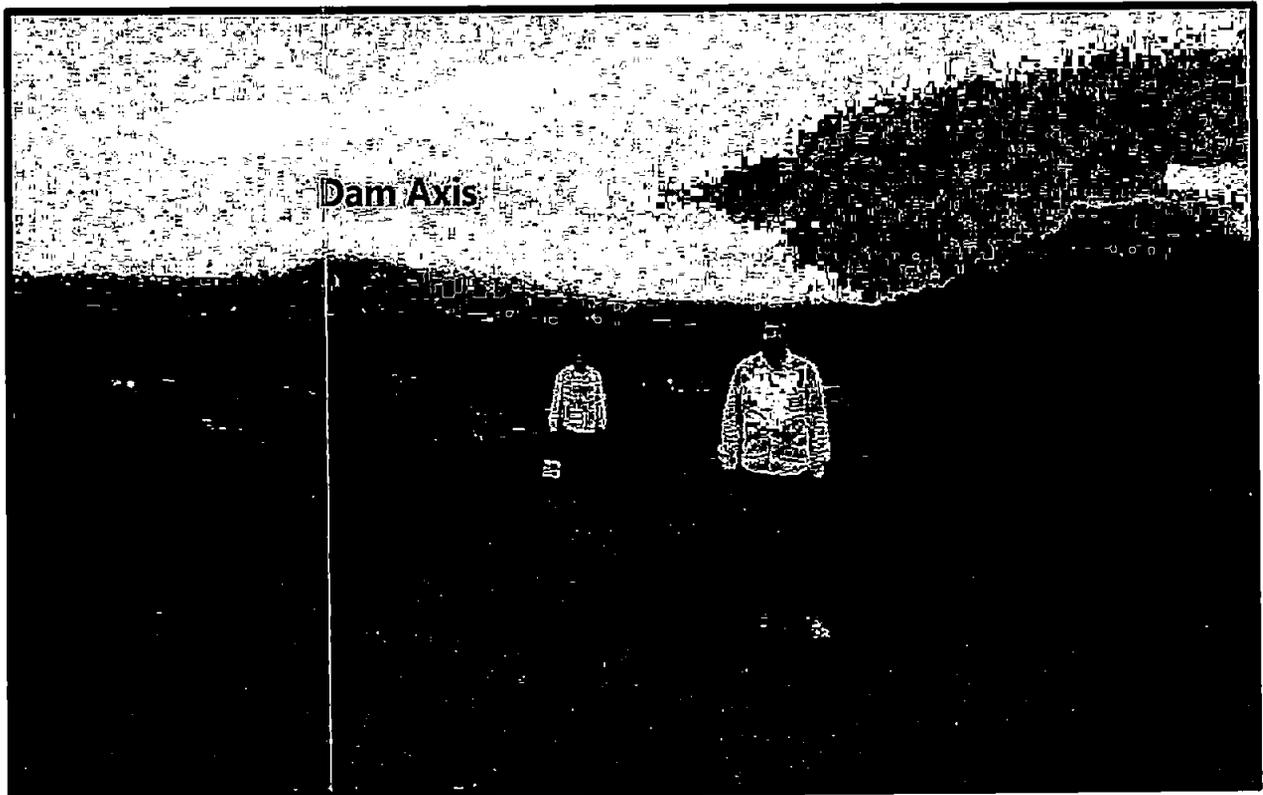


Figure 2.1 : View of Proposed Upper Reservoir Site



Figure 2.2 : View of Existing Lower Reservoir Site

2.2 PROJECT IMPACT AREA

In context of River Valley Hydro Electric Projects with or without Pump Storage Project and Stand-alone Pump Storage Project, the study area is construed as impact area and shall comprise of the following:

- Catchment area up to the upper and lower reservoir site.
- Submergence Area.
- Area falling within 10 km radius from the periphery of the upper reservoir and downstream up to 10 km from the lower reservoir.

2.3 GEOLOGY OF STUDY AREA

The geological formations underlying the area are the basaltic lava flows of upper Cretaceous to lower Eocene age. Igatpuri tehsil of Nashik district is mainly part of the Great Deccan Trap and formed by volcanic eruption. It shows prominent basaltic features. Most of the basalts in the study area are fine or coarse textured and nodular form. Along the banks of the rivers in the flowing area, shallow alluvial formation occurs in narrow belt.

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

2.4 SEISMICITY OF STUDY AREA

As per the seismic zoning map of India, as incorporated in Indian Standard Criteria for Earthquake Resistant Design of Structures IS:1893-(Part I) 2002, the proposed site lies in seismic Zone-III, which is referred to as moderate risk zone.

2.5 LAND USE OF STUDY AREA

The dominating classes are dense forest (47.75%), agriculture land (29.87%), open forest (20.61%), settlement (0.95%) and water body (0.82%). The land use pattern of study area is exhibited in Figure 2.3 and enumerated in Table 2.1.

Table 2.1: Land use & Land cover of Study Area

S.N.	Land use category	Area in sq. km	Area in %
1	Agriculture Land	121.75	29.87
2	Dense Forest	194.63	47.75
3	Open Forest land	83.99	20.61
4	Waterbody	3.36	0.82
5	Settlement	3.85	0.95
Total		407.58	100.00

2.6 SLOPE OF STUDY AREA

The study area has hilly and plain topography. The general slope of the study area is from north to south and follows the general trend of drainage. The slope map of the study area is shown in Figure 2.4 and the area under different slope classes is enumerated in Table 2.2. About 31.92% of the area is covered under very gentle; 21.07% and 19.23% under gentle slope and moderate slope respectively. About 27.78% is covered under moderately steep slope to steep slope.

Table 2.2: Area Under Different Slope Classes of Study Area

S. No	Slope Range (Degrees)	Slope Description	Area under different class (Sq. km)	Area (%)
1	0-5	Very Gentle Slope	130.11	31.92
2	5-10	Gentle Slope	85.89	21.07
3	10-15	Moderate Slope	78.37	19.23
4	15-20	Moderately Steep Slope	62.89	15.43
5	>20	Steep Slope	50.32	12.35
Total			407.58	100.00



WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

2.7 HUMAN HABITATION OF STUDY AREA

The study area comprises of 40 villages of which 20 ,18 and 2 are in Nashik, Thane and Ahmednagar districts respectively. Out of these villages Jamunde and Kalbhonde shall be project affected villages as these shall be impacted due to acquisition of private land, falling within the boundary of these villages for project works. As per the Census of India 2011, the total households under study area villages are 9190. The total population of villages is 52201 composed of 26398 males and 25803 females with sex ratio of 977. (Table2.3).

The cast wise composition of the total population made up the Scheduled Cast population is 2234 (4.28%) and Scheduled Tribe population is 32079 (61.45%), which shows that the Scheduled Tribe is the dominant cast in most of the villages in study area. The total literate population is 28605, of which male and female population is 16974 and 11631 respectively. Total literate population is 64.83%, of which male and female literates are 76.40 % are 53.09 % respectively. The total working population is 24293 (46.53%) which comprises of main workers 18849 (36.10%) and marginal workers 5444 (10.43%) while non-workers are 27908 (53.47%). Among main workers, cultivators constitute the highest category (54.3%), followed by cultivators (29.7%) and other workers (15.90%). Among marginal workers agricultural labour constitutes the highest category (50.7%) followed by cultivators (31.9%) and other workers (15.4%).

Table 2.3: Population Composition of Study Area

S. No.	Villages	H.H.	Population						
			Total	Male	Female	Below 6 yr.	Male <6 yr.	Female <6 yr.	Sex Ratio
1	Bhavli Bk	176	1023	527	496	146	81	65	941
2	Titoli	203	1076	548	528	148	73	75	964
3	Bortembhe	289	1673	858	815	231	121	110	950
4	Kanchangaon	316	1906	975	931	275	147	128	955
5	Talogha	411	2501	1303	1198	398	235	163	919
6	Taloshi	303	1796	891	905	239	111	128	1016
7	Nandgaonsado	718	4203	2102	2101	567	292	275	1000
8	Pimpri Sadroddin	394	2316	1174	1142	361	185	176	973
9	Fangul Gavhan	256	1531	790	741	215	120	95	938
10	Borli	111	616	298	318	107	51	56	1067
11	Bhavli Kh	397	2307	1112	1195	396	206	190	1075
12	Kaluste	660	3885	1987	1898	502	263	239	955
13	Bharwaj	159	819	412	407	95	49	46	988
14	Manjargaon	177	889	453	436	98	43	55	962
15	Nirpan	146	828	415	413	173	87	86	995
16	Gavhande	104	701	351	350	147	77	70	997



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S.No.	Villages.	H.H.	Population						
			Total	Male	Female	Below 6 yr.	Male <6 yr.	Female <6 yr.	Sex Ratio
17	Jamunde	107	589	287	302	120	62	58	1052
18	Kurungwadi	186	1055	514	541	288	145	143	1053
19	Ambewadi	380	2183	1111	1072	317	150	167	965
20	Taked Kh	220	1120	582	538	150	82	68	924
21	Kasara Kh.	460	2588	1293	1295	443	236	207	1002
22	Dand	35	165	80	85	29	16	13	1063
23	Umbravane	42	249	126	123	36	16	20	976
24	Fugale	168	1018	507	511	202	103	99	1008
25	Vashala Bk	282	1439	711	728	246	114	132	1024
26	Vashala Kh	69	325	153	172	56	24	32	1124
27	Susarwadi	156	1044	563	481	122	70	52	854
28	Pingalwadi	37	162	87	75	28	16	12	862
29	Dhakane	296	1882	1036	846	268	146	122	817
30	Kothale	261	1233	589	644	258	137	121	1093
31	Kalbhonde	176	997	510	487	205	128	77	955
32	Julawani	294	1382	699	683	184	82	102	977
33	Jambhulwad	129	665	342	323	104	48	56	944
34	Roadvahal	92	476	233	243	96	45	51	1043
35	Hinglud	77	404	203	201	42	18	24	990
36	Chondhe Kh.	81	384	185	199	62	31	31	1076
37	Chilhar	98	588	290	298	92	42	50	1028
38	Ranvihar	286	1468	763	705	194	102	92	924
39	Ghatghar	197	1176	588	588	186	95	91	1000
40	Udadawane	241	1539	750	789	249	131	118	1052
	Total	9190	52201	26398	25803	8075	4180	3895	977



PSW Energy PSP Two Limited

Project- Bhavali Pumped Storage Project (5 X 250 MW+2x125mw) in Nashik &Thane District, Maharashtra

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

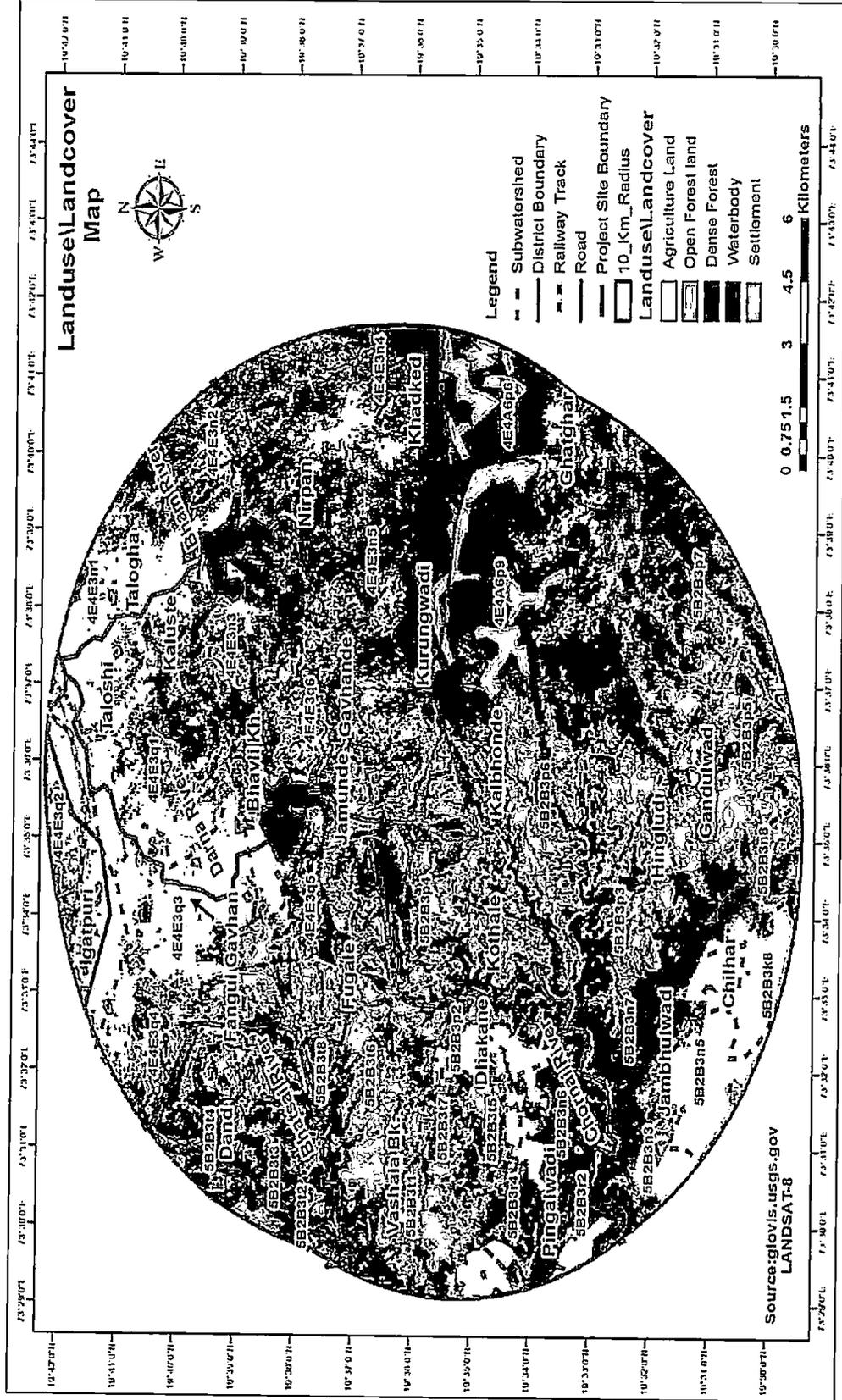


Figure 2.3 : Land Use Land Cover Map



JSW Energy PSP Two Lili

Project- Bhavali Pumped Storage Project (5 X 250 MW+2x125mw) in Nashik &Thane District, Maharashtra

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

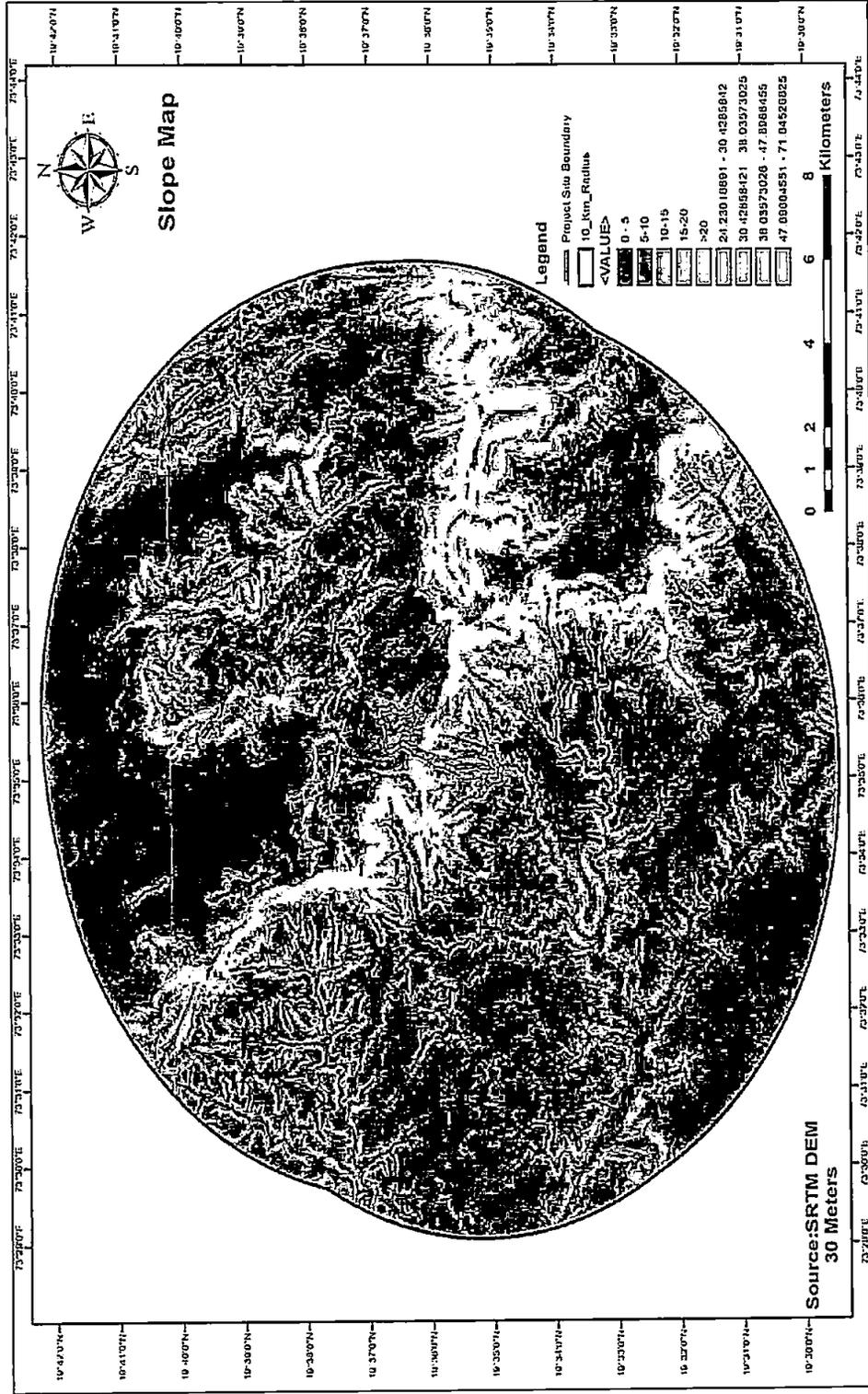


Figure 2.4 : Slope Map of Study Area

37 90



2.8 BASELINE STATUS OF ENVIRONMENT ATTRIBUTES

2.8.1 CLIMATE OF STUDY AREA

The average annual temperature of the study area is 24.2 °C. January is the coldest month of the year with average minimum temperature 15.5 °C. April is the hottest month of the year with average maximum temperature 35.8 °C. Average precipitation is about 2084 mm. There is average 96 rainy days in a year of which 80 days are in monsoon season. Skies are generally clear from November to April. During monsoon the clouds cover varies from 4.7 to 6.3 oktas of sky. For about 146 days skies are clear and for 76 days about 3 to 5 oktas of sky are covered.

2.8.2 Ambient Air Quality in Study Area

The maximum concentration of PM₁₀, PM_{2.5}, NO_x and SO₂ monitored at was 66.3µg/m³, 25.5µg/m³, 12.8µg/m³ and 9.6µg/m³ respectively which shows that concentration of pollutants was within the limits of NAAQS, prescribed by CPCB ,2009.

2.8.3 Noise Levels in Study Area

The highest noise levels recorded during daytime at Bhavali Khurd is 62.6 dB (A) and during nighttime it is 50.3dB (A) and both are within the CPCB limits of 65 dB (A) and 55 dB (A) for commercial zone. The noise levels for all other locations are within the limits set forth under Noise Pollution (Regulation and Control) Rules, 2000. Standards for daytime and night time i.e., 55 dB (A) and 45 dB (A) respectively.

2.8.4 Soil Quality in Study Area

The soil is neutral having pH varying from 6.6 to 7.34. The texture of the soil is loam, and sandy clay loam. Available nitrogen content in the surface soils ranges between 153 to 849 kg/ha thereby is indicating that soils are low to high in available nitrogen content. Available phosphorus content ranges between 6.6 to 46.9 kg/ha thereby indicating that soils are low to high in available phosphorus. Available potassium content in these soils' ranges between 81.8 to 826 kg/ha, thereby indicating low to high in potassium content. The organic carbon varies from 0.76 % to 3.0% thereby implying high in organic content.

2.8.5 Surface Water Quality in Study Area

The pH values of all analyzed samples ranged between 6.97 – 7.6 and are within the acceptable limit (6.5-8.5). The TDS levels ranged from 74 to 107 mg/l and were less than the desirable limit of 500 mg/l. Total hardness levels ranged from 56 to 77 mg/l and were well below the acceptable limit of 200 mg/l. The dissolved oxygen values ranged between 6.9-8.4 mg/l and were more than 4 mg/l, i.e., the limit under CPCB Water Quality Criteria for designated best use (C). The chlorides level in surface water samples ranged from 30.3 - 41.1 mg/l and were below the acceptable limit of 250 mg/l. The sulphate levels ranged from 7.4 to 14.1 mg/l and were below the acceptable limit of 200 mg/l. The nitrate ranged between 2.4 to 6.7 mg/l and were below the acceptable limit of 45 mg/l. The BOD values ranged between 1.1 to 2.8mg/l



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and exceeded the CPCB criteria of 2mg/l or less for Class A water. The Total Coliform level ranged between 52-116 MPN/100ml and were less than 500 MPN/100ml, the limits specified for Class B water under CPCB Water Quality Criteria is designated as best use. The water is suitable for meeting drinking water requirements after conventional treatment and disinfection.

2.8.6 Ground Water Quality in Study Area

The pH values ranged between 6.58 – 7.86 and are within the acceptable limit (6.5-8.5). The TDS levels ranged from 216 to 310 mg/l and were less than the desirable limit of 500 mg/l. Total hardness levels ranged from 140 to 190 mg/l and were well below the acceptable limit of 200 mg/l. Chloride levels at all the locations were within the desirable limits (250 mg/l) as it ranged between 57.1 – 83 mg/l. Sulphate levels at all the locations were within the desirable limits (200 mg/l) as it ranged between 21.3 – 36 mg/l. Nitrate levels at all the locations were within the desirable limits (45 mg/l) as it ranged between 2.8 – 5.1 mg/l. Iron at all the locations was observed well within the desirable limits (1.0 mg/l) as it ranged between 0.03 – 0.10 mg/l. Bacteriological studies revealed that no coliform bacterial are present in the samples. The heavy metal contents were observed to be in below detectable limits. All physical and general parameters were observed within the desirable limit as per IS10500:2012 (Second Revision). The WQI for ground water at all sampling locations is below 50 and therefore, water quality is excellent.

2.8.7 Hydrogeological Aspects of Study Area

Hydrogeologically, the study area is underlain by the basaltic lava flows. The groundwater in Deccan Trap Basalt occurs mostly in the upper weathered and fractured parts down to 20-25 m depth. At places potential zones are encountered at deeper levels in the form of fractures and inter-flow zones. The upper weathered and fractured parts form phreatic aquifer and ground water occurs under water table (unconfined) conditions. At deeper levels, the ground water occurs under semi-confined to confined conditions. The yield of dug wells tapping upper phreatic aquifer down to the depth of 12 to 15 m bgl ranges between 45 to 90 m³/day depending upon the local hydrogeological conditions. Borewells drilled down to 70 m depth, tapping weathered and vesicular basalt are found to yield 18 to 68 m³/day. The dug wells constructed in Alluvium has been ranging in depth from 8-12 m with diameters of 2-3 m, whereas the borewells range in depth from 15 to 20 m and the yield of both the dug wells and borewells ranges from 13 to 22 m³/day.

During pre-monsoon, depth to ground water in dug wells occur in most part of the watershed within 5-7.5 mbgl. During monsoon in some of dug wells extremely shallow water levels within 1.0- 1.5 mbgl have been observed in study area. In the Decadal Water Level Trend of all Ground Water Monitoring Wells (2010-2019) at Igatpuri Piezometer during pre-monsoon season, the fall of 1.33m/year has been observed, whereas, during post monsoon season, a rise of 1.293m/year has been found. The piezometer level observed a rise of 0.0593m/year during the decade period. There is no problem of availability of ground water at present as in both Taluka the stage of ground water development is categorized safe.

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2.9 FLORA OF STUDY AREA

2.9.1 Forest Types in Study Area

As per the revised classification of Indian forest types by Champion & Seth, the forests of the study area can be broadly classified under two sub-groups with their associated types (Table 2.4).

Table 2.4: Type of Forests in Study Area

S. N.	Forest Group/Type	Distribution/Dominant species
1	Southern Tropical Moist Deciduous Forests. Type-3B/C1b: Moist Teak Forest	<p>This type can be seen near plains of Igatpuri range. The crop is deteriorated due to encroachment on forest areas. The over wood consists of Teak (<i>Tectona grandis</i>) with its associates like Sadada (<i>Terminalia tomentosa</i>), Hed (<i>Adina cordifolia</i>), Kalamb (<i>Mitragyna parvifolia</i>), Shisham (<i>Dalbergia latifolia</i>), Khair (<i>Acacia catechu</i>), and Dhawada (<i>Anogeissus latifolia</i>).</p> <p>The underwood consists of Apta (<i>Bauhinia racemosa</i>), Asan (<i>Bridelia retusa</i>), Awala (<i>Emblca officinalis</i>), Bahava (<i>Cassia fistula</i>), Bhokar (<i>Cordia myxa</i>), Dhaman (<i>Grewia tiliifolia</i>), Humb (<i>Miliusa tomentosa</i>), Jambhul (<i>Syzygium cumini</i>), Kahandol (<i>Sterculia urens</i>), Karwal (<i>Dillenia pentagyna</i>), Kuda (<i>Holarrhena pubescens</i>), Kudi (<i>Wrightia tinctoria</i>), Kumbhi (<i>Carea arborea</i>), Moha (<i>Madhuca longifolia</i>), Palas (<i>Butea monosperma</i>), Payar (<i>Ficus rumphii</i>), Petari (<i>Dalbergia paniculata</i>), Shendri (<i>Mallotus philippensis</i>), Tembru (<i>Diospyros melanoxylon</i>), Tetu (<i>Oroxylum indicum</i>), Umber (<i>Ficus glomerata</i>), Waras (<i>Heterophragma quadriloculare</i>), Bamboo (<i>Dendrocalamus strictus</i>), etc.</p> <p>The undergrowth consists of Burando (<i>Blumea lacera</i>), Dhaiti (<i>Woodfordia fruticosa</i>), Gal (<i>Randia dumetorum</i>), Galgugar (<i>Flacourtia indica</i>), Ghatbor (<i>Ziziphus xylopyrus</i>), Guthura (<i>Lantana camara</i>), Karvi (<i>Strobilanthes callosa</i>), Karwand (<i>Carissa carandas</i>), Khuri (<i>Ixora pavetta</i>), Kirmira (<i>Casearia esculenta</i>), Murud Sheng (<i>Helicteres isora</i>), Ranbhendi (<i>Thosposia lampas</i>), Tarota (<i>Senna tora</i>), etc</p>
	Southern Tropical Moist Deciduous Forests. Type-3B/C2: Southern Moist Mixed Deciduous Forest	<p>The over wood consists predominantly of miscellaneous species like Kakad (<i>Garuga pinnata</i>), Modhal (<i>Lannea coromandelica</i>), Sadada (<i>Terminalia tomentosa</i>), and Dhawada (<i>Anogeissus latifolia</i>). In addition to this, the species which occurs in the overwood are Bibla (<i>Pterocarpus marsupium</i>), Bondara (<i>Lagerstroemia parviflora</i>), Khair (<i>Acacia catechu</i>), Kinhai (<i>Albizia procera</i>), Pangara (<i>Erythrina variegata</i>), Sawar (<i>Bombax ceiba</i>), Shisham (<i>Dalbergia latifolia</i>), Shiras (<i>Albizia lebbeck</i>), Shiwan (<i>Gmelina arborea</i>), Teak (<i>Tectona grandis</i>) and Tiwas (<i>Ougeinia oojeinensis</i>).</p> <p>The underwood consists of Amba (<i>Mangifera indica</i>), Apta (<i>Bauhinia racemosa</i>), Asan (<i>Bridelia retusa</i>), Awala (<i>Emblca officinalis</i>), Bahava (<i>Cassia fistula</i>), Dhaman (<i>Grewia tiliifolia</i>), Kahandol (<i>Sterculia urens</i>), Kudi (<i>Wrightia tinctoria</i>), Kumbhi (<i>Carea arborea</i>), Moha (<i>Madhuca longifolia</i>), Palas (<i>Butea monosperma</i>), Payar (<i>Ficus rumphii</i>), Tembru (<i>Diospyros melanoxylon</i>), Waras (<i>Heterophragma quadriloculare</i>)</p>

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			The undergrowth consists of Bor (<i>Ziziphus mauritiana</i>), Burando (<i>Blumea lacera</i>), Dhaiti (<i>Woodfordia fruticosa</i>), Gal (<i>Randia dumetorum</i>), Ghatbor (<i>Ziziphus xylopyrus</i>), Gulthur (<i>Lantana camara</i>), Karvi (<i>Strobilanthes callosus</i>), Karwand (<i>Carissa carandas</i>), Kharata (<i>Streblus asper</i>), Tarota (<i>Senna tora</i>), etc.
2	Western Tropical Forest Type Southern scrub	Sub- Hill 8A/C2: thorn	This sub type is generally found near Kurungwadi and Ambewadi area of Igatpuri range. The percentage of ever green species particularly Amba (<i>Mangifera indica</i>) and Karap (<i>Memecylon edule</i>) is significantly high. These types of forests are found in narrow strips. Top Canopy and Second Storey: This type of forest is dominated by Amba (<i>Mangifera indica</i>), Asassn (<i>Bridelia retusa</i>), Bhuri (<i>Ixora pavetta</i>), Jambhul (<i>Syzygium cumini</i>), Kakad (<i>Garuga pinnata</i>), Karap (<i>Memecylon edule</i>), Koshimb (<i>Schleichera oleosa</i>), Modhal (<i>Lannea coromandelica</i>), Palas (<i>Butea monosperma</i>), Pangara (<i>Erythrina variegata</i>), Sadada (<i>Terminalia tomentosa</i>), Waras (<i>Heterophragma quadriloculare</i>), etc. Among herbs and shrubs Bhoma (<i>Glochidion hohenackeri</i>), Karwand (<i>Carissa congesta</i>), Karvi (<i>Strobilanthes caliosus</i>), Tarota (<i>Senna tora</i>). etc. are the dominant species.

2.9.2 Flora

There are many patches of forests in the study area. The forest of the study area is mainly dominated with Aam (*Mangifera indica*), Sadada (*Terminalia tomentosa*), and Dhawada (*Anogeissus latifolia*).

Vegetation in Lower Reservoir Area

In upper reservoir, scattered forest vegetation and stunted growth of tree species were observed. The upper reservoir area is mainly dominated with shrubby species along with few trees of Amba and Sadada. The upper story is mainly dominated by tree species like Aam (*Mangifera indica*), Sadada (*Terminalia tomentosa*), Umar (*Ficus racemose*) and Dhawada (*Anogeissus latifolia*). The shrub and herb species consists of Karwand (*Carissa congesta*), Bhoma (*Glochidion hohenackeri*) and Karvi (*Strobilanthes caliosus*), etc.

Vegetation in Lower Reservoir Area

The lower reservoir area has slightly dense vegetation with respect to upper reservoir area. The vegetation is also diverse. The vegetation is mixed type by Sadada (*Terminalia tomentosa*), Teak (*Tectona grandis*), Hed (*Adina cordifolia*), Kalamb (*Mitragyna parvifolia*), Shisham (*Dalbergia latifolia*), Khair (*Acacia catechu*), and Dhawada (*Anogeissus latifolia*). The undergrowth consists of Dhaiti (*Woodfordia fruticosa*), Gal (*Randia dumetorum*), Galgugar (*Flacourtia indica*), Ghatbor (*Ziziphus xylopyrus*), Guthura (*Lantana camara*), Karwand (*Carissa carandas*), Khuri (*Ixora pavetta*), and Murud Sheng (*Helicteres isora*).

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Vegetation Near Tail Race Channel:

The Vegetation type in tail race channel area is similar to the lower reservoir area. The vegetation is dominated by teak species along with the associated species.

Vegetation in Rest of Study area

In rest of the study area, the main jungle type is mixed deciduous forest and main composition is Teak along with Sadada-Dhavda- and Wali-Dhaiti local type of vegetation. In dense forest area, the teak is the dominant species. In some areas of the study area on steep slopes and depleted soil areas the Kakkad Modhal-waras sub type of forest is observed.

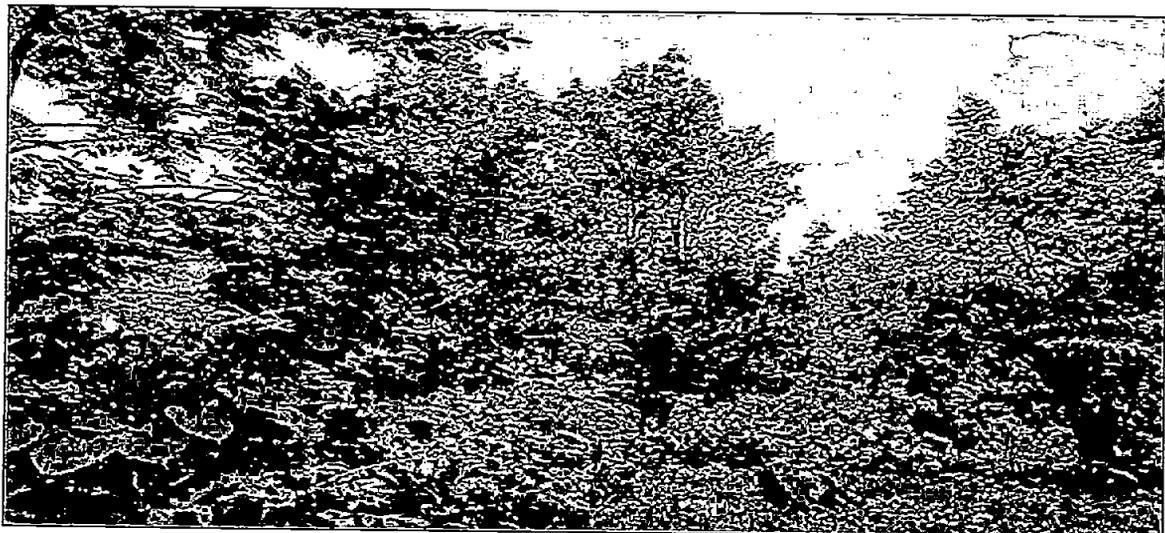
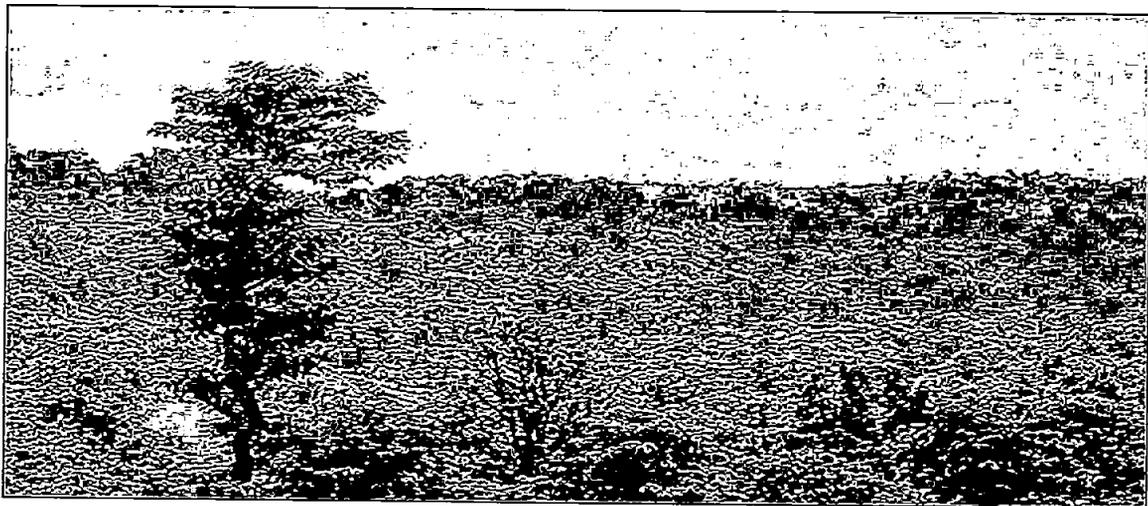


Figure 2.5 : Photographs of Flora of Study Area

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2.9.3 Floristic Composition

During primary and secondary study carried out under present project, 88 tree species (37 families), 41 shrub species (23 families), 40 herbs species (26 families) and 14 species of climbers (10 families) and 18 species of grasses (1 family) were recorded from the study area. The comprehensive list of the plant species observed in the study area is given Table 2.5.

Table 2.5: Plant Species Recorded/Reported in Study Area

Sl. No.	Local Name	Botanical Name	Family	IUCN Status
Trees				
1.	Amba	<i>Mangifera indica</i>	Anacardiaceae	DD
2.	Ambada	<i>Spondias pinnata</i>	Anacardiaceae	LC
3.	Biba	<i>Semecarpus anacardium</i>	Anacardiaceae	LC
4.	Modhal, Moi	<i>Lannea coromandelica</i>	Anacardiaceae	LC
5.	Humb	<i>Milium tomentosum</i>	Annonaceae	-
6.	Kuda (Safed)	<i>Holarrhena antidysenterica</i>	Apocyanaceae	LC
7.	Kuda	<i>Wrightia tinctoria</i>	Apocyanaceae	LC
8.	Buralicode	<i>Wrightia arborea</i>	Apocyanaceae	LC
9.	Medsing	<i>Dolichandron falcata</i>	Bignoniaceae	-
10.	Tetu	<i>Oroxylon indicum</i>	Bignoniaceae	-
11.	Waras/Varas	<i>Heterophrasma quadriculata</i>	Bignoniaceae	-
12.	Semal	<i>Bombax ceiba</i>	Bombacaceae	LC
13.	Aliv	<i>Lepidium sativum</i>	Brassicaceae	
14.	Kakad	<i>Garuga pinnata</i>	Burseraceae	-
15.	Salai	<i>Boswellia serrata</i>	Burseraceae	-
16.	Bahawa	<i>Cassia fistula</i>	Caesalpiniaceae	LC
17.	Chamol	<i>Bauhinia lawii</i>	Caesalpiniaceae	-
18.	Chinch	<i>Tamarindus indica</i>	Caesalpiniaceae	LC
19.	Wagat	<i>Capparis zeylanica</i>	Capparaceae	-
20.	Petari	<i>Mallotus polycarpus</i>	Euphorbiaceae	-
21.	Ain (sadada)	<i>Terminalia alata</i>	Combretaceae	-



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Sl. No.	Local Name	Botanical Name	Family	IUCN Status
22.	Arjun sadada	<i>Terminalia arjuna</i>	Combretaceae	-
23.	Beheda	<i>Terminalia bellirica</i>	Combretaceae	LC
24.	Dhawda, Dhamoda	<i>Anogeissus latifolia</i>	Combretaceae	-
25.	Hirda	<i>Terminalia chebula</i>	Combretaceae	LC
26.	Ain	<i>Terminalia elliptica</i>	Combretaceae	-
27.	Tendu	<i>Diospyros melanoxylon</i>	Ebenaceae	-
28.	Kamala, Kumkum	<i>Mallotus philipensis</i>	Euphorbiaceae	-
29.	Anjan	<i>Hardwickia binata</i>	Fabaceae	LC
30.	Apta	<i>Bauhinia racemosa</i>	Fabaceae	-
31.	Bija/Bibla	<i>Pterocarpus marsupium</i>	Fabaceae	NT
32.	Karanj	<i>Pongamia pinnata</i>	Fabaceae	LC
33.	Palas	<i>Butea monosperma</i>	Fabaceae	LC
34.	Pangara	<i>Erythrina stricta</i>	Fabaceae	-
35.	Shisham	<i>Dalbergia latifolia</i>	Fabaceae	VU
36.	Sissoo	<i>Dalbergia sissoo</i>	Fabaceae	LC
37.	Tiwas/Tinsa	<i>Ougenia oojeinensis</i>	Fabaceae	-
38.	Kumbhi	<i>Careya arborea</i>	Lecythidiaceae	-
39.	Bondara	<i>Lagerstroemia parviflora</i>	Lythraceae	LC
40.	Baranga	<i>Kydia calycina</i>	Malvaceae	LC
41.	Bakan-Nimb	<i>Melia azadirachta</i>	Meliaceae	LC
42.	Neem/Nimb	<i>Azadirachta indica</i>	Meliaceae	LC
43.	Babul	<i>Acacia nilotica</i>	Mimosaceae	LC
44.	Ghubata	<i>Acacia polycantha</i>	Mimosaceae	-
45.	Hiwar	<i>Acacia leucophloea</i>	Mimosaceae	LC
46.	Ichan (Pandra Khair)	<i>Acacia ferruginea</i>	Mimosaceae	VU
47.	Kansar	<i>Albizia amara</i>	Mimosaceae	LC
48.	Khair	<i>Acacia catechu</i>	Mimosaceae	LC
49.	Safed Siras	<i>Albizzia procera</i>	Mimosaceae	-

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Sl. No.	Local Name	Botanical Name	Family	IUCN Status
50.	Siras (Kala)	<i>Albizzia lebbek</i>	Mimosaceae	-
51.	Sonchafa	<i>Michelia champaca</i>	Mognoliaceae	LC
52.	Amba-payer	<i>Ficus virens</i>	Moraceae	LC
53.	Payer, Pipri	<i>Ficus amplissima</i>	Moraceae	-
54.	Phanas	<i>Artocarpus heterophyllus</i>	Moraceae	-
55.	Umbar	<i>Ficus racemosa</i>	Moraceae	LC
56.	Wad	<i>Ficus bengalensis</i>	Moraceae	-
57.	Shevga	<i>Moringa oliefera</i>	Moringaceae	-
58.	Jambul, Jamun	<i>Syzygium cumini</i>	Myrtaceae	LC
59.	Nilgiri	<i>Eucalyptus camaldulensis</i>	Myrtaceae	-
60.	Mokha	<i>Schrebera swietenoides</i>	Oleaceae	-
61.	Shindi	<i>Phoenix sylvestris</i>	Palmaceae	-
62.	Darara	<i>Erythrina suberosa</i>	Papilionaceae	-
63.	Asand	<i>Bridelia retusa</i>	Phyllanthaceae	LC
64.	Awalkanti, Aonla	<i>Phyllanthus emblica</i>	Phyllanthaceae	LC
65.	Bhoma	<i>Glochidion hohenackeri</i>	Phyllanthaceae	-
66.	Bor	<i>Zizyphus mauritiana</i>	Rhamnaceae	LC
67.	Ghatbor	<i>Zizyphus xylopyra</i>	Rhamnaceae	-
68.	Ali	<i>Morinda tinctoria</i>	Rubiaceae	-
69.	Aliv	<i>Meyna laxiflora</i>	Rubiaceae	-
70.	Haldu/ Hed	<i>Haldina cordifolia</i>	Rubiaceae	-
71.	Kalamb	<i>Mitragyna parvijflora</i>	Rubiaceae	-
72.	Bel	<i>Aegle marmelos</i>	Rutaceae	NT
73.	Kawat	<i>Limonia acidissima</i>	Rutaceae	-
74.	Kusum	<i>Schleichera oleosa</i>	Sapindaceae	LC
75.	Ritha	<i>Sapindus laurifolius</i>	Sapindaceae	-
76.	Bakula	<i>Mimusops elengi</i>	Sapotaceae	LC
77.	Kad, Kadhai, Kandol	<i>Sterculia urens</i>	Sterculiaceae	-



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Sl. No.	Local Name	Botanical Name	Family	IUCN Status
78.	Bothi, Varying	<i>Eriolaena quinquelocularis</i>	Sterculiaceae	-
79.	Dhaman	<i>Grewia tilifolia</i>	Tiliaceae	-
80.	Gangudi	<i>Grewia tenax</i>	Tiliaceae	LC
81.	Gol, Karamatigol	<i>Trema orientalis</i>	Ulmaceae	LC
82.	Papada	<i>Holoptelea integrifolia</i>	Ulmaceae	-
83.	Sag/Sagwan	<i>Tectona grandis</i>	Verbenaceae	-
84.	Shivan	<i>Gmelina arborea</i>	Verbenaceae	LC
85.	Ela	<i>Elettaria cardamomum</i>	Zingiberaceae	○
86.	Kharmati	<i>Memecylon umbellatum</i>	Melastomataceae	-
87.	Kirmira	<i>Glycosmis pentaphylla</i>	Rutaceae	-
88.	Kuda	<i>Holarrhena pubescens</i>	Apocynaceae	-
Shrubs				
1.	Achra	<i>Dyschoriste dalzellii</i>	Acanthaceae	-
2.	Karvi	<i>Carvia callosa</i>	Acanthaceae	-
3.	Kati Koranti	<i>Barleria prionitis</i>	Acanthaceae	LC
4.	Amoni	<i>Rhus mysorensis</i>	Anacardiaceae	-
5.	Pandrakuda	<i>Holarrhena antidysenterica</i>	Apocyanaceae	LC
6.	Karvand	<i>Carissa congesta</i>	Apocynaceae	LC
7.	Anantvel	<i>Hemidesmus indicus</i>	Asclepiadaceae	-
8.	Rui	<i>Calotropis gigantea</i>	Asclepiadaceae	○
9.	Kadu Jire	<i>Vernonia anthelmintica</i>	Asteraceae	-
10.	Dhordavana	<i>Artemisia nilagirica</i>	Asteraceae	-
11.	Phadya Niwadung	<i>Opuntia dillenii</i>	Cactaceae	LC
12.	Awal, Tarvad	<i>Senna auriculata</i>	Caesalpiniaceae	-
13.	Chilhar	<i>Caesalpinia decapetala</i>	Caesalpiniaceae	-
14.	Dewawali	<i>Cassia suffruticosa</i>	Caesalpiniaceae	-
15.	Tarwad	<i>Cassia auriculata</i>	Caesalpiniaceae	-
16.	Yenkal/Bharati	<i>Maytenus emarginata</i>	Celastraceae	-

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Sl. No.	Local Name	Botanical Name	Family	IUCN Status
17.	Henkal	<i>Gymnosporia spinosa</i>	<i>Celestraceae</i>	-
18.	Chandrajyoti	<i>Jatropha curcas</i>	<i>Euphorbiaceae</i>	LC
19.	Pachurna	<i>Securinega virosa</i>	<i>Euphorbiaceae</i>	-
20.	Shembarti	<i>Acacia pennata</i>	<i>Fabaceae</i>	LC
21.	Umbrella Thorn	<i>Vachellia tortilis</i>	<i>Fabaceae</i>	LC
22.	Hirna	<i>Indigofera trita</i>	<i>Fabaceae</i>	LC
23.	Dhaiti	<i>Woodfordia fruticose</i>	<i>Lythraceae</i>	LC
24.	Ambadi	<i>Hibiscus aculeatus</i>	<i>Malvaceae</i>	-
25.	Ranbhendi	<i>Thespesia lampas</i>	<i>Malvaceae</i>	-
26.	Zingaroot	<i>Urena lobata</i>	<i>Malvaceae</i>	LC
27.	Velatur	<i>Dichrostachys cinerea</i>	<i>Mimosaceae</i>	LC
28.	Pandharpali	<i>Securinega leucopyrus</i>	<i>Phyllanthaceae</i>	LC
29.	Vowding	<i>Embelia tsjeriam cottam</i>	<i>Primulaceae</i>	-
30.	Bor	<i>Ziziphus mauritiana</i>	<i>Rhamnaceae</i>	LC
31.	Chanyabor	<i>Ziziphus nummularia</i>	<i>Rhamnaceae</i>	-
32.	Toran	<i>Ziziphus rugosa</i>	<i>Rhamnaceae</i>	-
33.	Gal/Gel	<i>Catunaregam spinosa</i>	<i>Rubiaceae</i>	LC
34.	Papat	<i>Pavetta indica</i>	<i>Rubiaceae</i>	-
35.	Bhokoda	<i>Casearia graveolens</i>	<i>Salicaceae</i>	-
36.	Bhui ringni	<i>Solanum xanthocarpum</i>	<i>Solanaceae</i>	-
37.	Ati, Murudsheng	<i>Helicteres isora</i>	<i>Sterculiaceae</i>	-
38.	Jaol	<i>Tamarix dioica</i>	<i>Tamaricacease</i>	-
39.	Barkudi	<i>Grewia damine</i>	<i>Tiliaceae</i>	-
40.	Bharangi	<i>Clerodendrum serratum</i>	<i>Verbenaceae</i>	-
41.	Gultura/Ganeri	<i>Lantana camara</i>	<i>Verbenaceae</i>	-
Herbs				
1.	Buikarvi	<i>Hygrophila serpyllum</i>	<i>Acanthaceae</i>	-
2.	Corata	<i>Barleria lawii</i>	<i>Acanthaceae</i>	-



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Sl. No.	Local Name	Botanical Name	Family	IUCN Status
3.	Aghada	<i>Achyranthes aspera vari</i>	<i>Amaranthaceae</i>	-
4.	Babli	<i>Heracleum grandis</i>	<i>Apiaceae</i>	-
5.	Dongarjeera	<i>Pimpinella heyneana</i>	<i>Apiaceae</i>	-
6.	Badadha	<i>Arisaema murrayi</i>	<i>Araceae</i>	-
7.	Khorpad	<i>Aloe vera</i>	<i>Asphodelaceae</i>	-
8.	Burandu	<i>Ageratum conyzoides</i>	<i>Asteraceae</i>	-
9.	Dagadipala	<i>Tridax procumbens</i>	<i>Asteraceae</i>	-
10.	Khurasini	<i>Guizotia abyssinica</i>	<i>Asteraceae</i>	-
11.	Ranjenda	<i>Zinnia peruviana</i>	<i>Asteraceae</i>	-
12.	Tarota	<i>Senna tora</i>	<i>Caesalpinaceae</i>	-
13.	Pivli tilwan	<i>Cleome viscosa</i>	<i>Cleomaceae</i>	-
14.	Gomett	<i>Solena amplexicaulis</i>	<i>Cucurbitaceae</i>	-
15.	Kartoli	<i>Momordica dioca</i>	<i>Cucurbitaceae</i>	-
16.	Medwan	<i>Dioscorea oppositifolia</i>	<i>Dioscoreaceae</i>	-
17.	Buishirid	<i>Euphorbia fusiformis</i>	<i>Euphorbiaceae</i>	-
18.	Barbada	<i>Indigofera cordifolia</i>	<i>Fabaceae</i>	-
19.	Borupdi	<i>Indigofera glandulosa</i>	<i>Fabaceae</i>	-
20.	Dador	<i>Sesbania bispinosa</i>	<i>Fabaceae</i>	LC
21.	Kachquiri/Kawitch	<i>Mucuna pruriens</i>	<i>Fabaceae</i>	LC
22.	Phat-phati	<i>Crotalaria filipes</i>	<i>Fabaceae</i>	-
23.	Rangas	<i>Crotalaria medicaginea</i>	<i>Fabaceae</i>	-
24.	Alsi	<i>Dalbergia volubilis</i>	<i>Fabaceae</i>	LC
25.	Chidsi/ Chimandara	<i>Eragrostis unioides</i>	<i>Gramineae</i>	LC
26.	Kal-lavi	<i>Gloriosa superba</i>	<i>Lilliaceae</i>	LC
27.	Jalmukhi	<i>Rotala densiflora</i>	<i>Lythraceae</i>	LC
28.	Rankel/Kawder	<i>Ensete superbum</i>	<i>Musaceae</i>	-
29.	Gatrack	<i>Boerhavia diffusa</i>	<i>Nyctaginaceae</i>	-
30.	Chichur-kanda	<i>Habenaria grandifloriformis</i>	<i>Orchidaceae</i>	NT

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SI. No.	Local Name	Botanical Name	Family	IUCN Status
31.	Haryakand	<i>Geodorum demiflorum</i>	<i>Orchidaceae</i>	-
32.	Ambushi	<i>Oxalis corniculata</i>	<i>Oxalidaceae</i>	-
33.	Pivla dhotra	<i>Argemona mexicana</i>	<i>Papaveraceae</i>	-
34.	Ranborat	<i>Echinochloa colona</i>	<i>Poaceae</i>	LC
35.	Burad/shedya	<i>Paspalidium flavidum</i>	<i>Poaceae</i>	LC
36.	Bohra/Kaligunj	<i>Cardiospermum halicacalum</i>	<i>Sapindaceae</i>	-
37.	Kangani	<i>Solanum nigrum</i>	<i>Solaraceae</i>	-
38.	Agya	<i>Girardinia diversifolia</i>	<i>Urticaceae</i>	-
39.	Anderphod	<i>Leea macrophylla</i>	<i>Vitaceae</i>	-
40.	Gokhru	<i>Tribulus terrestris</i>	<i>Zygophyllaceae</i>	LC
Climbers				
1.	Kawalvel/Nivali	<i>Tylophora dalzellii</i>	<i>Asclepiadaceae</i>	-
2.	Sathawari	<i>Asparagus racemosus</i>	<i>Asparagaceae</i>	-
3.	Mahulvel	<i>Bauhinia vahlii</i>	<i>Ceasalpiniaceae</i>	-
4.	Randhodka	<i>Luffa acutangular</i>	<i>Curcubitaceae</i>	-
5.	Amarvel	<i>Cuscuta reflexa</i>	<i>Cuscutaceae</i>	LC
6.	Kadukand	<i>Dioscorea bulbifera</i>	<i>Dioscoreaceae</i>	-
7.	Mukani/Ranudid	<i>Vigna radiata</i>	<i>Fabaceae</i>	-
8.	Palasvel	<i>Butea superba</i>	<i>Fabaceae</i>	-
9.	Ramdatan	<i>Smilax macrophylla</i>	<i>Liliaceae</i>	-
10.	Bandgul	<i>Dendrophthoe falcata</i>	<i>Loranthaceae</i>	-
11.	Bokadvel/Ghatmol	<i>Aspidoptrys cordata</i>	<i>Malipighiaceae</i>	-
12.	Butgandivel	<i>Clematis hedy sarifollia</i>	<i>Ranunculaceae</i>	-
13.	Aradhashish	<i>Ventilago denticulate</i>	<i>Rhamnaceae</i>	-
14.	Toran	<i>Zizyphus rugosa</i>	<i>Rhamnaceae</i>	-
Grasses				
1	Balgadhan	<i>Cyperus rotundus</i>	<i>Poaceae</i>	LC
2	Belakuda	<i>Eragrostis tenella</i>	<i>Poaceae</i>	-



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Sl. No.	Local Name	Botanical Name	Family	IUCN Status
3	Fulora	<i>Themeda quadrivalvis</i>	Poaceae	-
4	Gavati Chaha	<i>Cymbopogon citratus</i>	Poaceae	-
5	Goundwel	<i>Andropogon pumilus</i>	Poaceae	-
6	Haryali	<i>Cynodon dactylon</i>	Poaceae	LC
7	Kahandol	<i>Chrysopogon fulvus</i>	Poaceae	-
8	Kalikusali/Kusal	<i>Heteropogon contortus</i>	Poaceae	-
9	Kasti	<i>Bambusa arundinacia</i>	Poaceae	NE
10	Kathara	<i>Bothriochloa pertusa</i>	Poaceae	-
11	Kunda	<i>Ischaemum pilosum</i>	Poaceae	NT
12	Manvel	<i>Dendrocalamus strictus</i>	Poaceae	NE
13	Marvel	<i>Dichanthium annulatum</i>	Poaceae	-
14	Mesi	<i>Chloris barbata</i>	Poaceae	-
15	Paonya	<i>Sehima sulcatum</i>	Poaceae	NE
16	Rosha	<i>Cymbopogon martini</i>	Poaceae	-
17	Shedya	<i>Sehima nervosum</i>	Poaceae	NE
18	Thuda	<i>Ischaemum rugorum</i>	Poaceae	LC

2.9.4 RET Plant Species in Study Area

There are 3 Near Threatened (NT) and two Vulnerable (VU) species and only one endemic specie in study area. Based on IUCN Version 3.1, the conservation status of these species is given in Table 2.6.

Table 2.6: List of Near Threatened & Vulnerable species in Study Area

S.N.	Species	Conservation Status: IUCN, (Ver 3.1)
1	<i>Aegle marmelos</i>	NT
2	<i>Pterocarpus marsupium</i>	NT
3	<i>Habenaria grandifloriformis</i>	NT
4	<i>Acacia ferruginea</i>	VU
5	<i>Dalbergia latifolia</i>	VU

NT: Near Threatened; VU: Vulnerable

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2.9.5 Plant of Ethno botanical/medicinal Importance in Study Area

During the survey, ethno-botanical information on 36 plant species was documented (Table 2.7). It was found that these plant species are used for medicinal, timber, fuel wood, fodder, ornamental, agricultural tools, thatching, fencing, etc.

Table 2.7: List of ethno-botanically important plant species in Study Area

Sl. No.	Local Name	Botanical Name	Family	Part used	Status
1	Amba	<i>Mangifera indica</i>	Anacardiaceae	Bark, leaves, fruits, wood	EN
2	Semal	<i>Bombax ceiba</i>	Bombacaceae	Root, gum	VU
3	Salai	<i>Boswellia serrata</i>	Burseraceae	Bark, gum	VU
4	Bahawa	<i>Cassia fistula</i>	Caesalpiniaceae	All parts	EN
5	Chinch	<i>Tamarindus indica</i>	Caesalpiniaceae	Fruit, pulp	-
6	Ain (sadada)	<i>Terminalia alata</i>	Combretaceae	Heart wood	-
7	Arjun sadada	<i>Terminalia arjuna</i>	Combretaceae	Bark	VU
8	Beheda	<i>Terminalia bellirica</i>	Combretaceae	Bark. Fruits	VU
9	Hirda	<i>Terminalia chebula</i>	Combretaceae	Fruits	EN
10	Tendu	<i>Diospyros melanoxylon</i>	Ebenaceae	Leaves	-
11	Bija/Bibla	<i>Pterocarpus marsupium</i>	Fabaceae	Bark and leaves	-
12	Karanj	<i>Pongamia pinnata</i>	Fabaceae	Root, bark, leaves, flower	R
13	Shisham	<i>Dalbergia latifolia</i>	Fabaceae	Heart wood, Bark, leaf	-
14	Sissoo	<i>Dalbergia sissoo</i>	Fabaceae	Heart wood	-
15	Bakan-Nimb	<i>Melia azadirachta</i>	Meliaceae	Seed	-
16	Neem/Nimb	<i>Azadirachta indica</i>	Meliaceae	Bark and leaves	VU
17	Bate, Kalasiras	<i>Albizia lebbek</i>	Mimosaceae	Heart wood, bark	-
18	Kalasiras	<i>Albizia Lebbeck</i>	Mimosaceae	Heart wood, seeds	-
19	Khair	<i>Acacia catechu</i>	Mimosaceae	Bark, heart wood	VU
20	Phanas	<i>Artocarpus heterophyllus</i>	Moraceae	Fruit, leaves	-
21	Umbar	<i>Ficus racemosa</i>	Moraceae	Fruit, leaves, bark	-
22	Shevga	<i>Moringa oliefera</i>	Moringaceae	Leaves, bark, roots	-
23	Jambul, Jamun	<i>Syzygium cumini</i>	Myrtaceae	Bark, leaves, fruits	VU
24	Haldu/ Hed	<i>Haldina cordifolia</i>	Rubiaceae	Heart wood, Bark, leaf	-
25	Bel	<i>Aegle marmelos</i>	Rutaceae	Fruit, leaf, root, and bark	VU
26	Kusum	<i>Schleichera oleosa</i>	Sapindaceae	Bark, wood, seeds	-
27	Ritha	<i>Sapindus laurifolius</i>	Sapindaceae	Seeds	-
28	Sag/Sagwan	<i>Tectona grandis</i>	Verbenaceae	Whole plant	EN
29	Karvand	<i>Carissa congesta</i>	Apocynaceae	Root, fruit	-

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Sl. No.	Local Name	Botanical Name	Family	Part used	Status
30	Rui	<i>Calotropis gigantea</i>	Asclepiadaceae	Bark, root	-
31	Chandrajyoti	<i>Jatropha curcas</i>	Euphorbiaceae	Fruit, seeds	-
32	Bor	<i>Ziziphus mauritiana</i>	Rhamnaceae	Fruit, leaves, flower	VU
33	Khorpad	<i>Aloe vera</i>	Asphodelaceae	Leaves	-
34	Kachquri/Kawitch	<i>Mucuna pruriens</i>	Fabaceae	Seeds	-
35	Pivla dhotra	<i>Argemone mexicana</i>	Papaveraceae	Seed	-
36	Kangani	<i>Solanum nigrum</i>	Solaraceae	Fruit	-

2.10 FAUNA OF STUDY AREA

The forests, water bodies, mountains and hills present in the study area are having different habitats for different kind of wild fauna. Faunal elements studied comprise mammals, avifauna, herpetofauna and butterflies. Baseline data has been collected during EIA study of the project, and secondary literature. Secondary literature is primarily included in Forest Working Plan of the published literature and EIA report of other projects in the same area, viz., Wildlife Management Plan for Bhadra Iron Ore Mine of JSW Steel Ltd., prepared by ZSI, September, 2018.

2.10.1 Mammals

Sixteen species of mammals were found/reported from secondary sources as well as from the primary survey and consultations (Table 2.8). Out of reported species, nine species are Schedule-I species, three species and four species belong to Schedule -II and IV respectively. As per IUCN criteria (2010), study area harbors three vulnerable species and one species is categorized under threatened category.

Table 2.8: Mammalian Species Recorded/Reported in Study Area

S.N.	Common Name	Scientific Name	Family	WPA	CS (IUCN)
1	Panther	<i>Panthera pardus</i>	Felidae	I	VU
2	Striped Hyaena	<i>Hyaena hyaena</i>	Hyaeninae	I	NT
3	Jackal	<i>Canis aureus</i>	Canidae	I	LC
4	Khokad	<i>Vulpes bengalensis</i>	Canidae	I	LC
5	Jungle cat	<i>Felis chaus</i>	Felidae	I	LC
6	Wolf	<i>Canis lupus</i>	Canidae	I	LC
7	Mongoose	<i>Herpestes edwardsi</i>	Herpestidae	IV	LC
8	Common Langur	<i>Semnopithecus entellus</i>	Cercopithecidae	II	LC
9	Chowsingha	<i>Tetracerus quadricornis</i>	Bovidae	I	VU
10	Barking deer	<i>Muntiacus muntjak</i>	Cervidae	I	LC
11	Sasa	<i>Lepus nigricollis</i>	Laporidae	II	LC
12	Salu	<i>Hystrix indica</i>	Hystricidae	I	LC

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S. N.	Common Name	Scientific Name	Family	WPA	CS (IUCN)
13	Khar	<i>Funambulus palmarum</i>	Sciuridae	IV	LC
14	Sambar	<i>Cervus unicolor</i>	Cervidae	IV	VU
15	Monkey	<i>Macaca mulatta</i>	Cercopithecidae	IV	LC
16	Wild Boar	<i>Sus scrofa</i>	Suidae	II	LC

CS (IUCN)-Conservation Status (IUCN), LC-Least Concerned, VU-Vulnerable, NT-Near Threatened, WPA (S)-Schedule as amended in 2022.

2.10.2 Avifauna

An on-spot identification of birds has been carried out with the help of pictorial guides/literature published by Grimmett *et al.* (2011). The study area of the proposed HEP is poor in avifaunal richness. A total of 49 species belonging to 25 orders were recorded during this survey (Table 2.9). Among bird species, ten species viz., White backed Vulture, Slender billed vulture, Sparrow hawk, Brahminy kite, Booted eagle, Crested serpent eagle, Grey junglefowl, Indian peafowl, Barn owl and Brown wood owl belong to Schedule-I. Rest of the species belong to either Schedule-II or IV. As per the IUCN Red list, two species of Vultures are categorized as "Critically Endangered" and all other species are listed as "Least Concern"

Table 2.9: Avifauna Recorded /Reported in Study Area

S. No.	Scientific Name	Common Name	Order	CS IUCN	WPA Status	Status
1	<i>Gyps bengalensis</i>	White backed Vulture	Accipitridae	CR	I	R
2	<i>Gyps tenuirostris</i>	Slender billed vulture	Accipitridae	CR	I	R
3	<i>Accipiter nisus</i>	Sparrow hawk	Accipitridae	LC	I	R
4	<i>Milvus migrans</i>	Pariah Kite	Accipitridae	LC	II	R
5	<i>Haliastur indus</i>	Brahminy kite	Accipitridae	LC	I	R
6	<i>Hieraaetus pennatus</i>	Booted eagle	Accipitridae	LC	I	R
7	<i>Aquila pomarina</i>	Lesser spotted eagle	Accipitridae	LC	IV	R
8	<i>Spilornis cheela</i>	Crested serpent eagle	Accipitridae	LC	I	R
9	<i>Alcedo atthis</i>	Common kingfisher	Alcedinidae	LC	II	R
10	<i>Dendrocygna javanica</i>	Lesser whistling duck	Anatidae	LC	II	R
11	<i>Anus acuta</i>	Pintail	Anatidae	LC	II	R
12	<i>Tachymarptis melba</i>	Alpine swift	Apodidae	LC	II	R
13	<i>Ardea cinerea</i>	Grey heron	Ardeidae	LC	II	R
14	<i>Ardeola grayii</i>	Indian pond heron	Ardeidae	LC	II	R
15	<i>Bubulcus ibis</i>	Cattle egret	Ardeidae	LC	II	R
16	<i>Ardea alba</i>	Great egret	Ardeidae	LC	II	R
17	<i>Egretta garzetta</i>	Little egret	Ardeidae	LC	II	R



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S. No.	Scientific Name	Common Name	Order	CS IUCN	WPA Status	Status
18	<i>Caprimulgus mathrnttensis</i>	Sykes nightjar	Caprimulgidae	LC	IV	R
19	<i>Vanellus malabaricus</i>	Yellow wattled lapwing	Charadriidae	LC	IV	R
20	<i>Cionia episcopus</i>	White naked stork	Ciconiidae	VU	IV	R
21	<i>Streptopelia chinensis</i>	Spotted dove	Columbidae	LC	II	R
22	<i>Columba livia</i>	Brown rock pigeon	Columbidae	LC	IV	R
23	<i>Streptopelia trangcubarica</i>	Red collared dove	Columbidae	LC	II	R
24	<i>Coracias benghalensis</i>	Indian roller	Coraciidae	LC	II	R
25	<i>Centropus sinensis</i>	Crow pheasant	Cuculidae	LC	II	R
26	<i>Eudynamys scolopaceus</i>	Asian Koel	Cuculidae	LC	II	R
27	<i>Dicrurus macrocercus</i>	Black Drongo	Dicruridae	LC	II	R
28	<i>Lanius schach</i>	Rufous-backed shrike	Laniidae	LC	II	R
29	<i>Sterna aurantia</i>	River tern	Lariidae	LC	I	R
30	<i>Argya striata</i>	Jungle Babbler	Leiotherichidae	LC	II	R
31	<i>Merops orientalis</i>	Green bee eater	Meropidae	LC	II	R
32	<i>Phalacrocorax carbo</i>	Great cormorant	Phalacrocoracidae	LC	II	R
33	<i>Francolinus pictus</i>	Painted partridge	Phasianidae	LC	II	R
34	<i>Francolinus pondicerianus</i>	Grey francolin	Phasianidae	LC	II	R
35	<i>Perdica asiatica</i>	Jungle bush quail	Phasianidae	LC	II	R
36	<i>Gallus sonneratii</i>	Grey junglefowl	Phasianidae	LC	I	R
37	<i>Pavo cristatus</i>	Indian peafowl	Phasianidae	LC	I	R
38	<i>Dinopium benghalense</i>	Blackrumped Woodpecker	Picidae	LC	II	R
39	<i>Ploceus philippinus</i>	Baya weaver bird	Ploceidae	LC	II	R
40	<i>Psittacula krameri</i>	Rose ringed parakeet	Psittacidae	LC	II	R
41	<i>Pycnonotus jocosus</i>	Red whiskered bulbul	Pycnonotidae	LC	II	R
42	<i>Pycnonotus cafer</i>	Red vented bulbul	Pycnonotidae	LC	II	R
43	<i>Amaurornis phoenicurus</i>	Waterhen	Rallidae	LC	II	R
44	<i>Himantopus himantopus</i>	Black winged stilt	Recurvirostridae	LC	II	WM
45	<i>Tyto alba</i>	Barn owl	Strigidae	LC	I	R
46	<i>Strix leptogrammica</i>	Brown wood owl	Strigidae	LC	I	R

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S. No.	Scientific Name	Common Name	Order	CS IUCN	WPA Status	Status
47	<i>Athene brama</i>	Spotted owletta	Strigidae	LC	II	R
48	<i>Acridotheres tristis</i>	Common myna	Sturnidae	LC	II	R
49	<i>Pseudibis papilosa</i>	Black ibis	Threskiornithida e	LC	IV	R

CS (IUCN)-Conservation Status (IUCN), LC-Least Concerned, LR-Low Risk, NL-Not Listed, VU-Vulnerable, NT-Near Threatened, WPA (S)-Schedule as amended in 2022.

2.10.3 Herpetofauna

The amphibian and reptiles were sampled with the same transect marked for mammals/birds. The sampling was also carried out along the banks of river & submergence area and downstream of proposed dam. There were 2 species of frogs, 4 species of snakes and 4 species of lizards recorded/confirmed in the study area of which three (Indian cobra, Russell’s Viper and Rat snake) belong to Schedule-I of WPA,1972 further amended in Dec., 2022 (Table 2.10).

Table 2.10: Herpetofauna Recorded /Reported in Study Area

S.N.	Common Name	Scientific Name	Vernacular Name	Family	Schedule	IUCN
1	Frog	<i>Rana tigrina</i>	-	Ranidae	IV	LC
2	Indian bull frog	<i>Hoplobatrachus tigerinus</i>	-	Dicroglossidae	II	LC
3	Indian cobra	<i>Naja naja</i>	Nag	Elapidae	I	LC
4	Indian Krait	<i>Bungarus caeruleus</i>	-	Elapidae	II	LC
5	Russell’s Viper	<i>Vipera russellis</i>	-	Crotalidae	I	LC
6	Rat snake	<i>Ptyas mucosus</i>	Dhaman	Colubridae	I	LC
7	Forest Lizard	<i>Calotes versicolor</i>	-	Agamidae	IV	LC
8	House gecko	<i>Hemidactylis brukaii</i>	-	Gekkonidae	II	LC
9	Monitor lizard	<i>Varanus monitor</i>	Ghorpad	Varanidae	II	LC
10	Chamaeleon	<i>Chaemeleon vulgatis</i>	-	Chamaeleonidae	IV	LC

LC= Least Concerned

2.10.4 Butterflies

Eight species of butterfly belonging to 4 families were reported from the study area (Table 2.11).

Table 2.11: Butterfly Recorded /Reported in Study Area

S. N.	Insect Group	Species	Family	IUCN Status	WPA Status
1	Butterfly (Lepidoptera)	<i>Castalius rosimon</i>	Lycaenidae	NE	-
2		<i>Pareronia hippie</i>	Pieridae	NE	-
3		<i>Neptis hylas</i>	Nymphalidae	NE	-

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S. N.	Insect Group	Species	Family	IUCN Status	WPA Status
4		<i>Sarangasa dasahara</i>	Hesperiidae	NE	-
5		<i>Junonia aflites</i>	Nymphalidae	NE	-
6		<i>Talicauda nyseus</i>	Lycaenidae	NE	-
7		<i>Euthalia aconthea</i>	Nymphalidae	NE	II
8		<i>Junonia lemonias</i>	Nymphalidae	NE	-

2.11 DESCRIPTION OF SCHEDULE-I FAUNAL SPECIES

The details regarding description, distribution, behavior, habitat, food habits, reproduction, life span, threats and conservation status of Schedule -I faunal species found in study area are given in following sub sections:

2.11.1 Panther

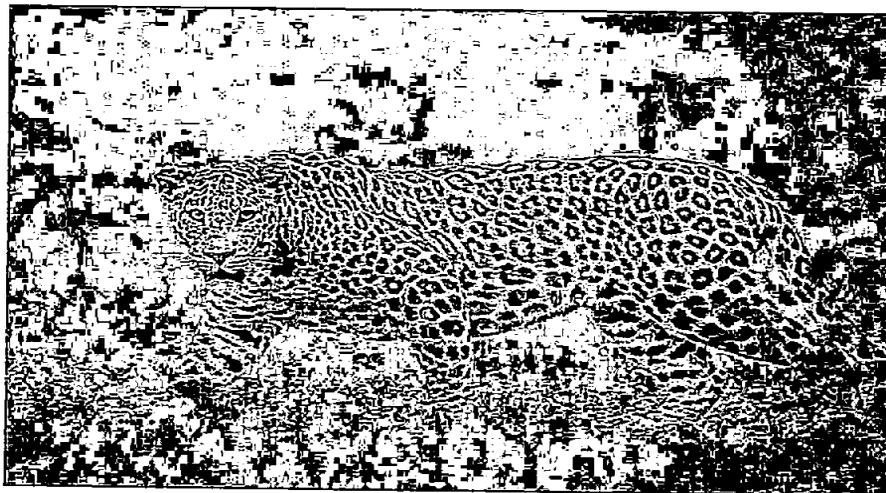


Figure 2.6 : Photograph of Panther

Kingdom: Animalia, Phylum: Chordata, Class: Mammalia, Order: Carnivora, Family: Felidae

Genus: Panthera, Binomial Name: *Panthera pardus fusca*

Description: The body size and color patterns of leopards varies geographically and probably reflects adaptations to particular habitats. The Indian Panther has strong legs and a long, well-formed tail, broad muzzle, short ears, small, yellowish-grey eyes, and light-grey ocular bulbs. Male Indian leopards grows in between 127 cm to 142 cm in body size and weigh between 50 and 77 kg. Females are smaller, growing to between 104 cm to 117 cm (3 ft 10 in) in body size and weigh between 29 and 34 kg.



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Distribution: In India, the leopard is found in all forest types, from tropical rainforests to temperate deciduous and alpine coniferous forests. It is also found in dry scrubs and grasslands, the only exception being desert and the mangroves of Sundarbans.

Behaviour: They are solitary, nocturnal carnivores. Although they sometimes hunt during overcast days, they are less diurnal in areas close to humans in comparison to uninhabited areas. They mark their territory with urine, feces, and claw marks and communicate with conspecifics by growling, roaring, and spitting when aggravated and purring when content. They can run at bursts of up to 60 km/hour, jump more than 6 m horizontally and 3 m vertically. Range of their territory varies from 13 to 35 sq km.

Habitat: They inhabit a variety of terrain. They are most populous in mesic woodlands, grassland savannas, and forests. They also occupy mountainous, scrub, and desert habitats. They favor trees throughout their entire geographic distribution and have been recorded at 5638 meters on Mt. Kilimanjaro. ("African Wildlife Foundation", 2009).

Food Habits: Their foods are primarily ungulates (Harihar et al. 2011; Mondal et al. 2011; Selvan et al. 2013), Sambar; Chital; Wild pig (*Sus scrofa*); cattle; Barking deer; Gaur (*Bos garus*); porcupine; Rodents; Birds; Civet (Harihar et al).

Reproduction: These are promiscuous, as both males and females have multiple mates. Females initiate mating by walking back and forth in front of a male and brushing up against him or swatting him with her tail. A single breeding pair may copulate up to 100 times per day for several days, The reproductive season is year-round but peaks during the rainy season in May. Gestation last 96 days and females usually give birth once every 15 to 24 months. Typically, females stop reproducing around 8.5 years old. (Friedman and Case, 2002; Macaskill, 2009)

Life Span: They can live to be 21 to 23 years while in captivity. Wild leopards may live to be 10 to 12 years. Survival rates for cubs range from 41% to 50%. (Guggisberg, 1975; Hunter and Hinde, 2005)

Threats: Hunting of Indian leopards for the illegal wildlife trade is the biggest threat to their survival. They are also threatened by loss of habitat and fragmentation of formerly connected populations, and various levels of human-leopard conflict in human-dominated landscapes

Conservation Status: The leopards are listed as "Vulnerable" on the IUCN Red List of Threatened Species. As far as the Indian Wildlife Protection Act, 1972 further amended in Dec., 2022 is concerned; the species is placed in **Schedule-I**

2.11.2 Wolf

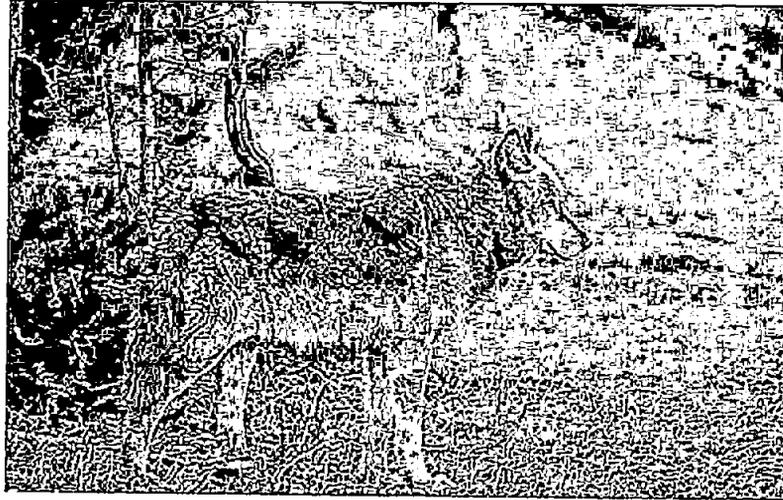


Figure 2.7 : Photograph of Wolf

Kingdom: Animalia, **Phylum:** Chordata, **Class:** Mammalia, **Order:** Carnivora, **Family:** Canidae

Genus: Canis, **Binomial Name:** *Canis lupus*

Description: A large canid, the Grey Wolf superficially looks like a slim Alsatian (Iljin, N.A, 1941) with a big head, long limbs, large feet, a slightly curved tail and shorter ears. It has a long muzzle. Its pelage varies greatly with tones of red and grey fur intermingled with black, especially on the dorsal crest, forehead and tip of the tail. The undersides are buff or creamish in colour. Adult males generally weigh 80kg to 145kg, and adult females 55kg to 95kg.

Behaviour: Wolves are highly social, pack-living animals. Each pack comprises two to thirty-six individuals, depending upon habitat and abundance of prey. Most packs are made up of 5 to 9 individuals. Packs are typically composed of an alpha pair and their offspring, including young of previous years. Unrelated immigrants may also become members of packs.

Distribution: It is distributed from the eastern parts of the Kashmir Valley to the Changthang in Ladakh. Jammu & Kashmir; a small population is known from Spiti in Himachal Pradesh. It is distributed in a patchy fashion through peninsular India in appropriate habitat. It is mainly found in the states of Haryana, Uttar Pradesh, Rajasthan, Gujarat, Madhya Pradesh, Maharashtra, Karnataka, Andhra Pradesh and West Bengal.

Habitat: It inhabits cold deserts of the trans-Himalayas while it frequents dry open country, scrubland and semi-arid grasslands in the Peninsula (Jhala and Giles, 1991). It has a wide tolerance level of habitat with different precipitation as is evidenced by its presence in habitats with 300 mm precipitation in the Rann and in parts of Rajasthan, to those with 1,500 mm precipitation in Odisha. (Shahi, 1982)

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Food Habits: Their diet is dominated by wild medium-sized hooved mammals and domestic species.

Reproduction: Wolves are monogamous, mated pairs usually remaining together for life. Should one of the pair dies, another mate is found quickly [Heptner and Naumov, 1998]. Wolves become mature at the age of two years and sexually mature from the age of three years. Females can produce pups every year, one litter annually being the average. The gestation period lasts 62–75 days with pups usually being born in the spring months or early summer in very cold places such as on the tundra. Young females give birth to four to five young.

Life Span: They can live up to 13 years in the wild.

Threats: Continued threats include competition with humans for livestock, especially in developing countries, exaggerated concern by the public concerning the threat and danger of wolves, and fragmentation of habitat, with resulting areas becoming too small for populations with long-term viability.

Conservation Status: The Wolf is listed as Least Concerned species in the Red List of International Union for Conservation of Nature (IUCN) and Appendix-I and II in CITES. As far as the Indian Wildlife Protection Act, 1972 further amended in Dec., 2022 is concerned; the species is placed in Schedule-I.

2.11.3 Striped Hyaena



Figure 2.8 : Photograph of Striped Hyaena

Kingdom: Animalia, Phylum: Chordata, Class: Mammalia, Order: Carnivora, Family Hyaenidae:

Genus: Canis, Binomial Name: *Hyaena hyaena linnaeus*



WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

Description: The striped hyena has a massive, but short torso set on long legs. The hind legs are significantly shorter than the forelimbs, thus causing the back to slope downwards. The legs are relatively thin and weak, with the forelegs being bent at the carpal region. The neck is thick, long and largely immobile, while the head is heavy and massive with a shortened facial region. The eyes are small, while the sharply pointed ears are very large, broad and set high on the head. Like all hyenas, the striped hyena has bulky pads on its paws, which are blunt but powerful.

Behavior: Striped hyenas typically live alone or in pairs and occur at relatively low population densities throughout their distribution range. The Striped hyena is a primarily nocturnal animal, which typically only leaves its den at the onset of total darkness, returning before sunrise.

Distribution: The distribution area of the striped hyenas around the globe extends from tropical and sub-tropical regions of Africa to middle and south Asia (Hofer & Mills, 1998; Leakey et al., 1999; Qarqaz et al., 2004; Wagner, 2006).

Habit: These prefer riverbed than that of mixed forest, Acacia Forest, Shorea forest and grassland. This animal mostly prefers open areas or lands covered with short shrubs in their natural distribution areas (Akay et al., 2011). In the Indian subcontinent, they occur in arid and semi-arid ecosystems, as well as in the extremely wet regions of southwestern coast (Prater, 1971; Karanth, 1986).

Food Habits: They seek their food by scent and usually feed on prey killed by other animals. Some hyena species are considered as proficient hunters (Prater 1971, Kruuk 1976).

Reproduction: The striped hyena is monogamous, with the male establishing the den with the female, helping her raise and feed when cubs are born. The mating season varies according to location. In captivity, breeding is non-seasonal. Mating can occur at any time of the day, during which the male grips the skin of the female's neck.

Threats: Striped hyena is under threats due to habitat degradation, poaching, loss of prey species and livestock grazing. The high dependency of the local people on the natural forests especially government managed forests is also a major problem to the survival of the striped hyena and its prey species

Conservation Status: Protected under Schedule I of the Indian Wildlife Protection Act, 1972 as amended in December 2022, the striped hyena has been classified on the IUCN Red List as "Near Threatened".

2.11.4 Jackal



Figure 2.9 : Photograph of Jackal

Kingdom: Animalia, **Phylum:** Chordata, **Class:** Mammalia, **Order:** Carnivora, **Family:** Canidae:

Genus: Canis, **Binomial Name:** *Canis aureus*

Description: The Golden Jackal resembles Gray Wolf, but is smaller in size, weight and has more elongated torso, less-prominent forehead, shorter legs and tail, and a muzzle that is narrower and more pointed. Males measure 71–85 cm in body length and females measures 69–73 cm. Males weigh 6–14 kg and females weigh 7–11 kg. The shoulder height is 45–50 cm for both.

Behaviour: The basic social unit of the Golden Jackal is a mated pair and it is young. Golden jackal pairs forage and rest together. Their behaviour is highly synchronized. Cooperative hunting is important to the Jackals. Members of the same family also cooperate in sharing larger food items and transport food in their stomachs for later regurgitation to pups or to a lactating mother.

Distribution: Jackal (*Canis aureus*) are found in semi-arid zone, tropical dry and moist deciduous forests of the country and their diet ranges from wild ungulates to domestic livestock and rodents.

Habitat: The Golden Jackal is the most northerly of jackal species, and the most widely distributed. Golden jackals prefer dry open country, arid short grasslands and steppe landscapes.

Food Habits: Golden jackals consume 54% animal food and 46% plant food. They are opportunistic foragers with a very varied diet, which consists of young gazelles, rodents, (especially during winter), hares, ground birds and their eggs, reptiles, frogs, fish, insects and fruit. They take carrion on occasion.

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

Reproduction: Golden jackals live in mated pairs and are strictly monogamous. They have been observed to produce pups for at least eight years. The gestation period is 63 days. Young Jackals are born in a den within the parents' marked territory.

Life Span: Golden jackals live eight to nine years in the wild and up to sixteen years in captivity.

Threats: They are sometimes hunted for their fur.

Conservation Status: Protected under Schedule-I of the Indian Wildlife Protection Act, 1972 as amended in December 2022, the striped hyena has been classified on the IUCN Red List as "Least Concerned".

2.11.5 Indian Fox

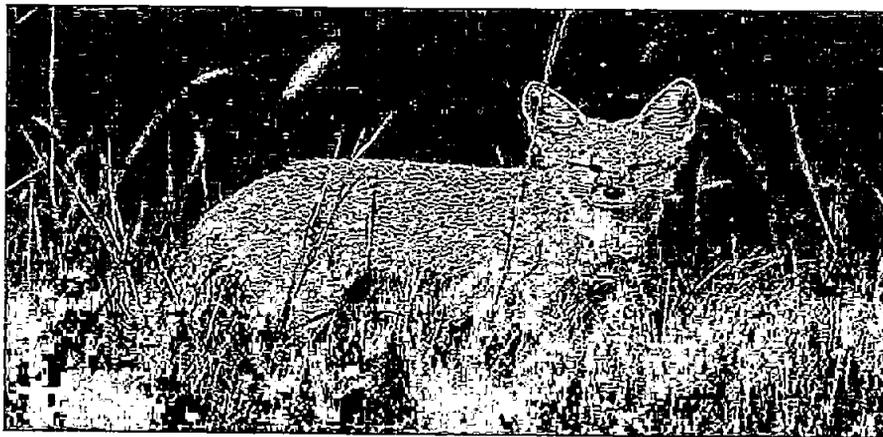


Figure 2.10 : Photograph of Indian Fox

Kingdom: Animalia, **Phylum:** Chordata, **Class:** Mammalia, **Order:** Carnivora, **Family:** Canidae:

Genus: Vupes, **Binomial Name:** *V. bengalensis*

Description: Indian fox is a relatively small fox with an elongated muzzle, long, pointed ears, and a long, bushy tail. The pelage ranges in color from buff to silver-grey with an overall grizzled effect; the dorsal pelage is mostly greyish and paler ventrally. The legs tend to be brownish or rufous, and the underparts light, a pale sand or ginger shade.

Behaviour: Bengal foxes are predominantly crepuscular and nocturnal. The basic social unit of the Bengal Fox is the breeding pair, formed by a pair of bonds that can last for many years. Bengal foxes are not especially suspicious of humans, but, can be found near human habitation.

Distribution: It is endemic to the Indian subcontinent, ranging from the Himalayan foothills and Terai of Nepal through the South portion of the Indian Peninsula (but the western and east Ghats are not included).

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

Habitat: In the Indian peninsula, the species is confined to plains and open scrub forests. It was considered to be a habitat generalist, but it shows a strong preference for semiarid, short grassland habitats at multiple scales.

Food Habits: Bengal foxes are omnivorous and opportunistic feeders, feeding primarily on insects, small mammals, reptiles, small birds, and fruits.

Reproduction: Bengal foxes are thought to form long-term monogamous pairs. During the breeding season, males vocalize intensely during the night and at dusk and dawn. The mating season occurs in December to January and after a gestation period of 50–53 days, two to four pups are born.

Threats: Lack of habitat protection is perhaps the greatest threat to the Bengal fox.

Conservation Status: Protected under Schedule-I of the Indian Wildlife Protection Act, 1972 as amended in December 2022, the Indian fox has been classified on the IUCN Red List as “Least Concerned”.

2.11.6 Indian Jungle Cat



Figure 2.11 : Photograph of Indian Jungle Cat

Kingdom: Animalia, **Phylum:** Chordata, **Class:** Mammalia, **Order:** Carnivora, **Family:** Felidae:

Genus: Felis, **Binomial Name:** *Felis chaus*

Description: Jungle cats are medium-sized wild cats. They have a coat colour that varies from sandy, greyish brown to tawny red with a slender body with underparts of cream and pale fur.

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

Conservation Status: Jungle fowl is listed as “Least Concerned” as per IUCN version 3.1. As far as the Indian Wildlife Protection Act, 1972 further amended in Dec., 2022 is concerned; the species is placed in Schedule-I.

Threats: They are hunted for meat and for the long neck hackle feathers that are sought after for making fishing lures.

2.11.12 *Gyps bengalensis*

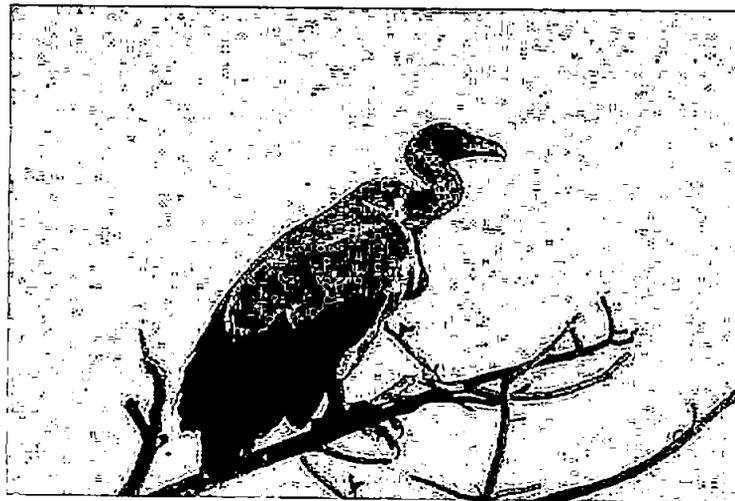


Figure 2.17 : Photograph of *Gyps bengalensis*

Kingdom: Animalia, **Phylum:** Chordata, **Class:** Aves, **Order:** Accipitriformes, **Family:** Accipitridae

Genus: Gyps, **Binomial Name:** *Gyps bengalensis*

Description: Immature *G. bengalensis* are dark brown and their lower back and rump area are brown rather than white. The underwing coverts are dark brown. Eyes are dark brown, and the legs are blackish but lighter than the adult. Generally, adults tend towards black coloration, while younger individuals are browner.

Behavior and Reproduction: These are social animals, living in flocks year-round, often with other vulture species. Up to 15 large nests may be observed in a single roost tree. At night, vultures roost in trees. Typical flight speeds are between 50 and 55 miles /hour but can reach speeds up to 90 miles/hour. The breeding season of *G. bengalensis* is from October to March.

Distribution and Habitat: These are very common on the Indian subcontinent. *Gyps bengalensis* is generally found in open areas and fields enclosing scattered trees.

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

Food Habits: Feed almost exclusively on the remains of dead animals, regardless of whether it is fresh or putrid. Many populations of *G. bengalensis* forage through dumpsters for food.

Conservation Status: The species is listed as "Critically Endangered" species as per IUCN version 3.1. As far as the Indian WPA, 1972 amended further in Dec., 2022, is concerned; the species is placed in Schedule-I.

Threats: Disease, pesticides, environmental contamination, poisoning, reduced food availability, calcium deficiency, reduced nesting habitat, nest predators, are the most common.

2.11.13 Slender billed vulture



Figure 2.18 : Photograph of Slender billed vulture

Kingdom: Animalia, **Phylum:** Chordata, **Class:** Aves, **Order:** Accipitriformes, **Family:** Accipitridae

Genus: *Gyps*, **Binomial Name:** *Gyps tenuirostris*

Description: Immature. This mid-sized vulture (80 to 95 cm in length) is mostly grey with a pale rump and grey undertail coverts. The thighs have whitish down. The neck is long, bare, skinny and black.

Behavior and Reproduction: Spends most of the time soaring on spread wings, using the thermal currents along the cliffs that help the bird to rise into the air. It rarely flaps the wings, except at take-off. The breeding season occurs between October and March. The female lays a single white egg with some pale reddish flecks and blotches. The incubation lasts about 50 days, shared by both parents. The chick is regularly fed by the adults at nest, and for some weeks more after fledging.

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

Distribution and Habitat: The Slender-billed Vulture is found throughout much of Asia, including India, Nepal, Bangladesh, Cambodia, Laos, and Burma. These use savannas, arid open country mixed with some wooded patches, generally in lower elevations, to forage, feed, roost and nest.

Food Habits: These are scavengers, feeding mostly from carcasses of dead animals. They also scavenge at rubbish dumps and slaughterhouses

Conservation Status: The species is listed as "Critically Endangered" species in the Red List of International Union for Conservation of Nature (IUCN) version 3.1. As far as the Indian Wildlife Protection Act, 1972 further amended in Dec., 2022 is concerned; the species is placed in Schedule-I.

Threats: The main threat is due to consumption of meat and tissue of dead livestock which contains this drug Diclofenac administered to the animal.

2.11.14 Sparrow hawk

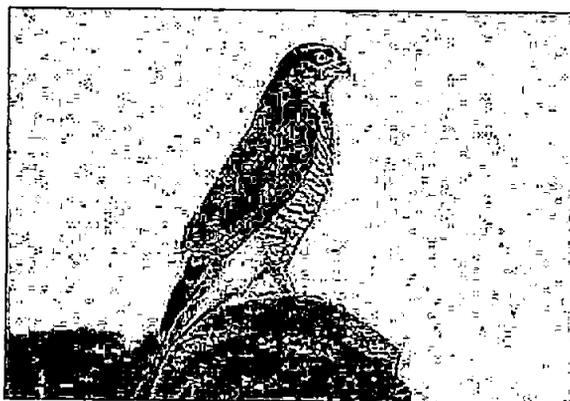


Figure 2.19 : Photograph of Sparrow hawk

Kingdom: Animalia, **Phylum:** Chordata, **Class:** Aves, **Order:** Accipitriformes, **Family:** Accipitridae

Genus: Accipiter, **Binomial Name:** *Accipiter nisus*

Description: Adult male sparrow hawks have bluish-grey back & wings and orangey-brown bars on their chest and belly. Females and young birds have brown back and wings, and brown bars underneath. Sparrow hawks have bright yellow or orangey eyes, long, yellow legs and long talons. Females are larger than males, as with all birds of prey.

Behavior and Reproduction: These are excellent bird hunters, catching small species like finches, sparrows and tits; sometimes they ambush their prey from a perch, while other times they may fly low, suddenly changing direction to fool it.

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

Distribution and Habitat: Sparrow hawks breed in woodland but also visit gardens and more open country. They can be seen in towns and cities, as well as rural areas.

Food Habits: Feed on small birds, insects and rodents. Males can catch birds up to thrush size, but females, being bigger, can catch birds up to pigeon size. Some sparrowhawks catch bats.

Conservation Status: The species is listed as “Critically Endangered” species in the Red List of International Union for Conservation of Nature (IUCN) version 3.1. As far as the Indian Wildlife Protection Act, 1972 further amended in Dec., 2022 is concerned; the species is placed in Schedule-I.

Threats: The main threat is due to habitat loss and diclofenac in working farm animals.

2.11.15 Brahminy kite



Figure 2.20 : Photograph of Brahminy kite

Kingdom: Animalia, **Phylum:** Chordata, **Class:** Aves, **Order:** Accipitriformes, **Family:** Accipitridae

Genus: *Haliastur*, **Binomial Name:** *Haliastur indus*

Description: Brahminy kites are medium-sized birds of prey. Adults have a reddish-brown body plumage contrasting with their white head and breast which make them easy to distinguish from other birds of prey.

Behavior and Reproduction: These are excellent bird hunters, catching small species like finches, sparrows and tits; sometimes they ambush their prey from a perch, while other times they may fly low, suddenly changing direction to fool it. They might be monogamous and form long-lasting pair bonds. Their breeding season occurs from December to April. The female lays a clutch of 2 dull-white or bluish-white oval eggs.

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

Distribution and Habitat: Brahminy kites are found in the Indian subcontinent, Southeast Asia, and Australia. They are mainly seen in the plains but also in coastal regions, estuaries, wetlands, mangrove swamps, and even in urban areas. They are found mainly on the coast and in inland wetlands, where they feed on dead fish and other prey.

Food Habits: They are carnivores and scavengers. They are primarily scavengers and feed mainly on dead fish and crabs, especially in wetlands and marshland, but occasionally hunt live prey such as hares, bats, and flying insects.

Conservation Status: The species is listed as “Critically Endangered” species in the Red List of International Union for Conservation of Nature (IUCN) version 3.1. As far as the Indian Wildlife Protection Act, 1972 further amended in Dec., 2022 is concerned; the species is placed in Schedule-I.

Threats: The main threat is due to habitat loss and diclofenac in working farm animals

2.11.16 Booted Eagle



Figure 2.21 : Photograph of Booted Eagle

Kingdom: Animalia, **Phylum:** Chordata, **Class:** Aves, **Order:** Accipitriformes, **Family:** Accipitridae

Genus: *Hieraaetus*, **Binomial Name:** *Hieraaetus pennatus*

Description: The Booted eagle is a small eagle, comparable to the common buzzard in size though more eagle-like in shape. Males grow to about 510–770 gm in weight, with females about 840–1,025 gm with a length of 40 cm and a wingspan of 11–132 cm.

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

Behavior and Reproduction: This eagle lays 1–2 eggs in a nest built from sticks and lined with green leaves in a tree or on a crag, or it takes over the disused nest of another large bird such as a black kite or grey heron. The female incubates the egg for around 45 days.

Distribution and Habitat: It breeds in southern Europe, North Africa and across Asia, and also in western South Africa and Namibia. This is a species found often in hilly countryside with some open areas, it breeds in rocky, broken terrain but migrants will use almost any type of habitat other than dense forest.

Food Habits: Larger insects such as locusts form part of the diet, more commonly a variety of birds, reptiles and mammals are selected even up to the size of rabbits.

Conservation Status: The species is listed as “Least Concern” species in the Red List of International Union for Conservation of Nature (IUCN) version 3.1. As far as the Indian Wildlife Protection Act, 1972 further amended in Dec., 2022 is concerned; the species is placed in Schedule-I.

Threats: The main threat is due to habitat loss and diclofenac in working farm animals

2.11.17 Crested serpent eagle



Figure 2.22 : Photograph of Crested serpent eagle

Kingdom: Animalia, **Phylum:** Chordata, **Class:** Aves, **Order:** Falconiformes, **Family:** Accipitridae

Genus: *Spilornis*, **Binomial Name:** *Spilornis cheela*

Description: These are medium-sized raptors with length varying from 55 to 76 cm and weigh from 420 to 1800 gm. Their wingspan ranges from 109 to 169 cm.

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

Behavior and Reproduction: Crested serpent eagles' mate in monogamous pairs and remain in pairs throughout the year. Courtship displays consist of pairs soaring and calling together. These courtship flights may include rolling and wing vibrating. (Del Hoyo, et al., 1994). In Southern India they lay eggs between December and March; in Northern India and Sri Lanka they lay between February and May. Their nests are usually found midway in tall trees close to a source of water such as a stream.

Distribution and Habitat: In India it is found from the lower Himalayas to the Andamans. They prefer the edges of forests where they can soar and effectively hunt. They can inhabit dry to wet forests, tea plantations, wooded savannas and mangroves.

Food Habits: They prey primarily on snakes, as their name implies, and they are not limited to the non-venomous species. They also eat many kinds of small mammals and birds.

Conservation Status: The species is listed as "Least Concern" species in the Red List of International Union for Conservation of Nature (IUCN) version 3.1. As far as the Indian Wildlife Protection Act, 1972 further amended in Dec., 2022 is concerned; the species is placed in Schedule-I.

Threats: The main threat is due to habitat loss and diclofenac in working farm animals

2.11.18 River tern

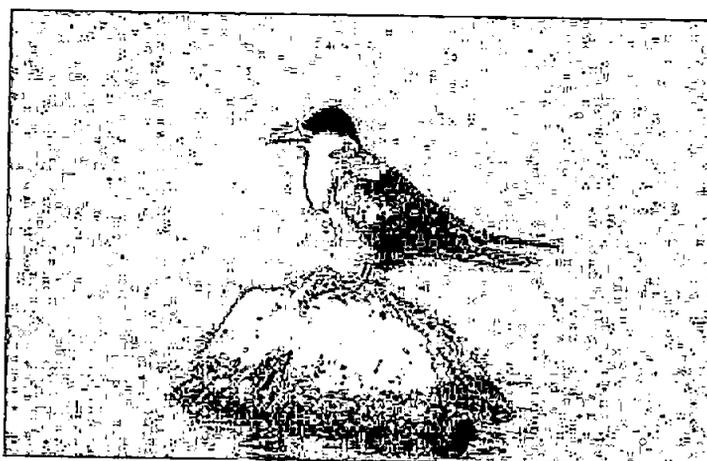


Figure 2.23 : Photograph of River tern

Kingdom: Animalia, Phylum: Chordata, Class: Aves, Order: Charadriiformes, Family: Laridae

Genus: Sterna, Binomial Name: *Sterna aurantia*

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

Description: The River tern is a slender bird, about the size of a pigeon, with grey upper parts, black cap on the head, yellow beak, long pointed wings, a deeply-forked tail and short, yellow stubby legs. Both the sexes look alike.

Behavior and Reproduction: It is a resident breeder in the region, found along most of the inland rivers, and breeds on sandy islands. It spends a great portion of its time fishing.

Distribution and Habitat: The River tern has a wide range across Southern Asia. In India, it is found throughout the country, inhabiting rivers and freshwater lakes, occasionally occurring on estuaries.

Food Habits: It predominantly feeds on fish, small crustaceans and insects. More likely to be sighted in flight than on the ground.

Conservation Status: The species is listed as "Vulnerable" species in the Red List of International Union for Conservation of Nature (IUCN) version 3.1. As far as the Indian Wildlife Protection Act, 1972 further amended in Dec., 2022 is concerned; the species is placed in Schedule-I.

Threats: The main threat is from predation and flooding of nesting areas. Anthropogenic disturbance due to mining of sand-beds is also a potent threat.

2.11.19 Barn Owl



Figure 2.24 : Photograph of Barn Owl

Kingdom: Animalia, Phylum: Chordata, Class: Aves, Order: Strigiformes, Family: Tytonidae

Genus: *Tyto*, Binomial Name: *Tyto alba*

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

Description: The barn owl is a medium-sized, pale-colored owl with long wings and a short, squarish tail. Its size varies from about 33 to 39 cm, with a wingspan of some 80 to 95 cm.

Behavior and Reproduction: It is nocturnal, relying on its acute sense of hearing when hunting in complete darkness. It often becomes active shortly before dusk but can sometimes be seen during the day when relocating from one roosting site to another.

Distribution and Habitat: The Barn Owls have a worldwide distribution and require large areas of open land either be marsh, grasslands, or mixed agricultural fields over which to hunt. For nesting and roosting, they prefer quiet cavities, either in trees or man-made structures.

Food Habits: It predominantly feeds on rats, mice, occasional frog, smaller bird species.

Conservation Status: The species is listed as "Least Concern" species in IUCN version 3.1. As far as the Indian Wildlife Protection Act, 1972 further amended in Dec., 2022 is concerned; the species is placed in Schedule-I.

Threats: The main threat is from reduction of food supply, with fewer areas of rough grassland available for hunting. By far, the biggest threat to Barn Owls living in proximity to humans is mouse and rat poison. Barn Owls eats almost exclusively rodents.

2.11.20 Brown wood owl



Figure 2.25 : Photograph of Brown wood owl

Kingdom: Animalia, Phylum: Chordata, Class: Aves, Order: Charadriiformes, Family: Laridae

Genus: *Sterna*, Binomial Name: *Sterna aurantia*

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

Description: The Asian brown wood owl is one of the larger owls, with an average length of between 45cm to 57cm. They are perfectly camouflaged to their forest surroundings, with the main body a light chestnut brown, and barred with dark brown and white with faint white patches on the shoulders, and buff and brown streaked under parts. River tern is a slender bird, about the size of a pigeon, with grey upper parts, black cap on the head, yellow beak, long pointed wings, a deeply forked tail and short, yellow stubby legs. Both the sexes look alike.

Behavior and Reproduction: It is a resident breeder in the region, found along most of the inland rivers, and breeds on sandy islands. It spends a great portion of its time fishing.

Distribution and Habitat: South Asia from India and Sri Lanka east to western Indonesia and south China, tropical and temperate forest.

Food Habits: It predominantly feeds on fish, small crustaceans and insects. More likely to be sighted in flight than on the ground.

Conservation Status: The species is listed as "Vulnerable" species in the Red List of International Union for Conservation of Nature (IUCN) version 3.1. As far as the Indian Wildlife Protection Act, 1972 further amended in Dec., 2022 is concerned; the species is placed in Schedule-I.

Threats: The main threat is from habitat loss and deforestation.

2.11.21 Russell's Viper

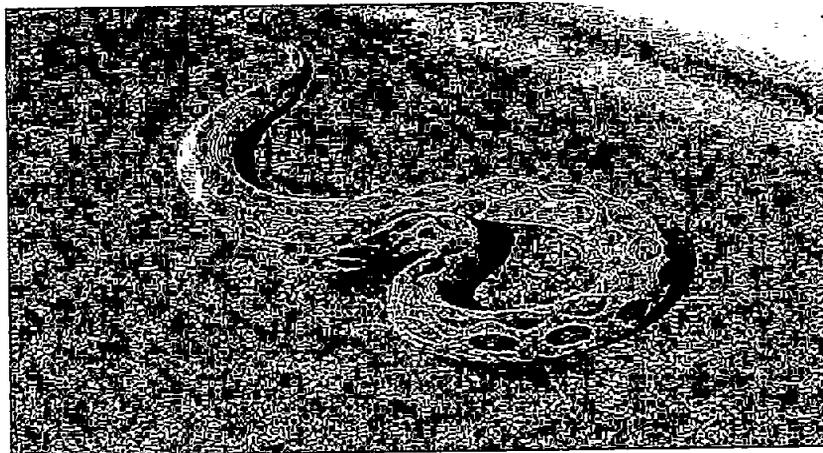


Figure 2.26 : Photograph of Russell's Viper

Kingdom: Animalia, Phylum: Chordata, Class: Reptilia, Order: Squamata, Family: Vepridae

Genus: Daboia, Binomial Name: *Vipera russellis*

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

General Description: The head is flattened, triangular, and distinct from the neck. The snout is blunt, rounded, and raised. The crown of the head is covered with irregular, strongly fragmented scales. The body is stout, the cross-section of which is rounded to circular. Russell's viper grows to a maximum body and tail length of 166 cm (65 in) and averages about 120 cm

Distribution and Habitat: Russell's viper is found in India, Sri Lanka, Bangladesh, Nepal, and Pakistan. In India, it is abundant in Punjab, very common along the West Coast and its hills, in southern India especially in the state of Karnataka and north to Bengal. It is uncommon to rare in the Ganges valley, Northern Bengal, and Assam. Russell's viper is not restricted to any particular habitat but does tend to avoid dense forests. The snake is mostly found in open, grassy or bushy areas, but may also be found in second growth forests (scrub jungles), on forested plantations

Behaviour: It is terrestrial and active primarily as a nocturnal forager. However, during cool weather, it alters its behavior and becomes more active during the day. These snakes are strong and may react violently to being picked up.

Feeding: These feed primarily on rodents, although especially it will also eat small reptiles, land crabs, scorpions, and other arthropods.

Reproduction: It is ovoviviparous. Mating generally occurs early in the year, although pregnant females may be found at any time. The gestation period is more than six months. It is a prolific breeder. Litters of 20–40 are common, although fewer offspring may occur, as few as one.

Conservation Status: Listed as "Least Concern" (IUCN 3.1) and included in Schedule-I (WPA, 1972), further amended in Dec., 2022.

2.11.22 *Ptyas mucosus*



Figure 2.27 : Photograph of Rat Snake

Kingdom: Animalia, Phylum: Chordata, Class: Reptilia, Order: Squamata, Family: Colubridae

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

Genus: *Ptyas*, **Binomial Name:** *Ptyas mucosus*

General Description: The Rat snake is a large snake found in parts of South and Southeast Asia. Their color varies from pale browns in dry regions to nearly black in moist forest areas. These are non-venomous and fast-moving snakes. They eat a variety of prey and are frequently found in urban areas where rodents thrive.

Distribution and Habitat: Oriental rat snakes are found in Afghanistan, Bangladesh, Burma (Myanmar), Cambodia, China (Zhejiang, Hubei, Jiangxi, Fujian, Guangdong, Hainan, Guangxi, Yunnan, Tibet, Hong Kong, Taiwan), India, Sri Lanka, Indonesia (Sumatra, Java, Bali), Iran, Laos, West Malaysia, Nepal, Myanmar, Pakistan (Sindh area), Thailand, Turkmenistan, Vietnam, Nepal. They inhabit forest floors, wetlands, rice paddies, farmland, and suburban areas.

Behaviour: Oriental rat snakes are solitary creatures. They are diurnal and semi-arboreal. Adult members emit a growling sound and inflate their necks when threatened.

Feeding: These prey upon small reptiles, amphibians, birds, and mammals.

Reproduction: It mates in late spring and early summer, though in tropical areas reproduction may take place year-round. Females produce 6–15 eggs per clutch several weeks after mating.

Threat: Rat snakes are hunted by humans in some areas of their range for skins and meat.

Conservation Status: Listed as "Not Evaluated" (IUCN 3.1) and included in Schedule-I (WPA, 1972, amended in December, 2022).

2.11.23 Indian Cobra

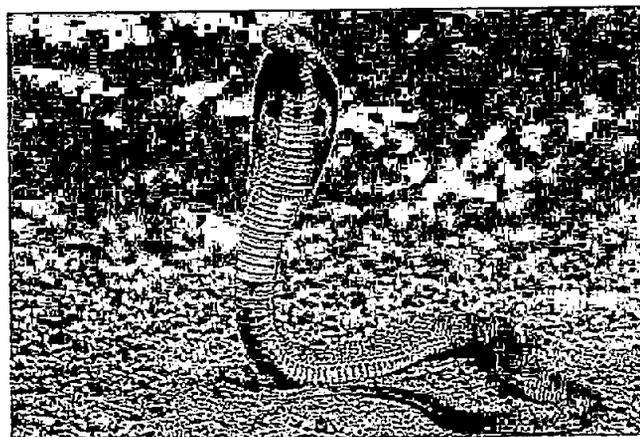


Figure 2.28 : Photograph of Indian Cobra

Kingdom: Animalia, **Phylum:** Chordata, **Class:** Reptilia, **Order:** Squamata, **Family:** Elapidae

Genus: *Naja*, **Binomial Name:** *Naja naja*



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Distribution: Indian cobras are found throughout the Indian subcontinent, including India, Pakistan, Bangladesh, Sri Lanka, Nepal, and Bhutan.

Habitat: They inhabit a variety of habitats, including forests, grasslands, agricultural areas, and human settlements.

Ecology and Behavior: Indian cobras are highly venomous snakes known for their iconic hood, which they display when threatened. They primarily feed on rodents, birds, frogs, and other small vertebrates. They are primarily nocturnal but can also be active during the day.

Breeding: Breeding occurs seasonally, with females laying clutches of eggs in hidden locations, such as under leaf litter or in termite mounds. Hatchlings emerge after an incubation period of around 50 to 60 days.

Conservation Status: Indian cobras are not separately assessed on the IUCN Red List, but they are generally considered to be of least concern due to their wide distribution and adaptability to various habitats.

Threats: While Indian cobras face some threats such as habitat loss and persecution by humans due to fear and misunderstanding, they are less impacted compared to other snake species due to their ability to thrive in a variety of habitats

2.12 WILDLIFE CORRIDORS

No elephant corridor, tiger reserve, wildlife migration corridor etc., is located within 1 Km. from boundary of the forest land proposed for diversion.

3 PROBABLE IMPACTS OF PROJECTS ON FLORA AND FAUNA

3.1 IMPACTS DURING PROJECT CONSTRUCTION

During the construction phase, various adverse impacts on the wildlife are anticipated in the surrounding areas of the proposed project in terms of increased noise levels, land vibrations during tunneling and blasting, release of air and water pollutants, etc. Mammals and birds are the most vulnerable group affected by these negative impacts, which affect their movement, behavior and breeding habits.

3.1.1 Disturbance Due to Blasting

Blasting shall have adverse impact on fauna using the area contiguous with the surrounding habitation area as habitat. Construction and operation activities generate noise and artificial light, which can disturb wildlife. Nocturnal animals may be particularly affected by light pollution, altering their behavior and disrupting natural processes. The noise generation has an adverse impact on terrestrial fauna and avi-fauna. Intervention in the project area will impact butterflies and birds which are quite sensitive to noise and human presence. The traffic noise has detrimental effect on the survival rates and breeding success of such fauna which reside in the small habitats along roadside communicating using acoustic signals. Sometime as a result of habitat loss and physical disturbance, the fauna shall move from the habitat along roadside. Based on the field observations and interaction with local people and forest officials, it was noted that the Project area does not constitute part of any wildlife migratory routes and construction activities won't affect animal movement.

All precautions shall be taken as envisaged under the relevant acts in respect of handling of explosive material and blasting which shall invariably be carried out by a qualified blaster.

3.1.2 Impact on Soil Materials, Vegetation and Human Health

Excavation results in land degradation and formation of loose soil particles which are mainly fugitive dust. The transportation of excavated/construction material on unpaved roads cause fugitive dust emission. These dust particles are usually blown away along the wind direction and get deposited on the canopy of surrounding vegetation and agricultural crops thereby interfering with photosynthesis and other physiological activities of the green cover. Finally, this may result in reduced ecological functions of the forest ecosystems as well as economic productivity of the agro-ecosystems. Since the fugitive dust particles neither move far away from point of emission nor ground level concentration (GLC) is high it has been found from dust dispersion modelling that PM10 and PM2.5 at the nearest habitation shall be merely $0.40 \mu\text{g}/\text{m}^3$, $0.05 \mu\text{g}/\text{m}^3$ respectively. Thus, there shall not be significant impact.

The gaseous pollutant Oxides of Nitrogen (NOx) react in the atmosphere to form Nitrogen Dioxide (NO₂) which can have adverse effects on health, particularly among people with respiratory illness. NOx are pollutants that cause lung irritation and weaken the body's defenses against respiratory infections such as pneumonia and influenza, it can cause shortness of breath and chest pains and increase a person's susceptibility to asthma. Air quality modelling shows that predicted concentration of NOx at the nearest habitation shall be merely $0.38 \mu\text{g}/\text{m}^3$. The air quality modelling for haul road has revealed that the increased GLC in respect of NOx were insignificant being $0.14 \mu\text{g}/\text{m}^3$ up to 25m and $0.12 \mu\text{g}/\text{m}^3$ up to 50m and $0.10 \mu\text{g}/\text{m}^3$ up to 1km.



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3.1.3 Increase in Biotic Pressure

Due to labour influx (3000 workers), pressure on land and water resource would occur. The disposal of sewage, solid waste would be required. If the labour force is not provided with proper fuel arrangements, the pressure on adjoining forest for fuel wood may take place. Besides, labour may engage in activities that are detrimental to natural habitat such as hunting, illegal extraction of timber for fuel wood and non-timber forest products.

To reduce the dependence on forest, the project proponent / contractors shall provide alternate fuel substituting fuelwood with LPG for cooking and domestic electricity connection for lighting.

3.1.4 Loss of Habitat

Habitat loss is construed to occur when an area supporting good genetic diversity and population growth rate is diverted for non-forestry purpose. This shall lead to loss of some of the plant species used for various purposes by man and animals. About 243.74 ha of forest land will be brought under submergence along with standing trees, which shall have to be clear felled. The area proposed for diversion is a habitat for mega animals with other species. The area proposed for diversion is substantial and any changes occurred would be recoverable with appropriate mitigation measures. For mitigating loss due to forest land, Compensatory Afforestation plan have been formulated, which shall be further implemented by the Forest Department.

3.1.5 Fragmentation of Habitat

Habitat fragmentation bisects the landscape and leaves smaller, more isolated land for wildlife, causing local and population level changes to native flora and fauna. The construction may lead to habitat fragmentation and destruction. The alteration of river flow, excavation, and infrastructure development can disrupt ecosystems, affecting plant and animal species that rely on specific habitats.

Out of 243.74 ha forest land proposed for diversion, about 139.52 ha of forest land will be used for creating upper and lower reservoir, which shall be brought under permanent submergence, and shall act as a physical barrier for wildlife. Animal movement in this patch of area will be totally blocked. The forest land 11.813 ha is required for underground works and 44.9 ha is needed for muck sites which shall not lead to any fragmentation of habitat. Forest land (37.83ha) required for roads infrastructure can fragment wildlife corridors, hindering animal movement between habitats. This can isolate populations, reduce genetic diversity, and impact long-term survival. Habitat fragmentation bisects the landscape and leaves smaller, more isolated land for wildlife, causing local and population level changes to native flora and fauna.

3.1.6 Species Displacement

Increased human presence and infrastructure development can lead to the displacement of native species. Animals may avoid areas near the project site, affecting their feeding, breeding, and migration patterns

3.1.7 Water Quality Impairment

During the construction phase, the local drainage is supposed to catch considerable amount of sediment from the underground works. Impairment in water quality can lead to changes in water temperature,

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sediment load, and chemical composition may harm aquatic organisms, including fish, amphibians, and invertebrates. For overcoming this, the water coming out from such area will be dislodged of sediment in the silt trapping tanks before being released to local drain.

3.1.8 Impact of Illumination of Work Site

For facilitating the construction works at night, adequate lighting facilities such as flood lights, halogen lamps provided by the contractor at the site of work, storage area of materials and equipment and temporary access roads within project area can disturb wildlife. Nocturnal animals may be particularly affected by light pollution, altering their behaviour and disrupting natural processes.

3.1.9 Increase in Greenhouse Gas (GHG) Emissions at Work Site

The construction activities related to Project shall generate GHG emissions from construction machinery and transport vehicle, which run on fossil fuels. The project's impact on local climate patterns, such as altered precipitation and temperature, could indirectly affect flora and fauna. Species adapted to specific conditions may face challenges due to climate shifts.

3.2 IMPACTS DURING PROJECT OPERATION

The following impacts are anticipated during operation of project.

- Improved habitat for mainly water birds due to creation of new reservoir.
- Improvement in food chain of birds and mammals due to creation of reservoir and increase in humidity level.
- The butterfly diversity in the area would be enhanced, as scrub habitat around the submergence will receive substantial amount of moisture, which will help in natural regeneration of forest canopy.
- Stray animals, however, may occasionally drift to the upper reservoir site, but, chances of their drowning or fall into reservoir are not there as the top of dam section is well above the natural ground level and dam section is made of concrete.
- During initial years of filling of reservoirs, the GHGs (CO₂ and CH₄) shall be emitted due to biomass resulting from putrefaction of biomass (root material) of trees fell. There shall be 89.9 ton and 85.1 ton CO₂ equivalent emission respectively from upper and lower reservoirs resulting from purification of soil organic carbon present in topsoil and below ground biomass during initial years of reservoir filling (Table 3.1).

Table 3.1: GHG Emissions from Reservoirs

S.N.	GHGs	Emission Type	Factors (kg/ha/day)	Total emissions during year	Total emissions (kg)	Total CO ₂ e (kg)
Upper Reservoir						
1	CO ₂	Diffusive	6.3	81862.2	81862.2	81862.2
2	CH ₄	Diffusive	0.022	285.9	285.9	8005.2
Total						89867.4
Say						89.9 Ton



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Lower Reservoir						
1	CO ₂	Diffusive	6.3	77493.15	77493.2	77493.2
2	CH ₄	Diffusive	0.022	270.6	270.6	7576.8
Total						85070
Say						85.1 Ton

3.3 IMPACTS IDENTIFICATION AND EVALUATION

Leopold et al were first to devise the use of matrix method for environmental impact assessment. Matrices are particularly useful as they reflect the impacts from series of interactions among the activities and the environmental elements. Although, the Leopold matrix is believed to largely depend on the subjective evaluation of experts that allows the judgments to be converted into empirical numbers, but, it is still a valid and widely used approach for the assessment of environmental impact. The Leopold matrix is a qualitative environmental impact assessment method pioneered in 1971. It is used to identify the potential impact of a project on the environment. In the matrix, the rows cover the key aspects of the environment and society, while the columns list the project's activities during all stages of the project. Environmental factors must correspond to all those that could be affected by the development of the activity in the project area and the area of influence.

A simplified/modified two-dimensional matrix inspired by Leopold matrix has been adopted for the environmental and social impact assessment of the project. Twenty-three key impact factors have been singled out from a wider list of less significant potential factors.

The interaction of activities and their impacts vary between construction and operational phase. Regarding the project, major activities occur in the construction phase. Therefore, major impacts are anticipated during construction. Some of the impacts will be of short duration particularly during construction phase, whereas some impacts will be long lasting. Each impact was analyzed under the categories mentioned above and quantified using modified Leopold matrix. Each impact was assigned with a score using a scale of 0-4, (Table 3.2) depending on the magnitude and potential. The magnitude, potential and significance of an impact were assessed based on the nature of the impact (short term/long term. reversible/irreversible. local/regional. direct/indirect. minor/major). A positive or negative sign was provided for beneficial and harmful nature of the impacts. The rows' totals of the matrix reflect the total impacts of an action on the various environmental components while the columns' total reflects the impact of all actions on one environmental variable

Table 3.2: Criteria for Evaluation of Impact

S.N.	Criteria	Score
1	No impact	0
2	Minor Impact	1
3	Medium Impact	2
4	Significant Impact	3
5	Major Impact	4



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Major positive and negative impact factor; major short term and long-term impacts and irreversible and reversible impacts and direct & indirect environmental impacts are interpreted in Table 3.3 through Table 3.6 respectively.

Table 3.7 and Table 3.8 sum up most of the impacts during construction and operation phase of the project. Notably, the magnitude of negative impacts decreases considerably in the operational phase of the project. In the construction phase, total score is -25 of which 78 stands for negative impacts and 53 for positive impacts. During the operational phase total score changes to +29 of which negative impacts score are 16 and positive are 45. Considering the project actions during construction phase excavation, quarrying and migrant population are major activities which pose major impacts on the environmental and social components while community development is most positive impact



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Table 3.4: Major Short-term and Long-term Environmental Impact

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Description	Short-term Impact Factor		Operation Period	Construction Period		Long-term Impact Factor
	Construction Period	Operation Period		Construction Period	Operation Period	
Physical Environment	Land degradation due to excavation for project and borrow/disposal area Temporary increase in GLC of ambient air at project sites. Increase in noise levels at project site and nearby settlement. Water and soil pollution due to improper disposal of waste and mal functioning of equipment. Spread of water borne disease.	No significant impact except impairment of water quality in reservoir during initial period.	Change in the land use of agriculture land, barren and forest land. Land degradation due to excavation for project components, approach road and borrow area. Spread of water borne diseases due to stagnation of water in pits.	Change in hydraulics and hydrological pattern of river flow. Decrease in water quality in the local streams due to run off from agriculture fields. Spread of water borne diseases due to stagnation of water in pits		
Biological Environment	Increase in temporary stress levels of wildlife and loss of productivity. Inhibition of free movement of wildlife and fishes. Threat of poaching due to migration of labor	No significant impact.	Loss of habitat due to diversion of forest land. Disturbance in existing ecological balance.	Fragmentation of habitat. Improved habitat for mainly water bird mammals, due to reservoir creation. Improvement in vegetal cover in project and catchment area. With upliftment of rural economy dependency on forest will decrease.		
Economic Environment	Increase in Temp. job opportunity Increase in demand for fuel and other construction material	Not applicable	The loss of agriculture land and agriculture produce for PAF. Loss of livelihood and income for PAF	Loss of jobs Employment in other sectors. Hike in the prices of land in the area. Benefits to economy and commerce and better market facilities Recreation and tourism potential Revenue generation by sale of energy.		
Social & Cultural Environment	Conflict between beneficiaries and non-beneficiaries. Conflict for employment between local people and migratory labor population. Increase in pressure on roads.	Not applicable	Loss of assets over which the PAFs have developed affinity	Betterment in social welfare of people of project area Better living Standards for people of project area. Preventing migration to other cities for earning livelihood.		



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Table 3.5: Major Reversible and Irreversible Environmental Impacts

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Description	Irreversible Impact Factor		Operation Period	Reversible Impact Factor		Operation Period
	Construction Period	Operation Period		Construction Period	Operation Period	
Physical Environment	Change in the land use of agriculture and forest land. Land degradation due to excavation for project components, approach road and borrow area.	Change in hydraulics and hydrological pattern of river flow. Impairment in water quality of reservoir due to impounding. Improvement in land status of impact and catchment area. Improvement of soil water regime of catchment area.	Temporary increase in GLC of ambient air at project site. Increase in noise levels at project site and nearby villages. Water and soil pollution due to improper disposal of waste and mal functioning of equipment. Spread of water borne disease due to stagnation of water in pits.	Spread of water borne disease due to stagnation of water in pits		
Biological Environment	Loss of habitat due to diversion of forest land. Fragmentation of habitat and disturbance in existing ecological balance.	Loss of habitat due to diversion of forest land. Fragmentation of habitat and disturbance in existing ecological balance.	No significant impact.	No significant impact.		No significant impact.
Economic Environment	Hike in the prices of land in the project area.	Loss of jobs. Better opportunities for cattle rearing. Employment in other sectors. Hike in the prices of land in project area. Benefits to economy and commerce and better market facilities. Recreation and tourism potential	Increase in Temporary job opportunity. Increase in demand for fuel and other construction material	No significant impact		No significant impact



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<p>Social & Cultural Environment</p>	<p>The pang of involuntary acquisition of land shall cause many social pressures and stress on the affected families</p>	<p>The pang of involuntary acquisition of land shall cause many social pressures and stress on the affected families Betterment in social welfare of farmers of command area Better living Standards for project area. Preventing migration to other cities for earning livelihood.</p>	<p>Conflict between beneficiaries and non-beneficiaries. Conflict for employment between local people and migratory labor population. Increase in pressure on the existing provincial / state road.</p>	<p>No significant impact</p>
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Table 3.6: Major Direct and Indirect Environmental Impacts



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Description	Direct Impact Factor		Indirect Impact Factor	
	Construction Period	Operation Period	Construction Period	Operation Period
Physical Environment	Land degradation due to excavation Temporary increase in GLC of ambient air at project site, Increase in noise levels at project site. Water and soil pollution due to improper disposal of waste and mal functioning of equipment.	Changes in the land use of agriculture and forest land. Changes in hydraulics and hydrological pattern of river flow. Improvement in water quality of local nala of villages due to implementation of sewage treatment works Improvement in land status of impact and catchment area.	Spread of water borne disease due to stagnation of water in pits.	No significant impact
Biological Environment	Increase in temporary stress levels of wildlife and loss of productivity. Inhibition of free movement of wildlife. Threat due to poaching due to migration of labor.	Loss of jobs for contractors' labor after completion of project.	Loss of habitat due to diversion of forest land. Fragmentation of habitat and disturbance in existing ecological balance.	Fragmentation of habitat. Improved habitat for mainly water bird mammals, due to reservoir. Improvement in vegetal cover With upliftment of rural economy dependency on forest will decrease.
Economic Environment	Increase in Temporary job opportunity Increase in demand for fuel and other construction material	Revenue generation by sale of energy. Free power (12 %) to state. Free power (1%) to local area for development fund Tourism & recreation potential of the area as well as state shall increase.	Loss of livelihood and income for PAF	Loss of jobs Better opportunities for cattle rearing. Employment in other sectors. Hike in the prices of land in the project area. Benefits to economy & commerce and better market facilities.
Social & Cultural Environment	Increase in pressure on the existing provincial / state road. Involuntary acquisition of land assets. Loss of assets over which the PAFs have developed affinity	Betterment in social welfare of farmers of project area Better living Standards for locals. Preventing migration to other cities for earning livelihood.	Conflict between beneficiaries and non-beneficiaries. Conflict for employment between local people and migratory labor population.	Betterment in social welfare of farmers of command area Better living Standards for famers of command area. Preventing migration to other cities for earning livelihood.



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Table 3.7 : Modified Leopold Matrix of Environment Impacts in Construction Phase

Environmental Effects →	Physical Environment										Biotic Environment						Economic						Social and Cultural				Total +ve	Total -ve	Total
	Landscapes	Hydraulics	Water pollution	Air pollution	Noise pollution	Vibration	Land degradation	D/Water users	Exploration of resources	Spread of diseases	Ground water	Aquatic life and fisheries	Fragmented habitats	Ecological balance	Stress on biodiversity	Employment	Social Values	Basic Amenities	Marketing	Cultural conflict	Archaeological	Demographic	S.S. Business						
Dam exc.	-2	0	-2	-2	0	-1	0	0	0	0	0	-2	-2	-2	-2	+2	0	0	0	0	0	0	0	0	-15	+2	-13		
Road const.	-2	0	-1	-2	-1	-2	0	0	-1	0	0	-2	-1	-2	+2	+2	0	+1	+1	0	0	0	0	0	-14	+4	-10		
Tunnelling	-1	0	-1	-1	-1	-1	0	0	0	-1	0	0	-1	-1	+2	+2	0	+1	+1	0	0	0	0	0	-10	+4	-6		
Powerhouse	0	0	-2	-1	-1	-1	0	0	0	0	0	0	-1	0	+2	+2	0	+1	+1	0	0	0	0	0	-7	+4	-3		
Submergence	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Dumping	-2	0	-1	-2	-1	0	0	0	0	0	0	0	0	-2	+1	+1	0	0	0	0	0	0	0	0	-8	1	-7		
Agg. Crushing	0	0	-2	-2	-1	0	0	0	-2	0	0	0	-1	-2	+1	+1	0	0	0	0	0	0	0	0	-10	1	-9		
Colony	-1	0	0	0	0	-1	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	-3	0	-3		
Diversion	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
CAT & other EMP	0	0	+1	0	0	0	0	0	+2	0	0	0	+1	0	+2	+3	0	0	0	+2	0	0	0	0	0	+11	0	+11	
Vehicular Movement	0	0	0	-3	0	0	0	0	0	0	0	0	0	-2	0	+1	+1	0	0	0	0	0	0	+1	-8	+3	-5		
Migrant Population	0	0	-2	0	0	0	0	-2	0	0	0	0	-2	-2	0	-2	+4	+2	-3	0	0	-2	+4	-15	+10	-5			
L.A.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	-4	-3	0	0	0	0	-3	0	-12	0	-12			
Comm Development	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+4	+2	+3	+2	0	0	0	0	+2	0	0	+13	+13		
Energy Generation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Total	-8	0	-10	-13	-11	-2	-6	0	-2	-1	-1	-4	-10	-13	+14	0	+8	+7	-1	0	0	-5	+7	-78	+53	-25			



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Project- Bhavali Pumped Storage Project (5 X 250 MW+2x125mw) in Nashik &Thane District,
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Total	1	0	-1	0	-1	-1	-2	0	-1	-2	2	0	-2	2	-1	12	4	10	9	-1	0	-1	2	-16	45	29
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WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

4 MITIGATION MEASURES

During construction phase excavation, quarrying transportation and migrant population are major activities which pose major impacts on the environmental and social components which need to be addressed *pari passu* with construction.

4.1 MITIGATION MEASURES FOR IMPACT TO PHYSICAL & SOCIAL ENVIRONMENT

The construction activities shall be impacting physical environmental attributes like air, noise land and water and social environment to various magnitude which have been quantified and based on this mitigation measures in the form of Environmental Management Plan have been prescribed with financial implications. These are enumerated in Table 4.1.

Table 4.1: Potential Impacts, Mitigation Measures with Cost

Potential Impacts	Mitigation Measures	Cost
Land Environment		
Land degradation/soil erosion resulting from disturbance to soil surface and landscape from excavation and disposal of generated muck (64.51 lakh cum)	<ul style="list-style-type: none"> Reusing of 36.08 lakh cum on project work Properly retaining muck pile by providing 6m high RCC Counterfort retaining wall. Plantation through bio-technological method over surface of muck piles. Spreading topsoil, stacked separately, over plantation area after amending with FYM and bio-fertilizer. 	Provision of Rs. 2390 lakh made under Muck Management Plan
Land contamination due to MSW Disposal	<ul style="list-style-type: none"> Solid wastes generated shall be collected and disposed as per arrangement with Igatpuri Municipal Council (ULB) under Nashik Division for disposal of municipal solid waste. 	For this Rs 135 lakh have been earmarked under Solid Waste Management
Reduction in soil fertility due to contamination with cement, oil, and lubricants	<ul style="list-style-type: none"> Contaminated soil shall be addressed by in-situ bioremediation 	Engineering cost in DPR
Due to soil organic carbon present in topsoil and below ground biomass, there shall be GHG emission from reservoir.	<ul style="list-style-type: none"> Topsoil from submergence area shall be scraped and stacked separately before filling of reservoir. The whole root mass of the trees should be removed, and pits so created should be filled with stones, 	Engineering cost in DPR
Air Environment		
Maximum 24 hour predicted GLC in air for PM ₁₀ at upper and lower reservoir has been	<ul style="list-style-type: none"> Wet drilling shall be adopted. Dust mask will be provided to the workers. Regular maintenance of machineries 	For control of air pollution by sprinkling water, a provision of Rs. 91.08 lakh made



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found to be 10.8 $\mu\text{g}/\text{m}^3$ & 13.8 $\mu\text{g}/\text{m}^3$ respectively while the resultant concentration shall be 63.7 $\mu\text{g}/\text{m}^3$ and 67.4 $\mu\text{g}/\text{m}^3$ respectively.	<ul style="list-style-type: none">• Dumpers are not overloaded, and their speed kept within the prescribed limits.• Copious sprinkling of water at the work site shall be carried out through contractors• Periodical monitoring of air quality	under Management Plan for Control of Water, Air & Noise Pollution. For air quality monitoring, Rs 81.60 lakh provided under
On unpaved haul roads, Air pollution (at 25 m predicted GLC for PM_{10} is 9.9 $\mu\text{g}/\text{m}^3$ which reduces to 6.2 $\mu\text{g}/\text{m}^3$, 2.7 $\mu\text{g}/\text{m}^3$ and 1.1 $\mu\text{g}/\text{m}^3$ at 50m, 150m and 500 m respectively.	<ul style="list-style-type: none">• Periodical monitoring of ambient air quality.• Regular sweeping of roads, sprinkling of water and periodical repair of haul roads.• Vehicles with PUC engaged in construction activities shall be maintained properly.	For control of air pollution on haul roads by sprinkling water through tankers, a provision of Rs. 316 lakhs made under EMP for safeguards during road construction
Spillage of material on roads and dust emission on haul road	<ul style="list-style-type: none">• Tippers shall be covered with tarpaulin• Proper sprinkling of water on loose material being transported on roads	For control of air pollution, a provision of Rs, 316 lakhs made
Air Pollution from running of DG Sets.	<ul style="list-style-type: none">• DG sets shall not be located on downstream of prominent and first prominent wind direction.• The emission norms prescribed by the CPCB should be adhered.• The norms prescribed by the CPCB in respect of fixing the minimum stack height for generator, should be strictly complied with	Rs. 16.32 lakhs for Air Quality Monitoring for one year post construction and thereafter the cost shall be met from maintenance funds
Generation of dust from Batching Plant	<ul style="list-style-type: none">• At aggregate mixing plant, wind breakers will be erected, and water sprinklers installed.	Engineering cost under DPR
Noise Environment		
Temporary increase in noise levels at the construction site.	<ul style="list-style-type: none">• Regular noise level monitoring• Barriers may be erected around batching plant• Distribution of earmuffs/earplugs to workers• Reducing the exposure time of workers to the higher noise levels by resorting to rotation.	For noise level monitoring, Rs 8.00 lakh provided under Rs 0.60 lakh provided for PPE under Plan for Control of Water, Air & Noise Pollution
Setting up of ground vibration & generation of instantaneous high noise levels due to blasting	<ul style="list-style-type: none">• Optimum charge per delay shall be kept low.• Controlled blasting will be done.• Adoption of two row blasting and V pattern of firing and use of milli-second delay detonators• Blasting not to be undertaken in night hours.	Engineering cost under DPR

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increase in noise levels at turbine, generator floor of underground powerhouse, during operation	<ul style="list-style-type: none">Implementing acoustic noise controls in penstock area, all floors in the powerplant, control room, by using acoustic absorption panels in main plant walls and control room, acoustic plaster, spray on damping material on cooling ducts.	Engineering cost under DPR
Noise generation due to operation of DG Sets and air compressors	<ul style="list-style-type: none">Silent DG Sets shall be installed. Stationary air compressors to be housed in acoustic enclosures	Engineering cost under DPR
Water Environment		
Reduction in capacity of reservoirs due to sediment deposition	<ul style="list-style-type: none">To address gully erosion, stream bank erosion, enhancing the forest cover for increasing soil holding capacity, biological and engineering treatment have been proposed.	Provision of Rs. 250 lakhs made under Catchment Area Treatment
Impairment of water quality by silt laden water from surface & underground works crusher & workshop.	<ul style="list-style-type: none">Silt laden water from work site and stone crusher to be desilted through settling tanks. The washings of workshop floors shall be collected in oil separators provided in channel.	Rs 4.0 lakh earmarked for construction of settling tanks under Management Plan
Contamination of water through sewage and solid waste generation.	<ul style="list-style-type: none">The sanitary waste generated from labour camp is proposed to be treated in STP. Solid waste generated in the project and labour colony, shall be managed as per MSW Rules.	For Solid Waste Management, Rs 135 lakh earmarked Rs. 13.20 lakhs provided for water quality monitoring Rs 44.0 lakh provided for STP under water pollution control
During initial years of filling of reservoir, there shall be GHG emissions	<ul style="list-style-type: none">Planting trees in 4 ha along reservoir periphery shall develop the potential of absorbing and retaining 111 ton of carbon as biomass, which implies carbon sequestration of 407 ton of CO2 equivalent.	Provision of Rs. 30 lakhs made under Reservoir Rim Treatment
Social Environment		
Public apprehension to project	<ul style="list-style-type: none">Interactions with the local people to assure the villagers against their worries and appraise them of the measures being taken to safeguard their interests.	Rs.600 lakh & Rs.100 lakhs provided under CSR and LADP Rs.500 lakhs provided under Watershed Development Plan

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	<ul style="list-style-type: none">Development of infrastructure in the area by implementing CSR initiatives and Watershed Development Plan	
Increased fugitive dust emission.	<ul style="list-style-type: none">The traffic in project area shall be properly controlled.Copious sprinkling of water on haul roads	For control of air pollution, Rs 316 lakh provided (Sec. 10.19)
Impacts on health of locals	<ul style="list-style-type: none">Periodical health check-up camps/ mobile health facilities in villages and strengthening of existing health services.	Rs 144 lakh provided under CSR
Accidents during construction activities	<ul style="list-style-type: none">Explosive will be kept in safe custody as per Indian Explosive ActAll workers shall be provided with PPELighting devices and safety signal devices will be installedTraffic rules and regulations will be strictly adheredBlasting time, signal and guarding time to be regulatedFirst aid / dispensary facilities to be made available	Rs 87 lakhs provided under Occupational Health & Safety Management Rs 10 lakhs provided under Public Health Management Plan

4.2 MITIGATION MEASURES FOR IMPACT TO BIOLOGICAL ENVIRONMENT

For implementation of project large parts of forests and wildlife habitats and human settlement and agriculture land shall have to be cleared for constructing dam seat, reservoir space, job facility area, roads, muck disposal sites and portals for adits leading to degradation, fragmentation, and loss of habitat and significant losses to the biological diversity and imperative imbalance in ecological equilibrium. The mitigation measures for addressing potential impacts are described in following sub sections: -

4.2.1 Mitigation Measures for Loss of Habitat

For construction of project 243.74 ha forest land with standing trees shall be diverted. This shall lead to loss of some of the plant species used by man and animals and cause un-equilibrium of biodiversity. To compensate for loss of trees new trees shall have to be planted in some other area for maintaining biodiversity equilibrium. The user agency shall have to pay replacement cost of diverted forestland by way of either afforestation.

For mitigating loss due to forestland Compensatory Afforestation plan shall be implemented by the Forest Department In 243.746 ha land identified in Durgewadi Khurd/Chiplun/ Ratnagiri. The cost of compensatory afforestation has been estimated as Rs. 4854 lakhs.



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resin exudates of this species contain several unique active constituents, including vijjayosin, pterosupin, marsupsin, and pterostilbene, all of which show a wide range of pharmacological activity.

Chikarkanda (*Habenaria grandifloriformis*)

It is herb found in grassy land and on higher hills on grassy slopes up to 1600m, in full sun.

Acacia ferruginea

Acacia ferruginea is normally a smallish, drought-resistant, deciduous tree, not more than 12 m tall and 50 cm DBH. Commonly attaining 35 cm DBH with a bole rarely straight for more than 2-3 m. Branches slender, armed with conical prickles; spine persist on bole until it reaches about 15 cm DBH. The flowers are usually yellow but occasionally white and have many stamens apiece, giving each one a fuzzy appearance. Traditionally, different parts of this plant is used for treating various skin infections, itching, leucoderma, ulcers, inflammation of the mucous lining of the mouth and throat. The plant is also credited for treatment of helminthiasis, dysentery, piles and diabetes. Seeds are edible and are frequently crushed into flour, and gum flows from the stems and branches due to environmental conditions or stress

Dalbergia latifolia

Under natural conditions, *D. latifolia* reproduces by seed, root sucker or coppice. Artificial reproduction is common by seed, root cutting, and stump sprout. Direct seeding is possible under moist conditions with good weed control. Root cuttings can be planted directly in the field or raised in a nursery for future transplanting. Fresh seed germinates at 50-75% within 7-21 days of sowing. Stored in gunny sacks or earthen pots, seed remains viable for six months (Kadambi, 1954). Seed viability can be extended to 9-12 months by drying seeds to 8% moisture content and storing them in airtight containers, however, germination will decrease to 30-40%. One kilogram contains 21,000 seeds (DITSI, 1980).

For conservation of these near Threatened and vulnerable species, it shall be endeavored to collect seeds of these and propagate them in nurseries and plant them in already identified areas. The species shall be planted under green belt as avenue plantation and colony area besides. For collection of seeds, its drying and storing in bags, its pre-treatment and sowing in mother bed in nursery and then planting in suitable location and yearly maintenance. For developing school nurseries as sum of Rs 10 lakh has been provided.

Nursey at Mukne shall be created at a cost of Rs 25 lakh for raising tall plants. For planting RET species Rs 15lakh have been include in the plan. Beside this, measures shall be Implemented to conserve rare flower species on the plateau inside Wildlife Sanctuary, for which a sum of Rs 5.0 lakh have been provided.

5.1.1 Protection of Dead trees and Logs

The dead trees and wooden logs fallen shall not be removed from their place as they act as good habitat for ants and termites which in turn are good forms of food for birds, lizard etc. The residue of non-survival species (Snag) may be kept as it is for the water birds.

5.1.2 Conservation of Biodiversity Hotspots

In forest patches where biodiversity is very good should be identified and protected as these are good repository of gene pools.



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5.1.3 Good Practices during project Construction

For conservation of biodiversity and management of the wildlife habitat and population the following good practices shall be adhered by contractor and the officials of SJVN during construction period

- Temporary construction camps (TCF), site office and material laydown yard should be constructed in low vegetation areas and away from forest and wildlife habitats. Further, efforts should be made to minimize the footprint of the TCF using appropriate technologies such as provision of energy-efficient lighting, waste & water management in accordance to applicable standards of the state and central govt.
- All workers of project will be provided with identity cards and would not be allowed to enter in forest areas and villages without a valid permission. The exploitation of forest produce including fuel wood and plant species would be prohibited.
- Adequate measures to prevent exposure of any of local floral and faunal species from the wastes generated during construction activities must be ensured through the immediate wastes collection and storage of waste on designated location.
- Construction vehicles should always use the designated Right of Way (RoW) only to minimize soil compaction and impacts on vegetation.
- Use dust screens in the construction site during all construction activities.
- The Project authority will be bound by the rules and regulations of the Wildlife Protection Acts or any such agency of the State, which may exist or will be promulgated from time to time for the preservation of habitats and protection of biodiversity.
- Use regular dust suppression (water and dust stop powder etc.) in the designated RoW and construction areas to reduce/minimize dust generation
- Considering the movement of wild animals at night, project proponent shall adopt a controlled blasting. Workers will be encouraged to remove alien and invasive plant species from the working sites. The workers will be discouraged to plant any alien species in project areas.

Any construction, chemical, or hazardous wastes generated during the construction stage should be appropriately collected, stored, and disposed of to minimize exposure to flora and

5.2 STRATEGIES FOR CONSERVATION OF SCHEDULE-I WILDLIFE:

The buffer areas are essential for ensuring forest connectivity for land tenure dynamic as these constitute habitats for sub-adult, transients and old members of the Wildlife population. The aging wild animals from the source population residing in core zone migrate to the buffer zone while the adult replace them in source population zone (core zone). With habitat depletion of the buffer area, the source population shall be easily targeted and will always be at the risk of being eliminated. The buffer / fringe areas have immense importance as they have high corridor value which calls for maintaining and improving their ecological sustainability. Otherwise, they are likely to become ecological source sinks. Forest areas can be



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approved by the forest officers. Each year in suitable patches approved by forest officers, two-year-old plants of suitable species will be planted in pits of size 45x45x45 cm. filled with good soil and manure. Fruit, fodder and shelter providing trees such as *Alanglum salvifolium*, *Annana squamosa*, *Bobax ceiba*, *Erythrina suberosa*, *Sygm cumini*, *Ficus religosa*, *Ficus racemose*, *Madhuca longifolia*, wild *Mangifera indica* and *Zizipus maurtiana* will be planted to attract birds as well as other wildlife such as bats and small mammals. Under the plan it is envisaged to plant tall trees of *Umber (Ficus racemosa)* in secure area of army/defence forces, for which Rs 50 lakhs have been earmarked. Apart from this a sum of Rs 10 lakh is earmarked for distribution of free fruit trees to farmer through SFD.

Plantation of Ethno-botanically important plant species

Table 2.7 lists 36 ethno botanically important plant species that fall between FRL and MDDL of reservoirs. These species will be divided into two categories: those that can survive submergence and those that cannot. Species that cannot survive in submergence will be replaced by those that can, subjected to it will not affect the reservoir volume. Under the plan it is conceived to develop these species by making and throwing seedballs. On this count Rs 10 lakh has been earmarked.

Plantation of breeding grass for wildlife birds

To improve the habitat for wildlife bird breeding by planting breeding grass on the reservoir's outskirts. For artificial breeding and rearing of grassland birds like Jungle fowl, quails, partridges etc., a provision of Rs 15 lakh has been made.

Development of Water hole

It is proposed to provide a water hole within Bhorgad Conservation Reserve by drilling a borewell and lifting water through solar pump with proper fencing around for which Rs 5.0 lakh have been provided.

Removal of Water Hyacinth

Water hyacinth is a rapidly spreading aquatic weeds which adversely impacts the ecosystem. It also affects fish, crop and livestock productions and human health. Being a floating plant, it can be removed by raking the ponds surface. In view of its ability to multiply rapidly multiple cleanings throughout the year shall be required. For removal of *Ipomea/ water hyacinth* in water bodies like Nandur Madhameshwar etc., a provision of Rs 10.0 lakh has been earmarked under the plan.

5.2.7 Public Awareness & Celebration of Wildlife Week etc.

This is the most important aspect of wildlife conservation. People will be educated regarding the importance of wildlife conservation through mass publicity by installing sign boards and distributing literature in respective villages in the study area. Experts in the field of wildlife conservation will also be invited to deliver talks through slides. Special emphasis should be placed for raising awareness in school children through conducting debates and conducting audio visual classes. On this count a provision of Rs 5 lakh is being made.

5.2.8 Capacity Building

Under this sub-head specialized training in the field of management planning, park interpretation through conducting workshops / seminars / study tours for appraisal of good practices followed in other reserves. Apart from this training in the use of GIS systems and anti-poaching operations shall be imparted. For



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क्षेत्राच्या हद्दीचे अंतर १२.५ मी. आहे. उपरोक्त संदर्भिय पत्र-३ अन्वये प्राप्त झालेल्या अहवालानुसार उपवनसंरक्षक (वन्यजीव), नाशिक यांनी सदर प्रकल्प क्षेत्र व परिसर हे राष्ट्रीय व्याघ्र संवर्धन प्राधिकरण (NTCA) च्या संकेत स्थळावर असलेल्या निर्णय समर्थन प्रणाली (DSS) वर तपासणी करून सदर क्षेत्र व्याघ्र भ्रमण मार्गाचा भाग नसल्याचे कळविले आहे. तसेच सदर क्षेत्र हत्ती भ्रमण मार्ग देखील नसल्याचे या कार्यालयास कळविले आहे.

प्रकरणी संदर्भिय पत्र-२ अन्वये प्राप्त झालेला नकाशा मुख्य वन्यजीव रक्षक, तथा अपर प्रधान मुख्य वनसंरक्षक (वन्यजीव), महाराष्ट्र राज्य यांचेकडून सांक्षािकन करून चासोवत सहपत्रीत करण्यात येत आहे. तसेच सदरचा प्रकल्प हा Hydro Project या प्रकारातला असल्यामुळे तसेच सदरचे क्षेत्र कळसुवाई हरिश्चंद्रगड वन्यजीव अभयारण्याचे पर्यावरण संवेदनशील क्षेत्रापासून १२.५ मी. अंतरावर येत असल्यामुळे, आपलेकडून वन्यजीव संवर्धन आराखडा मागविण्यात आलेला होता.

त्यानुसार उपरोक्त संदर्भिय पत्र-२ अन्वये वन्यजीव संवर्धन आणि जैवविविधता व्यवस्थापन आराखडा या कार्यालयाचे मान्यतेसाठी सादर केलेला आहे. प्रकल्प यंत्रणेने एकुण रू. ३१५.०५ लक्ष आर्थिक तरतुद आराखड्यामध्ये केलेली होती. त्यामध्ये या कार्यालयाचे स्तरावरून आवश्यक बदल करून सुधारीत रू. ३२६.५० लक्ष रक्कमेचा आराखडा खालील तपशिलानुसार दिलेले आहे. त्याबाबत आवश्यक कार्यवाही आपले स्तरावरून करण्यात यावी.

Cost of Wildlife and Biodiversity Management Plan

Sr. No.	Activities	Amount (in rs. Lakhs)
1.	Removal of invasive alien species and planting palatable species grass	20.00
2.	Raising tall plants in mukne nursery	25.00
3.	Raising RET tall plants	15.00
4.	Planting tall trees of Umber in secure area of army/ defence forces	50.00
5.	Making and throwing seedballs	10.00
6.	Developing school nurseries	10.00
7.	Collection and production of grass seedling at chandani research plots	20.00
8.	Distribution of free fruit trees to farmer through SFD	10.00
9.	Artificial breeding and rearing of grassland birds like Jungle fowl, quails, partridges etc.	15.00
10.	Removal of Ipomea/ water hyacinth in water bodies like Nandur Madhameshwar etc.	10.00
11.	Cost of providing patrolling vehicle	28.50
12.	Training of staff capacity building for HWC and ornithology (Territorial/Wildlife/Social Forestry)	5.00
13.	Vulture Conservation (Dyef Nashik)	10.00
14.	Research of inland aquatic bodies and their conservation (Dyef Wildlife Nashik)	12.00

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15.	Conservation of wolf/ fox including maintenance of their lair	10.00
16.	Development of Grass lands/ pastures	50.00
17.	Awareness about Wildlife issues in children through चला जावूया वनाला	5.00
18.	Survey & Monitoring of implementation by CWLW office M.S.	5.00
19.	Implementing measures to conserve rare flower species on the plateau inside Wildlife Sanctuary.	5.00
20.	Providing and fencing solar water pump for water hole with borewell in Bhorgad Conservation Reserve	5.00
21.	Providing cage to rescue injured animal/ birds in Mamdapur Conservation Reserve	6.00
Total cost		326.50

वरील रू. ३२६.५० लक्ष रक्कम असलेला वन्यजीव संवर्धन आणि जैवविविधता व्यवस्थापन आराखडा वन्यजीव व्यवस्थापनाच्या दृष्टीने पोषक स्वरूपाचा असल्यामुळे, त्यांस मान्यता प्रदान करण्यात येत आहे.

सहपत्र :- वरीलप्रमाणे.

(विवेक खाडेकर)

मुख्य वन्यजीव रक्षक तथा
अपर प्रधान मुख्य वनसंरक्षक (वन्यजीव),
महाराष्ट्र राज्य

प्रतिलिपी : अपर प्रधान मुख्य वनसंरक्षक (वन्यजीव) पश्चिम, मुंबई यांना माहितीस व आवश्यक कार्यवाहीस सन्नेह अग्रेषित.

प्रतिलिपी : उपवनसंरक्षक (वन्यजीव), नाशिक यांना माहितीस व आवश्यक पुढील कार्यवाहीस अग्रेषित. आपणांस कळविण्यात येते की, या कार्यालयाचे स्तरावरून आराखड्यामध्ये बदल केलेला आहे. त्यानुसार आपले स्तरावरून आवश्यक कार्यवाही करून, आराखड्याबाबतचा पूर्तता अहवाल या कार्यालयास विहित मार्गाने सादर करावे.



JSW Energy PSP Two Limited

Project- Bhavali Pumped Storage Project (5 X 250 MW+2x125mw) in Nashik &Thane District,
Maharashtra

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

Table 5.1 : A Cost of Wildlife and Biodiversity Management Plan

Sr. No.	Activities	Amount (in Rs. Lakhs)
Wildlife Mitigation measures under Igatpuri sub-division		
1.	Removal of invasive species eg. <i>Lantana</i> , <i>glyricidia</i> , etc.	20.00
2.	Fodder Development work in Igatpuri subdivision	25.00
3.	Raising nursery for fodder species	15.00
4.	Construction of Watch Tower in Igatpuri CR	10.00
5.	Camera traps for wildlife monitoring	15.50
6.	GPS equipments	10.00
7.	Rescue equipments for HWC in Igatpuri and Sinnar	10.00
8.	First Aid Kits to schools	10.00
9.	Provision of Rescue Vehicle/ patrolling Vehicle (2)	30.00
10.	Training of Staff/ capacity building for HWC	15.00
11.	Management of Vulture restaurant	10.00
12.	Equipment and instruments for Rapid Rescue Team	15.00
13.	Awareness signages in CR	10.00
14.	Awareness about wildlife issues in schools	5.00
15.	Monitoring of implementation by CWLW office	5.00
16.	Protection hut(s) in CR	15.00
17.	Water holes with Solar Pump in CR	10.00
	Sub-total	230.50

79



JSW Energy PSP Two Limited

Project- Bhavali Pumped Storage Project (5 X 250 MW+2x125mw) in Nashik &Thane District,
Maharashtra

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

Wildlife Mitigation measures under Shahapur division		
18.	Rescue equipments for HWC	25.00
19.	Training of staff/ capacity building for HWC	25.00
20.	Awareness about wildlife issues in schools	16.00
21.	Habitat development works	30.00
Sub-total		96.00
Total Cost		326.50

7780



JSW Energy PSP Two Limited

Project- Bhavali Pumped Storage Project (5 X 250 MW+2x125mw) in Nashik &Thane District,
Maharashtra

WILDLIFE CONSERVATION AND BIODIVERSITY MANAGEMENT PLAN

Annexure-IS

**OFFICE OF THE PRINCIPAL CHIEF CONSERVATOR OF FORESTS
(HEAD OF FOREST FORCE), MAHARASHTRA STATE, NAGPUR**

ADDITIONAL PRINCIPAL CHIEF CONSERVATOR OF FORESTS AND NODAL OFFICER

First Floor, 'B' Wing, Van Bhavan, Civil Lines, Nagpur-440001.

Tel no. 0712-2556916 E-mail- apccfnodal@mahaforest.gov.in

No.:Desk-17/Nodal/PID-153240/1655/25-26

Nagpur - 440 001. Dated : 15/10/2025

To,
The Chief Conservator of Forests (T),
Thane

Subject:- Proposal for seeking prior approval of the Central Government under Section 2 (i) (ii) of the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980 in favour of JSW Energy PSP Two Limited for nonforestry use of 243.74 ha. of forest land (reserved Forest, Protected Forest and Private Forest) for Bhavali Pumped Storage Project (1500 MW) in Thane & Nasik District in the State of Maharashtra (Online proposal No. FP/MH/HYD/153240/2022) – regarding.

- Ref:- 1) The Government of India, MoEF&CC (FC Division), New Delhi letter No. 8-06/2025-FC-I/131020/2025, dated 02/09/2025.
2) This office, office note No.Desk-17/Nodal/SI/Thane/PID-153240/25-26/2504, dated 29/09/2025
3) The Principal Chief Conservator of Forests (Wildlife), Maharashtra State office note No. D-23(2)/Survey/C.No.90 (Nodal)/2582, dated 13/10/2025.

The Government of India, MoEF& CC (FC Division), New Delhi vide letter under reference above has raised back query on certain points and informed to submit query compliance. In this context, the Government of India in point (iv & v) has sought comments from PCCF (Wildlife).

2.0 Subsequently, this office vide office letter under reference No.2 has sought comments in this matter. Accordingly, the CWLW vide letter under reference No.3 has submitted comments which is stated as under:-

As per the condition no.iv & v, as per the documents in their office, the said project does not fall within any Wildlife Sanctuary, Tiger Reserve, National Park and Wildlife Corridor. Also, a request has been made to the government to establish a Management Committee for the Igatpuri Conservation Reserve. But the decision of the management committee is yet to be issued from the government level.

3.0 It is therefore requested that the remarks received from CWLW brought to the notice of the user agency at your level.

Encl:- As above

(Naresh Zurmure)

Adl. Principal Chief Conservator of Forests
& Nodal Officer

Copy to the Deputy Conservator of Forests (T), Shahapur and West Nashik for information and necessary action.



Forest Department

O/o Principal Chief Conservator of Forests (HoPF), Maharashtra State

Phone No.- 0712-2560953 Principal Chief Conservator of Forest (Wildlife) Maharashtra State

E-mail - pccfwlmgp@mahaforest.gov.in Website - www.mahaforest.gov.in

"Van Bhavan", 3rd Floor, Rangiri Road, Civil Lines, Nagpur - 440 001.

No:- D-23(2)/Survey/C.N.90(Nodal)/ 2582 /2025-26, Dated 13/10/2025

Office Note

Sub:- Proposal for diversion 243.74 ha. (Shahapur diversion 181.45 ha. and West Nashik Division 62.29 ha.) forest land for Bhavali Pumped Storage Project (1500 MW) village Kothale & Kalbhode in Tal. Shahapur, Dist. Thane & village Jamunde, Tal. Igatpuri, Dist. Nashik in the State of Maharashtra.

- Ref:- 1. Your office letter No. Desk-17/Nodal/SI/Thane/PID-153240/25-26/1504, dated 29/09/2025.
2. Government of India, Ministry of Environment, Forest and Climate Change, (Forest Conservation Division) New Delhi letter No. 8-06/202-1/131020/2025, dated 02/09/2025.

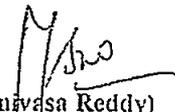
In the subject matter, the proposal for diversion of 243.74 ha. through reference letter No.1 has been received by this office on 01/10/2025 for the opinion of the Chief Wildlife Warden, M.S.

Government of India, Ministry of Environment, Forest and Climate Change, (Forest Conservation Division) New Delhi vide letter reference No. 2. has raised back query on certain points which is stated as below :

- iv. *The State Government has recommend the proposal with condition that User Agency shall obtain wildlife clearance and / or ensure compliance of mitigation measures, if required or suggested by PCCF (Wildlife). Accordingly, the State Government is requested to submit the comments of the PCCF (Wildlife)/CWLW.*
- v. *It has been submitted by the DFO Shahapur and West Nashik that recently the Government of Maharashtra has declared Gut No.42 of Village Jamunde, Tahsil- Igatpuri, District - Nashik as part of Igatpuri Conservation Reserve as per notification dated 22.11.2022. The State shall intimate whether the requisite conservation reserve management committee has been formed and whether the requisite approvals as applicable have been obtained or not ?*

As per the above condition no. iv and v, as per the documents in this office, the said project does not fall within any Wildlife Sanctuary, Tiger Reserve, National Park and Wildlife Corridor. Also, a request has been made to the government to establish a Management Committee for the Igatpuri Conservation Reserve. But the decision of the management committee is yet to be issued from the government level.

Encl - As above (Original Files)


(M. Srinivasa Reddy)
Chief Wildlife Warden &
Principal Chief Conservator of Forests (Wildlife),
Maharashtra State

To,
Additional Principal Chief Conservator of Forest &
Nodal officer, Maharashtra State, Nagpur.

2670
15/10/25

19
15/10/25





वन विभाग

प्रधान मुख्य वनसंरक्षक (वनबल प्रमुख) महाराष्ट्र राज्य, यांचे कार्यालय



O/o Principal Chief Conservator of Forests (HoFF), Maharashtra State

Phone No.- 0712-2560953

अपर प्रधान मुख्य वनसंरक्षक (वन्यजीव) महाराष्ट्र राज्य,

E-mail - pccfwlmgp@mahaforest.gov.in

Additional Principal Chief Conservator of Forest (Wildlife) Maharashtra State.

Website - www.mahaforest.gov.in

"Van Bhayan", 3rd Floor, Ramgiri Road, Civil Lines, Nagpur - 440 001.

पत्र-ई मेल क्रमांक :- कक्ष-२३(२)/वजी/सर्व्हे/प्र.क्र.१६३/२३६९ /२०२५-२६ दिनांक १६ /०७/२०२५

प्रति,

मुख्य वनसंरक्षक (प्रादेशिक),
नाशिक.

विषय :- Request for issuance of "Certificate and Certified map" mentioning that the project boundary is located outside the ESZ/WLS and no Tiger/Elephant Corridor/Critical polluted area falls in 10 kms of the proposed Bhavali Pumped Storage Project (1500 MW) Nashik and Thane Districts, Maharashtra.

- संदर्भ :- १. पर्यावरण, वने व हवामान बदल मंत्रालय, भारत सरकार, (Impact Assessment Division), नवी दिल्ली यांचेकडील पत्र क्र. J-१२०११/०८/२०२२-IA.I (R) दिनांक २७/०६/२०२२ रोजीचे पत्र.
२. अपर प्रधान मुख्य वनसंरक्षक (वन्यजीव) पश्चिम, मुंबई यांचे कार्यालयीन पत्र क्र. कक्ष-३/जमीन/ FCA/ प्र.क्र.१२०/६२६/२०२४-२५, दिनांक १४/११/२०२४.
३. अपर प्रधान मुख्य वनसंरक्षक (वन्यजीव) पश्चिम, मुंबई यांचे कार्यालयीन पत्र क्र. कक्ष-३/जमीन/ FCA/ प्र.क्र.१२०/ ६३६/२०२४-२५, दिनांक १८/११/२०२४.
४. या कार्यालयाचे पत्र क्र. कक्ष-२३(२)/वजी/सर्व्हे/प्र.क्र.१६३/४३७७, दिनांक २९/११/२०२४.
५. या कार्यालयास उद्देशुन लिहीलेले आपले कार्यालयीन पत्र क्र. कक्ष-२/जमीन/प्र.क्र.५८/२८२, दिनांक १९/०६/२०२५.

केंद्र शासनाने सदर प्रस्तावाचे अनुषंगाने संदर्भ पत्र-१ अन्वये A. Environmental Management and Biodiversity Conservation मधील अनु क्र. vi वर खालीलप्रमाणे अट घालून दिलेली होती.

vi. Certificate and certified map from Chief Wildlife Warden shall be submitted mentioning that project boundary is located outside the Eco-Sensitive Zone (ESZ)/ Wildlife Sanctuary and no Tiger/elephant corridor /critically polluted area falls within 10 km. of Project site.

वरील अट क्रमांक vi नुसार प्रस्तावित प्रकल्प क्षेत्राचे हद्दीपासून २.२१ कि.मी. अंतरावर कळसूबाई हरिश्चंद्रगड वन्यजीव अभयारण्य आहे. तसेच सदर अभयारण्याच्या पर्यावरण संवेदनशील क्षेत्रापासून प्रकल्प क्षेत्राच्या हद्दीचे अंतर १२.५ मी. आहे. उपरोक्त संदर्भिय पत्र-२ अन्वये प्राप्त झालेल्या अहवालानुसार

उपवनसंरक्षक (वन्यजीव), नाशिक यांनी सदर प्रकल्प क्षेत्र व परिसर हे राष्ट्रीय व्याघ्र संवर्धन प्राधिकरण (NTCA) च्या संकेत स्थळावर असलेल्या निर्णय समर्थन प्रणाली (DSS) वर तपासणी करून, सदर क्षेत्र व्याघ्र भ्रमण मार्गाचा भाग नसल्याचे कळविले होते. तसेच सदर क्षेत्र हत्ती भ्रमण मार्ग देखील नसल्याचे या कार्यालयास कळविले होते.

प्रकरणी संदर्भिय पत्र-३ अन्वये प्राप्त झालेला नकाशा मुख्य वन्यजीव रक्षक, तथा अपर प्रधाना मुख्य वनसंरक्षक (वन्यजीव), महाराष्ट्र राज्य यांचेकडून सांक्षाकन करून यासोबत सहपत्रीत करण्यात आलेला होता. तसेच सदरचा प्रकल्प हा Hydro Project या प्रकारातला असल्यामुळे व सदरचे क्षेत्र कळसुबाई हरिश्चंद्रगड वन्यजीव अभयारण्याचे पर्यावरण संवेदनशील क्षेत्रापासून १२.५ मी. अंतरावर येत असल्यामुळे, आपलेकडून वन्यजीव संवर्धन आराखडा मागविण्यात आलेला होता.

सदर प्रकरणी रु. ३२६.५० लक्ष रक्कमेचा वन्यजीव संवर्धन आणि जैवविविधता व्यवस्थापन आराखडयास या कार्यालयाचे संदर्भ पत्र ४ अन्वये मान्यता प्रदान करण्यात आलेली होती.

आता, विषयांकित प्रकरणी आपले कार्यालयीन संदर्भ पत्र ५ अन्वये जे.एस.डब्ल्यू. एनर्जी, पीएसपी -२, लि. मुंबई यांचेकडून उपरोक्त २४३.७४ हे. वनजमीन वन (संवर्धन) अधिनियम १९८० अंतर्गत वळतीकरण व परवानगी मिळणेकामी प्राप्त झालेनंतर सदर प्रस्तावाचे अवलोकन तसेच वळतीकरण क्षेत्राचे स्थळ निरीक्षण केले असता, प्रकल्प यंत्रणेकडून सादर करण्यात आलेला वन्यजीव व्यवस्थापन आराखडा हा प्रत्यक्षात स्थळावर असलेल्या परिस्थितीनुसार (Site Specific) आढळून न आल्यामुळे सुधारित वन्यजीव व्यवस्थापन आराखडा शिफारसीसह या कार्यालयास प्राप्त झालेला आहे. त्याचा तपशील खालील प्रमाणे आहे.

Cost of Wildlife and Biodiversity Management Plan

Sr. No.	Activities	Amount (in rs. Lakhs)
1.	Removal of invasive species eg. Lantana, glyricidia, etc.	20.00
2.	Fodder Development work in Igatpuri subdivision	25.00
3.	Raising nursery for fodder species	15.00
4.	Construction of Watch Tower in Igatpuri CR	10.00
5.	Camera traps for wildlife monitoring	15.50
6.	GPS equipment	10.00
7.	Rescue equipment for HWC in Igatpuri and Sinnar	10.00
8.	First Aid Kits to Schools	10.00
9.	Provision of Rescue Vehicle /Patrolling Vehicle (2)	30.00
10.	Training of Staff /capacity building for HWC	15.00
11.	Management of Vulture restaurant	10.00

12.	Equipment and instruments for Rapid Rescue Team	15.00
13.	Awareness signages in CR	10.00
14.	Awareness about wildlife issues in schools	5.00
15.	Monitoring of implementation by CWLW office	5.00
16.	Protection hut(s) in CR	15.00
17.	Water holes with Solar Pump in CR	10.00
18.	Rescue equipment for HWC	25.00
19.	Training of staff/capacity building for HWC	25.00
20.	Awareness about wildlife issues in schools	16.00
21.	Habitat development works	30.00
Total cost		326.50

वरील बाबनिहाय सुधारित रू. ३२६.५० लक्ष रक्कम असलेला वन्यजीव संवर्धन आणि जैवविविधता व्यवस्थापन आराखडा वन्यजीव व्यवस्थापनाच्या दृष्टीने पोषक स्वरूपाचा असल्यामुळे, त्यांस मान्यता प्रदान करण्यात येत आहे.

(Handwritten Signature)

(एम. श्रीनिवास राव)
मुख्य वन्यजीव रक्षक तथा
प्रधान मुख्य वनसंरक्षक (वन्यजीव),
महाराष्ट्र राज्य

प्रतिलिपी : मुख्य वनसंरक्षक (वन्यजीव) पश्चिम, मुंबई यांना माहितीस व आवश्यक कार्यवाहीस अग्रेषित.

प्रतिलिपी : उपवनसंरक्षक (वन्यजीव), नाशिक यांना माहितीस व आवश्यक पुढील कार्यवाहीस अग्रेषित.

प्रतिलिपी : JSW Energy PSP Two Limited, JSW Centre, Bandra Kurla Complex, Bandra East, Mumbai-400051 यांना माहितीस व आवश्यक पुढील कार्यवाहीस अग्रेषित.

Email- lalit.bora@jsw.in



Energy PSP Two Limited
 Regd. Office: JSW Centre,
 Bandra Kurla Complex,
 Bandra (East), Mumbai – 400 051,
 CIN: U40106MH2021PLC367136
 Phone: 022-4286 1000
 Fax: 022-4286 3000

UNDERTAKING

The JSW Energy PSP Two Limited, JSW Centre, Bandra Kurla Complex, Bandra East, Mumbai-400 051 is intending to construct Pumped Storage Project (1500 MW) in Thane & Nasik Districts of Maharashtra State.

1. The Government of Maharashtra has signed a Memorandum of Understanding with the JSW Energy PSP Two Limited, on 14th day of September, 2021, for facilitating setting up of a Hydro Energy Project in Thane & Nasik districts of Maharashtra State as per existing policy framework.
2. The land proposed for the project involves Reserved Forests and Private Forests (Deemed Reserved Forest) Land to the extent of 243.74 Ha.
3. A total of 243.74 hectares of forest land includes a proposed area of 62.29 hectares located in the village of Jamunde, within the Igatpuri Range of Nashik. This specific land is designated as part of forest land Survey no. 42.
4. There are five Survey nos. 37, 38, 39, 40, and 41 located within the Survey no. 42 that are also belongs to the Forest Department; however, they do not need to be diverted for the project.
5. We, JSW Energy PSP Two Limited, hereby confirm that Survey nos. 37, 38, 39, 40, and 41 are not necessary for diversion for the project.

Date: 26 / 09 / 2025

Place: Mumbai

Office Seal:




 (Lalit Parab)

Authorized Signatory,
 JSW Energy PSP Two Limited
 JSW Centre, Bandra Kurla Complex,
 Bandra East, Mumbai- 400 051



Part of O.P. Jindal Group

EIA
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**CATCHMENT AREA TREATMENT PLAN
OF
BHAVALI PUMPED STORAGE PROJECT (5 X 250 + 2 X 125
MW)**

District Nasik & Thane

Maharashtra

Section 1(c)(i) River Valley Project, Category "A"

June, 2023

Project Proponent:



JSW Energy PSP Two Limited

**JSW Centre, Bandra Kurla Complex,
Bandra East, Mumbai,
Maharashtra**

Submitted By:



EQMS GLOBAL PVT. LTD.

(Formerly EQMS India Pvt. Ltd.)

**305, 3rd Floor, Plot No. 16, Rishabh Corporate Tower,
Community Centre, Karkardooma, Delhi – 110092
Phone: 011-43062757;**

Website: www.eqmsglobal.com ; E-mail – kahmad@eqmsglobal.com



NABET Certificate No: NABET/EIA/1922/RA0197



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1 CATCHMENT AREA TREATMENT PLAN

1.1 OVERVIEW OF PROJECT

The proposed Bhavali Pumped Storage Project is a self-identified, green field project by the JSW Energy PSP Two Ltd. The project, conceived as an off-stream closed loop project of installed capacity 1500 MW 12000 MWH pumped storage component with 8.0 hours storage capacity for peak power shall be located in District Nashik and Thane, Maharashtra. It will encompass an upper reservoir and a lower reservoir, to be located in natural depressions near ridge separating the two districts. The upper reservoir (CA:4.40sq.km), proposed to be located in village Jamunde, Tehsil Igatpuri, District Nashik, shall be created by constructing 930m long rockfill dam with maximum height of 56m from NSL. It shall have gross and dead storage of 13.073MCM (0.46 TMC) and 1.654MCM (0.06 TMC) respectively by keeping FRL & MDDL at EL 737.00m & EL 711.00m respectively. The lower reservoir (CA:7.32 sq.km), proposed to be in village Kalbhonde, Tehsil Shahpur, District Thane, shall be created by constructing 330.50 m long rockfill dam with maximum height of 70m from NSL. It shall have gross and dead storage of 12.736MCM and 1.428 MCM respectively by keeping FRL & MDDL at EL 300.00m & EL 270.00m respectively. The upper and lower reservoir are proposed with a live storage of 11. 419MCM. The Project will generate 1500 MW by utilizing a design discharge of 326.42 cumecs with net head of 428.43m and 65.28 cumec with a rated head of 428.43 m respectively for larger and smaller unit. The PSP will utilize 1615 MW to pump 11.419MCM of water from lower reservoir to the upper reservoir. Layout of project is shown in Figure 1.1.

Water for one-time initial filling of upper reservoir shall be from the yield from the self-catchment of lower reservoir and used cyclically for energy storage and discharge. Evaporation and seepage losses will be recouped periodically from catchment of lower reservoir planned on Chornai Nala in upper catchment of Bhatsa dam.

1.2 NECESSITY FOR CATCHMENT AREA PLAN

The study of erosion and sediment yield from catchment is of utmost importance as the deposition of sediment in reservoir reduces its capacity, thus affecting the water available for the designated use. The eroded sediment from catchment when deposited on streambeds and banks causes braiding of river reach. The removal of top fertile soil from catchment also adversely affects the agricultural production. Another important factor that adds to the sediment load and which contributes to soil degradation is grazing pressure. A large number of cattle, sheep, and goats graze the pastures continuously throughout the year.

Catchment Area Treatment Plan has been prepared for areas with high soil erosion intensity. The CAT Plan targets towards overall improvement in the environmental conditions of the region. All the activities are aimed at treating the degraded and potential areas with very severe soil erosion. The plan provides benefits due to biological and engineering measures and its utility in maintaining the ecosystem health. The plan with objectives addresses issues such as prevention of gully erosion,





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Catchment Area Treatment Plan

enhancing the forest cover for increasing soil holding capacity; and arresting total sediment flow in the reservoir and flowing waters.

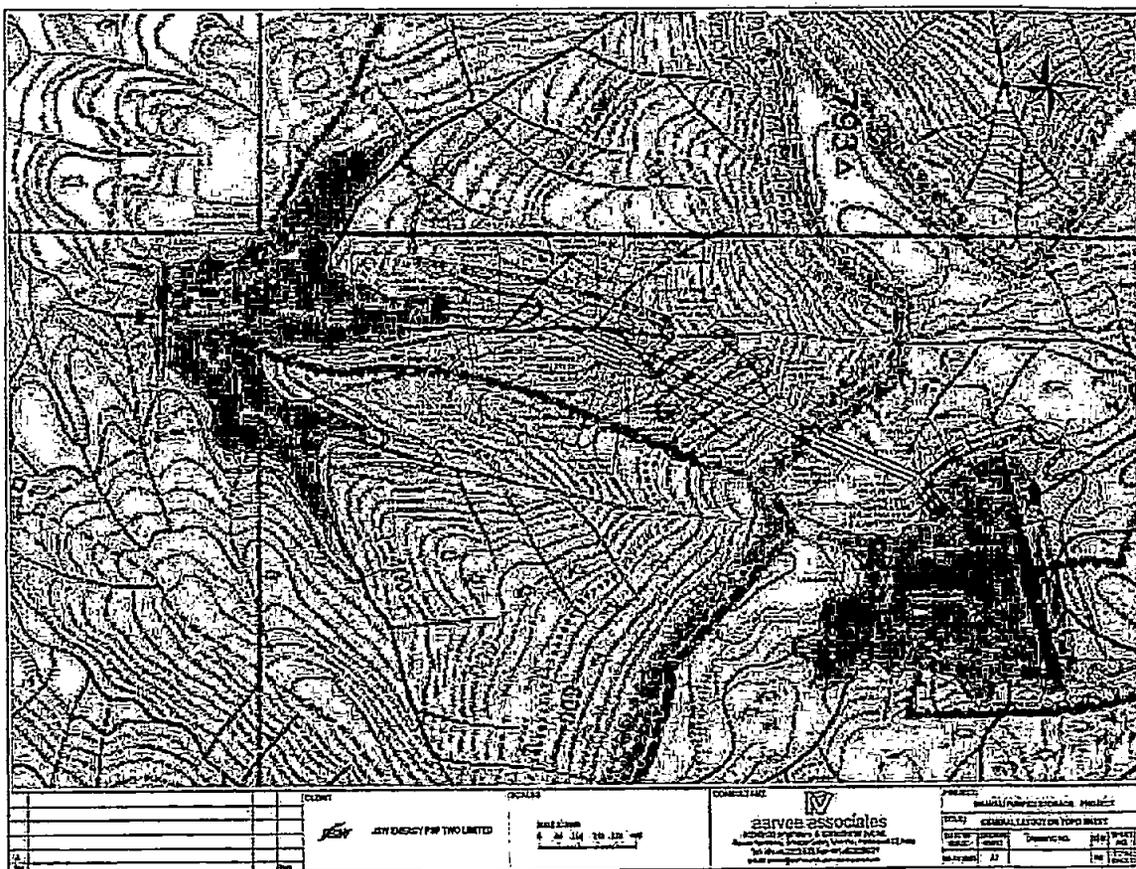


Figure 1.1 : Layout Map of Project on Toposheet

1.3 OBJECTIVES

The CAT Plan targets towards overall improvement in the environmental conditions of the region. All the activities are aimed at treating the degraded and potential areas with severe soil erosion. The plan with objectives addresses issues such as prevention of gully erosion, enhancing the forest cover for increasing soil holding capacity; and arresting total sediment flow in the reservoir and flowing waters. Catchment Area Treatment Plan has been prepared for areas with high soil erosion intensity.





1.4 DELINEATION OF CATCHMENT AREA

The total catchment area of draining into upper and lower reservoirs is 11.72 sq.km of which intercepted catchment is nil. The area under different sub-watersheds is illustrated in Table 1.1 and the satellite imagery of the catchment is presented in Figure 1.2 and Sub watershed location in Figure 1.3.

Table 1.1 : Basin Characteristics of Different Sub-watersheds

Sl. No.	Sub-watersheds	Catchment area of SWS (ha.)	Highest Elevation (masl)
1	4E8D5(1)	440	910
2	5B2B6(1)	319	793
3	5B2B6(2)	413	760
	Total	1172	-



Figure 1.2 : Google Image of Catchment Area





Catchment Area Treatment Plan

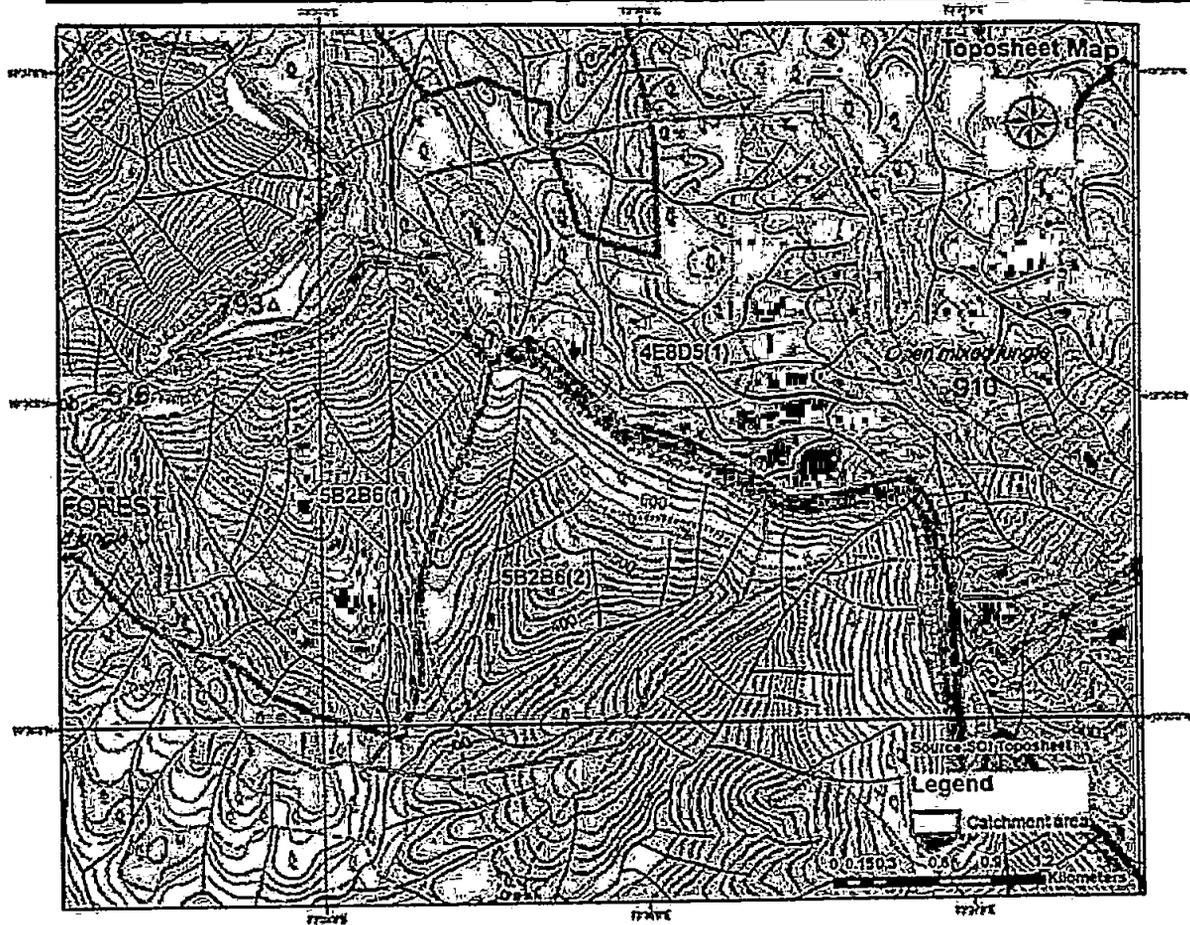


Figure 1.3 : Location of Sub-watershed

1.5 TOPOGRAPHY & BASIN CHARACTERISTICS

The project area lies in Northern Western Ghats (Sahyadri Mountain) and comprises of varied topography. The distinct physiographic units are the main system of Sahyadri hill ranges with plains of Darna River valley and Bhatsa river, tributary of the western flowing Ulhas River, separated by the hill ridge forming boundary between Nashik and Thane Districts.

The upper reservoir is receiving run off from two third order streams in the upper reaches of Darna River (Upper Godavari basin). The lower reservoir is receiving run off from two second order streams which confluence to form a third order stream within the reservoir. These streams are located in head reaches of Chorna Nadi, a tributary of Bhatsa river which in turn is a tributary of Western Flowing River (WFR) viz., Ulhas River. The catchment area of upper reservoir has hilly topography with the ground slopes from south to north. In the catchment area the ground elevation ranges between El. 700 m to El. 910 m. The catchment area of lower reservoir has hilly topography with the ground slopes from south to north. In the catchment area the ground elevation ranges between El. 300 m to El. 793 m. The





catchment is characterized by hill ranges, escapements, cliffs. The drainage pattern of the catchment is dendritic. above msl. The hills of the catchment are part of Western Ghats.

1.6 SOIL

The soil resource maps Maharashtra have been used in the present study. The soil is predominantly loamy and is described in Table 1.2 and the soil map is presented in Figure 1.4.

Table 1.2 : Soil Types and Their Description with Taxonomy

Soil Unit	Description
33	Shallow, well drained, loamy soils on moderately steeply sloping dissected hills and intervening valleys with severe erosion; associated with very shallow, well drained, loamy soils on gently sloping lands with moderate erosion.

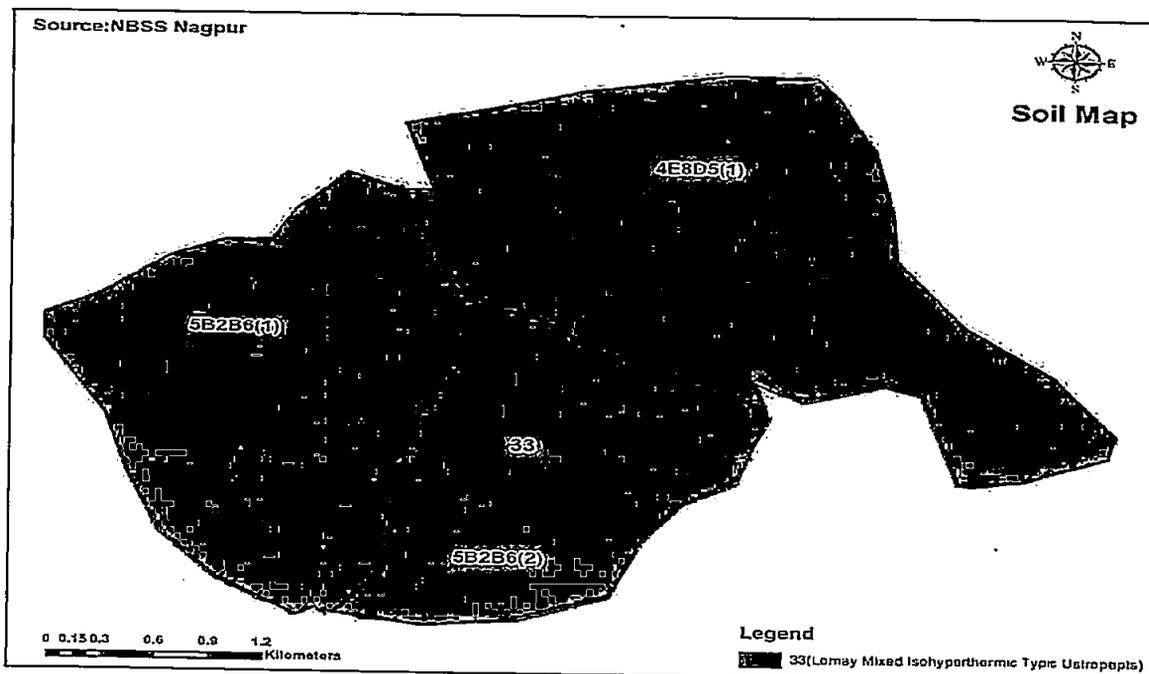


Figure 1.4 : Soil Map of Catchment Area

1.7 LAND USE

1.7.1 Land use-Land cover Classification

Based on satellite data and topo-sheets, a land-use map has been prepared. The Land use/ Land-cover map of the catchment area is presented in Figure 1.5 and its details in Table 1.3.





1.7.2 Land use Categories and Erosion

The erosion acts differently in different land-use types. It is important to understand the nature of erosion in a particular land-use class to further plan for treatment.

1.7.3 Settlement

8 ha area of the catchment constituting 0.68 % of the total catchment comes under this category. Settlement area is well-planned on developed terraces and provided with storm water drainage system. The roads in settlement area are all black topped/concrete paved were seen at some places. The category needs no treatment

1.7.4 Vegetation/Forest

Around 207 ha area constituting 17.66% of the catchment area is classified under this land-use category. Enrichment or gap plantation is suggested for such land-use category. Silvi-pasture plantation and natural regeneration can also be done.

1.7.5 Open Forest Land

Under open forest category about 668 ha, constituting 57% of the total catchment area exists in the catchment. Soils have relatively good water holding capacity, humus, nutrient content and high to moderate erosion rates on steeper slopes. Afforestation is suggested so as increase the crown density by 20% in whole of the area to reduce erosion. Gullies, frequent land slips and high to extremely high erosion rates are other prominent features. Stream bank protection works followed by well-planned afforestation are suggested for such land-use category.

1.7.6 River / Water body

Around 17 ha area constituting 1.45 % of the catchment area is classified under water bodies. The category needs no treatment except that the unstable bank shall be provided stream bank stabilization through protection measures whenever required.

1.7.7 Escarpment

About 80 ha area constituting 6.83% of the catchment is covered under this classification.

Table 1.3 : Land Use Details of Catchment (Sq.km)

Class	4E8D5(1)	5B2B6(1)	5B2B6(2)	Total	%
Agricultural Land	0.70	0.59	0.63	1.92	16.38
Open Scrub Land	2.76	2.23	1.69	6.68	57.00
Settlement	0.08	0.00	0.00	0.08	0.68
Escarpment	0.17	0.28	0.35	0.80	6.83
Water body	0.04	0.05	0.08	0.17	1.45
Vegetation	0.65	0.98	0.44	2.07	17.66
	4.40	4.13	3.19	11.72	100.00



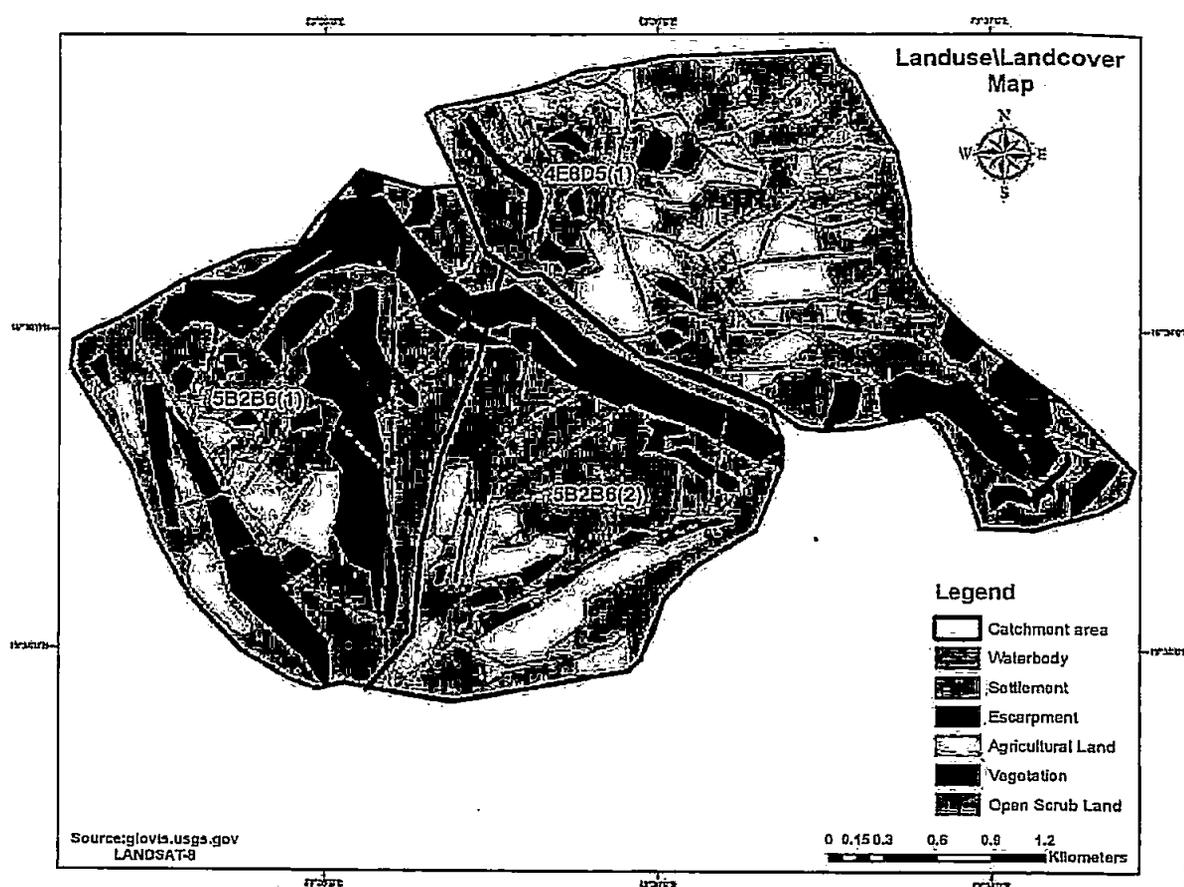


Figure 1.5 : Land use Map of Catchment Area

1.8 SLOPE

The slope of a watershed plays an important role in controlling the soil and water retention thereby affecting the land-use capability. The percentage of the slope in a watershed determines the soil erosion susceptibility and forms the basis for classifying different of the watershed into suitable classes for formulating effective soil erosion conservation measures. Broadly, the following slope classes and ranges (Table 1.4) as per norms of All India Soil & Land Use Survey were adopted to classify the slopes for the present study.

Table 1.4 : Slope Ranges

Sr. No.	Slope Range (Degrees)	Description
1.	0-5	Very Gently Sloping
2.	5-10	Gently Sloping
3.	10-15	Moderately Sloping
4.	15-20	Moderately Steep Slope
5.	>20	Steep Slope





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Catchment Area Treatment Plan

The slope map of the catchment is presented in Figure 1.6 and slope details are as presented under Table 1.5. The data shows that about 53.24 % area lies between very gently to gently sloping category and balance 46.76% falls from moderately to steep category.

Table 1.5 : Area Under Different Slope Classes (Area in Sq.km.)

Sub-watershed	V. Gently Sloping	Gently Sloping	Moderate Sloping	Moderately Steep slope	Steep Slope	Total
4E8D5 (1)	1.11	1.93	0.99	0.17	0.20	4.40
5B2B6 (1)	0.88	1.05	1.13	0.60	0.47	4.13
5B2B6 (2)	0.65	0.62	1.18	0.32	0.42	3.19
Total	2.64	3.60	3.3	1.09	1.09	11.72
%	22.52	30.72	28.16	9.30	9.30	100.00

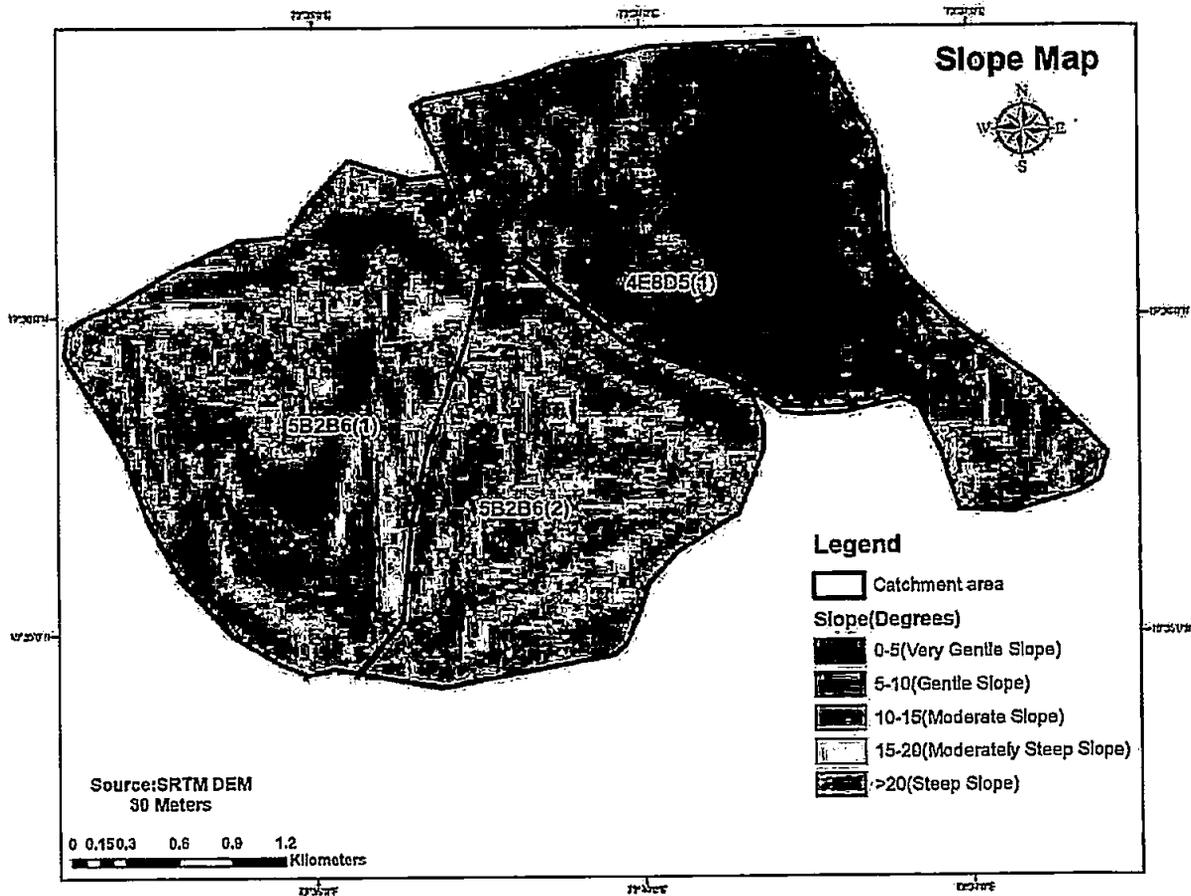


Figure 1.6 : Slope Map of Catchment Area





1.9 METHODOLOGY USED FOR STUDY

Superimposing topography, slope, soil and land use data/maps, a tentative estimation of erosion prone areas and landslides area in the catchment were made. The vulnerable and problematic areas were identified in different physiographic zones. These data sets were used for preparation of the thematic maps, calculation of sediment yield index and Erosion Intensity Units.

1.9.1 Soil Loss Using Silt Yield Index (SYI) Method

- The Silt Yield Index Model (SYI), considering sedimentation as product of erosivity, erodibility and aerial extent was conceptualized in the All-India Soil and Land Use Survey (AISLUS) as early as 1969 and has been in operational use since then to meet the requirements of prioritization of smaller hydrologic units within river valley project catchment areas.
- Methodology for the calculation of sediment yield index developed by All India Soil & Land Use Survey (Development of Agriculture, Govt. of India) was followed in this study.
- Determination of erosion intensity unit is primarily based upon the integrated information on soil characters, physiography, slope, land-use/land-cover, lithology and structure. This is achieved through super-imposition of different thematic map overlays. Based upon the field data collected during the field survey and published data, weightage value and delivery ration were assigned to each erosion intensity unit. The composite map for delineating different erosion intensity units was prepared through superimposition of the maps showing soil types, slope and land-use/land-cover. This thematic mapping of erosion intensity for entire catchment was done using the overlay and union techniques. Based on ground truth verification conducted during fieldwork and published data, weightage and delivery ratio was assigned to each erosion intensity units. The composite erosion intensity map was then superimposed on the drainage map with sub-watershed boundaries to evolve CEIU for individual sub-watershed.
- Each element of erosion intensity unit is assigned a weightage value. The cumulative weightage values of the erosion intensity units represent approximately the relative comparative erosion intensity within the watersheds. A basic factor of $K=10$ was used in determining the cumulative weightage values. The value of 10 indicated an equilibrium condition between erosion and deposition. Any value of $K (10+X)$ is suggestive of erosion intensity in an ascending order whereas the value of $K (10-X)$ is suggestive of deposition intensity in descending order.
- The delivery ratios were calculated for each composite erosion intensity unit. The delivery ration suggests the percentage of eroded material that finally finds entry into the reservoir or river/stream. Total area of different erosion intensity classes (composite erosion intensity unit) in each watershed was then calculated.
- The delivery ratio is generally governed by the type of material, soil erosion, relief length ratio, cover conditions, distance from the nearest stream, etc. However, in the present study the delivery rations to the erosion intensity units were assigned upon their distance from the nearest stream (being the most important factor responsible for delivery of the sediments) according to the following scheme. The delivery ratio criteria adopted for the study is presented in Table 1.6.

Table 1.6 : Delivery Ratio (DR) Criteria Adopted

Nearest Stream	Delivery Ratio (DR)
0-0.9 km	1.00
1.0-2.0 km	0.90
2.1-5.0 km	0.80





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5.1-15.0 km	0.70
15.1-30.0 km	0.50

1.9.2 Sediment Yield Index & Prioritization of Sub-Watersheds

- The erosivity determinates are the climatic factors and soil and land attributes that have direct or reciprocal bearing on the units of the detached soil material. The relationship can be expressed as:

Soil erosivity = f (Climate, physiography, slope, soil parameters land use/land cover, soil management)

- The Silt Yield Index (SYI) is defined as the Yield per unit area and SYI value for hydrologic unit is obtained by taking the weightage arithmetic mean of the products of the weightage value and delivery ratio over the entire area of the hydrologic unit by using suitable empirical equation.
- Prioritization of smaller hydrological units within the vast catchments is based on the SYI of the smaller units. The boundary values of range of SYI values for different priority categories are arrived at by studying the frequency distribution of SYI values and locating the suitable breaking point. The watersheds/sub-watersheds are subsequently rated into various categories corresponding to their respective SYI values.
- The application of SYI model for prioritization of sub-watersheds in the catchment areas involves the evaluation of:
 - Climatic factors comprising total precipitation, its frequency and intensity
 - Geomorphic factors comprising land forms, physiography, slope and drainage characteristics
 - Surface cover factors governing the flow hydraulics
 - Management factors.
- The data on climatic factors can be obtained for different locations in the catchment area from the meteorological stations whereas the field investigations are required for estimating the other attributes.
- The various steps involved in the application of model are:
 - Preparation of a framework of sub-watershed through systematic delineation
 - Rapid reconnaissance surveys on 1:50,000 scale leading to the generation of a map indicating erosion-intensity mapping units.
 - Assignment of weightage values to various mapping units based on relative silt-yield potential.
 - Computing Silt Yield Index for individual watersheds/sub watersheds.
 - Grading of watersheds/sub-watersheds into very high, high medium, low and very low priority categories.
- The area of each of the mapping units is computed and silt yield indices of individual sub-watersheds are calculated using the following equations:

Silt Yield Index

$SYI = (A_i \times W_i \times D_i) \times 100/A_w$; where $i = 1$ to n





Where

- A_i = Area of ith (EIMU)
- W_i = Weightage value of ith mapping unit
- D_i = Delivery ratio
- n = No. of mapping units
- A_w = Total area of sub-watershed

The SYI values for classification of various categories of erosion intensity rates were taken for the present study as:

	<u>Priority Category</u>	<u>SYI Values</u>
1.	Very High	>1300
2.	High	1200-1299
3.	Medium	1100-1199
4.	Low	1000-1099
5.	Very low	<1000

The sediment Yield Index calculated for sub-watersheds is presented in Table 1.7.

Table 1.7 : SYI and Priority Rating as per Erosion Intensity

SWS code	Erosion intensity	Area (ha)	Weightage	Area x weightage	Delivery ratio	Gross silt yield	SYI	Priority
4E8D5 (1)	Severe	21	17	357	0.8	285.6	1075	Low
	Moderate	54	15	810	0.8	648		
	Slight	361	13	4693	0.8	3754.4		
	Total	436		0		4688		
5B2B6 (1)	Severe	112	17	1904	0.8	1523.2	1165	Medium
	Moderate	95	15	1425	0.8	1140		
	Slight	201	13	2613	0.8	2090.4		
	Total	408		0		4753.6		
5B2B6(2)	Severe	106	17	1802	0.8	1441.6	1210	High
	Moderate	119	15	1785	0.8	1428		
	Slight	86	13	1118	0.8	894.4		
	Total	3.11		0		3764		





1.10 CATCHMENT AREA TREATMENT PLAN

It is known that there are mainly five categories of Land uses for which a proper treatment plan should be developed. First is the Agricultural Land as this activity can never be eliminated, because the faulty practice results in heavy loss of fertile soil. Second, being open forest land for obvious conservation reasons. Third is scrub or degraded land, which contributes heavily to the silt load and possibilities exist to bring this area under pastures and other plantation to meet the local demand of fuel and fodder and thus decreasing the biotic pressure on the forests and leading to environment friendly approach of sustainable development. The fourth and most important category is Barren land because with practically no vegetal cover, the area produces huge amount of silt load. The fifth is dense forest land where in a few places soil conservation measures are required. For treatment of catchment area, the areas that require treatment have been delineated from the Composite Erosion Intensity Unit Map. The sum of weightages was reclassified as per the Table 1.8 below to further subdivide the area as per the erosion intensity classes. The weightages for Land use, Slope & Soil were summed to get the Erosion Intensity Classes.

Table 1.8 : Erosion Intensity & Weightages

Erosion Intensity Class	Sum of weightages
Very severe (E5)	12 to 14
Severe (E4)	9 to 11
Moderate (E3)	6 to 8
Low (E2)	4 to 5
Negligible (E1)	0 to 3

Considering the topographic factors, soil type, climate, land-use/land-cover in the catchment area following engineering and biological measures have been proposed to be undertaken with the aim to check the soil erosion, prevent/check siltation of reservoir and to maintain its storage capacity in the long run.

The Erosion Intensity Map of the free draining catchment has been generated on the basis of SYI data and is presented in Figure 1.7 and the statistics are presented in Table 1.9.

Table 1.9 : Area (ha) Under Different Erosion Intensity Categories

Sub-watershed	Very Severe	Severe	Moderate	Low	Water bodies	Total
4E8D5 (1)	0	0.21	0.54	3.61	0.04	4.40
5B2B6 (1)	0	1.12	0.95	2.01	0.05	4.13
5B2B6(2)	0	1.06	1.19	0.86	0.08	3.19
Total	0	2.39	2.68	6.48	0.17	11.72



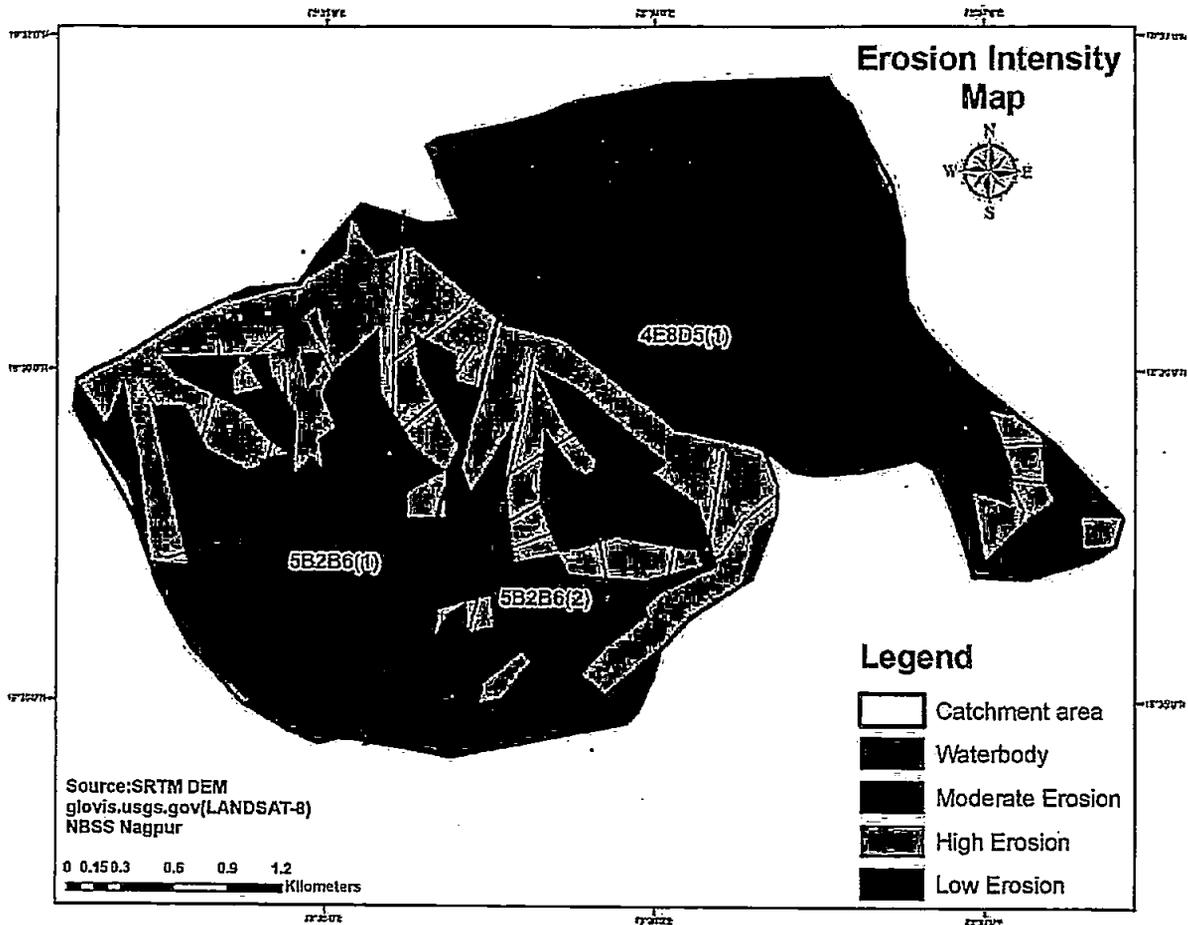


Figure 1.7 : Erosion Intensity Map of Catchment Area

1.11 TREATMENT OF INDIVIDUAL SUB-WATERSHED

Areas falling under very severe and severe erosion would be taken up for conservation treatment measures such as biological and engineering measures under CAT Plan. In the present case, an area of 20 ha has been proposed to be treated by plantation under the CAT plan. Besides this engineering measures will be undertaken.

1.11.1 Normal Afforestation

In critically degraded areas, plantation of locally useful diverse and indigenous plant species such as timber plantation species, fodder species, fuel wood species, grasses, shrubs and legumes, medicinal and aromatic plants would be undertaken. The forestation will include rising of multi-tier mixed vegetation of suitable local species in the steep and sensitive catchment areas of rivers/streams with the objective of keeping such areas under permanent vegetative cover. Furthermore, degraded areas would also be brought under vegetation cover. Suitable trees of economic value to local people shall





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be raised in the degraded forest areas near to villages with the objective of supplementing income of the villagers.

Effective fencing would also be provided for protection of saplings. Before any new area is taken up, eradication of weeds and unpalatable grass species is important. There are a few locations within forest in the catchment area where the crown density is poor and plantation can be done to increase the patch density of crop. In such areas, plantation of 1100 seedlings per hectare is likely to create dense forest.

1.11.2 Civil Structures

➤ Gully Control-Check Dams

Gullies are mainly formed because of physiographic, soil type, and heavy biotic interference in an area. Different types of check dams would be required for different conditions comprising of different materials depending upon the site conditions and the easy availability of material (stones) at local level and transport accessibility. Generally, brush wood check dams are recommended to control the erosion in the first order basin/streams in upper reaches and dry random stone masonry check dam shall be provided in the lower reaches where discharge is higher. In such stream where discharge and velocity of flow are still higher gabion structure shall be provided. Lower down the sub-watershed, i.e., in the third order drainage silt retention dams in the form of gabion structure shall be provided.

➤ Stream bank Protection

Stream bank erosion is caused by variety of reasons such as destruction of vegetative cover, mass movement on unstable bank slopes, undermining of top portion of lower bank by turbulent flow and sliding of slopes when saturated with water. The Stream Bank Protection would include wire crate boulder spurs in two to three tiers depending upon the high flood level of the streams.

1.12 COST UNDER BIOLOGICAL MEASURES

Out of the total stock to be planted under normal afforestation, 20% species shall be tree species having medicinal values and 10% of fruit bearing wild species useful to wildlife shall also be planted. The cost analysis per hectare of afforestation with 1111 plants/ha is based as per Model Rate Structure for raising with cost of fencing inclusive of maintenance for ten years with 5% annual escalation. Considering that the work of raising normal plantation shall commence from year 2024-25, the rate to be adopted for plantation shall be Rs 8.45 lakh/ha in accordance with the Ready Reckoner sanctioned by PCCF(HoEF), M.S. Nagpur letter dated Desk-17/ca/Nodal Cell/CR-40/152/2019-20, Dated 4.10.2019.

Plantation under normal afforestation component shall be carried out in catchment area. Plantations will be maintained for ten years. The cost of works under normal afforestation component for 20 ha area @ Rs 8.45 lakh/ha has been assessed as Rs. 169 lakhs (Table 110)

Table 1.10 : Cost Estimate for Normal Afforestation

SWS	Area Proposed for Normal Plantation (ha)	Rate (Rs lakh/ha)	Total (Rs lakh)
4E8D5 (1)	5	8.45	42.25





JSW Energy PSP Two Limited

Project- BHAVALI PUMPED STORAGE PROJECT (5 X 250 + 2 X 125 MW) in
Nashik & Thane Districts, Maharashtra

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5B2B6 (1)	10	8.45	84.50
5B2B6(2)	5	8.45	42.25
Total	20		169.00

1.13 ENGINEERING WORKS (SOIL & WATER CONSERVATION MEASURES)

Hard (Engineering) structures are to be constructed as landslide control and stream bank stabilization over visually active slides and eroded banks of the main nala and its tributaries falling under "Severe" and "Very Severe" erosion intensity areas to control the sediment flow and further degradation of the catchment areas. Since these measures are to be carried out by construction of individual structure such as wire crate spurs and dry random stone masonry walls/check dams and contour bunding in steep slopes etc. on-site specific basis. The cost of each of such structure has been analyzed on the basis of average dimensions adopted. The analysis of rates of such structures is presented in Table 1.11.

Table 1.11 : Cost Norms for Engineering Works

S. No.	Item	Quantity	Unit	Rate	Amount
1.	Dry Rubble Stone masonry (DRSM) Check Dam				
(a)	Excavation in foundation in all kinds of soil i/c boulders in 5.60 m x 1.80 m x 0.50 m = 5.04 cubic meter	5.04	Cum	116	584.64
(b)	Loading and unloading of rubble stone				
	I-Step 5 x 1.5 x 1.25 = 9.38				
	II - Step 7 x 1.0 x 0.75 = 5.25	23.52	Cum	297.38	6994.14
(c)	Wing Walls 2 x 3.75 x 0.6 x 1.5 = 6.75 Total 21.38 x 1.1 = 23.52				
(d)	Carriage of boulder by road from quarry site to 30 km beyond initial lead up to 1 km (146.40+10.4x25) x1.3	23.52	cum	528.30	12425.62
(e)	Carriage of boulder by manually (head load) total lead up to 150 m @153.8x1.3	23.52	Cum	199.94	4702.59
(f)	Labour charges for dry stone masonry with outer face stone dressed i/c lead upto 1 km and all lifts @706x1.3/cum	23.52	Cum	917.80	21586.67
				Total	46293.66
				Add 2% Contingencies	925.87
				Grand Total Rs.	47219.53
				Say Rs.	47000.00
2.	Wire Crate Check Dam				
(a)	Excavation in foundation in all kinds of soil i/c boulders in 6.60 m x 2.30 m x 0.50 m = 7.59 cubic meter	7.59	Cum	116	880.44
(b)	Loading and unloading of rubble stone	35.24	Cum	297.38	10479.67





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	Foundation Step - 6.0 x 2.0 x 1.0 m = 12 cubic meters				
	I- Step - 6.0 m x 1.9m x 1.0m = 11.40 cubic meter				
	II- Step - 6.0 m x 1.8m x 0.8 m = 8.64 cubic meter				
	Total requirement of boulder = 32.04 x 1.1 = 35.24 cubic meter				
(c)	Carriage of boulder by road from quarry site to 30 km beyond initial lead up to 1 km (146.40+10.4x25) x1.3	35.24	Cum	528.30	18617.29
(d)	Carriage of boulder by manually (head load) total lead up to 150 m @153.8x1.3	35.24	Cum	199.94	7045.89
(e)	Weaving of wire netting of GI wire mesh size 15 cm x 15 cm				
	Foundation Step-2(6x2+6x1+2x1) = 40 m ²	113.2	M ²	30	339.60
	I- Step-2(6x1.9+6x1+2x1) = 38.8 m ²				
	II- Step- 2(6x1.8 + 6x0.8 + 2x0.8) = 34.4 m ²				
	Total = 113.2 m ²				
(f)	Filling of boulder and hand packing in wire crates	35.24	M ³	778.70	27441.39
(g)	Cost of GI wire	2.25	Qtl	10000	22500
(h)	Carriage of boulder by manually (head load) total lead up to 150 m	2.25	Qtl	120	450
Total Rs.					87754.28
Add 3% Contingencies					2632.63
Grand Total Rs.					90386.92
Say Rs.					90400
3	Contour Bunding	1	ha	10000	10000.00

The Break-up of works in respect of civil structures for land slide and stream bank stabilization and moisture retention operations with their costs is shown in Table 1.12.

Table 1.12 : Cost of Engineering Measures

SWS	DRSM check dam @ Rs. 0.47 lakh each		Wire-Crate Check Dam @ Rs. 0.90 lakh each		Total Cost (Rs. lakh)
	No.	Cost	No.	Cost	
4E8D5 (1)	10	4.70	4	3.60	8.30
5B2B6 (1)	30	14.10	8	7.20	21.30
5B2B6 (2)	30	14.10	8	7.20	21.30
	70	32.90	20	18.00	50.90





1.14 COST OF OTHER COMPONENTS OF CAT PLAN

Apart from the forestry works and drainage line treatment in the catchment area there are other aspects of the CAT Plan to be addressed and their cost included in the overall cost estimate of the plan. Provision for micro planning and documentation are some of the integral ingredients, which have to be considered and included while formulating the CAT plans.

1.14.1 Provision for Micro Plans

Based on the ground truth reality in each of the village forest department committee or society under different sub-watersheds, comprehensive micro plan for execution of the work has to be prepared as per norms. The micro plan for each beat shall be with due regards to the environmental functions and productive potential of the forests and their carrying capacity. For this purpose, a provision of Rs. 2.60 lakh is being made.

1.14.2 Provision for Proper Documentation

Emphasis should be laid on the publicity of the work proposed under the plan and work carried out on annual basis so that transparency is maintained and proper documentation of the work is also carried out for future reference and testing the efficacy of the work in due course of time. On this count a provision of Rs. 1.00 lakh is proposed. The documentation would inter alia include implementation report, progress reports, photography, videography etc.

1.14.3 Provision for Forest Protection

The need for rigorous watch and ward of the forest covered under the catchment area becomes more imperative in view of proposed new plantation under the CAT plan and due to increased human activity in the form of labour, who shall be engaged for forestry works. Thus, fire protection measures including construction and maintenance of fire lines shall be carried out. For these a provision of Rs. 11.50 lakh is being earmarked.

1.14.4 Provision for Monitoring and Evaluation

The success of implementation of a CAT Plan can be fathomed by increase in vegetal cover on hill slopes and the enhancement. Various engineering and biological measures have been aimed at treating degraded and potential areas of severe to very severe soil erosion by increasing soil holding capacity and thus reducing sediment flow in the water. Therefore, for recording soil and silt data at regular intervals one small laboratory/observatory shall be established at dam site, where the regular discharges of the streams and silt samples shall be monitored daily for ten years by the project proponent.

A provision of Rs. 5.00 lakh is being made for monitoring and evaluation activities including the expenditure likely to be incurred on conducting meetings / seminar / workshops at the head quarter and outside. This will include payments made to the non-official members of the monitoring



JSW Energy PSP Two Limited
Project- BHAVALI PUMPED STORAGE PROJECT (5 X 250 + 2 X 125 MW) in
Nashik & Thane Districts, Maharashtra

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Catchment Area Treatment Plan

Table 1.14 : Year wise Requirement Funds for Implementing CAT Plan

Sl. No.	Component	1-Y	2-Y	3-Y	4-Y	5-Y	6-Y	7-Y	Total (Rs. Lakh)
1	Habitat treatment works								
(a)	Normal afforestation								
	i. Advance work	34.10	34.10	0.00	0.00	0.00	0.00	0.00	68.20
	ii. Plantation	0.00	27.30	27.30	0.00	0.00	0.00	0.00	54.60
	iii. Maintenance	0.00	0.00	12.80	9.40	8.00	8.00	8.00	46.20
2	Soil and water conservation measure								
(a)	DRSM check dam	0.00	11.75	11.75	9.40	0.00	0.00	0.00	32.90
(b)	Wire crate check dam	0.00	4.50	4.50	4.50	4.50	0.00	0.00	18.00
3	Other Component	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(a)	Micro plans	2.60	0.00	0.00	0.00	0.00	0.00	0.00	2.60
(b)	Documentation	0.00	0.00	0.20	0.20	0.20	0.20	0.20	1.00
(c)	Forest protection	1.00	2.50	2.50	1.50	1.50	1.50	1.00	11.50
(d)	Monitoring and Evaluation	0.00	1.00	1.00	1.00	1.00	0.50	0.50	5.00
(e)	Environmental Services	0.00	2.50	2.50	1.50	1.50	1.50	0.50	10.00
Total		37.70	83.65	62.55	27.50	16.70	11.70	10.20	250.00



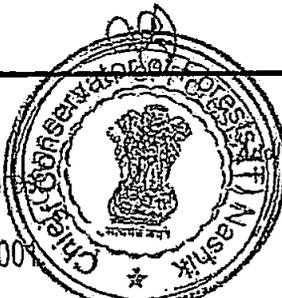
[Handwritten signature]

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ACSO, Nashik

[Handwritten signature]
Deputy Conservator of Forests
West Nashik

EQMS GLOBAL PVT. LTD

(Shernita Biswas)
Principal Chief Conservator Of Forests
(Head Of Forest Force)
Maharashtra State, Nagpur - 440004



(NARESH ZURMURE)
Principal Chief Conservator of Forests
and Nodal Officer
Maharashtra State, Nagpur

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OFFICE OF THE PRINCIPAL CHIEF CONSERVATOR OF FORESTS (HEAD OF FOREST FORCE), MAHARASHTRA STATE, NAGPUR

ADDITIONAL PRINCIPAL CHIEF CONSERVATOR OF FORESTS AND NODAL OFFICER
First Floor, 'B' Wing, Van Bhavan, Civil Lines, Nagpur-440001.

Tel no. 0712-2556916 E-mail- apccfnodal@maharforest.gov.in

No. Desk-17/Nodal/S1/PID- 153240/Thane/367/2023-24
Nagpur - 440 001, Date : 20/05/2025

To,

The Additional Chief Secretary (Forests),
Revenue & Forest Department.,
Mantralaya, Mumbai-32

Sub :- Proposal for diversion of 243.74 ha. (Shahapur division 181.45 ha. and West Nashik Division 62.29 ha.) Forest land for Bhavali Pumped Storage Project (1500 MW) Village Kothale & Kalbhode in Tal. Shahapur, Dist. Thane & Village Jamunde, Tal. Igatpuri, Dist. Nashik in the State of Maharashtra (FP/MH/HYD/153240/2022)

- Ref- 1) The Chief Conservator of Forests (T), Thane letter No.Desk-10/FCA/A-20/CR-80/24-25/OW-13/25-26, dated 05/05/2025.
2) This office letter No. Desk-17/Nodal/S1/PID-153240/Thane/357/25-26, dated 19/05/2025

The Chief Conservator of Forests (T), Thane vide letter under reference No.1 has submitted proposal to this office. Accordingly, this office vide letter under reference No.2 has submitted aforesaid proposal to Government of Maharashtra. Therefore, the copy of the Catchment Area Treatment Plan has approved by the Principal Chief Conservator of Forests (Head of Forest Force) Maharashtra State on note sheet as per Chapter No.9.2 (vii) of the consolidated guidelines and Clarifications issued under Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980. The copy of the same is enclosed herewith for needful action

Encl:- As above

Notesheet approved by the PCCF (HoFF)

Naresh Zurmure
20/5/25

(Naresh Zurmure)

Addl. Principal Chief Conservator of Forests
& Nodal Officer

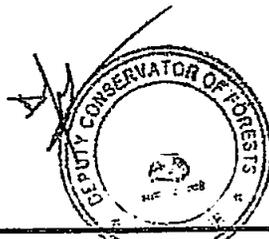
Copy to the Chief Conservator of Forests (T), Thane for information.
Copy to the Deputy Conservator of Forests, Shahapur/Nashik for information.
Copy to the Authorized Signatory, JSW Energy PSP, Limited, Mumbai for information.



Catchment Area Treatment Plan

Table 1.14 : Year wise Requirement Funds for Implementing CAT Plan

Sl. No.	Component	1-Y	2-Y	3-Y	4-Y	5-Y	6-Y	7-Y	Total (Rs. Lakh)
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3	Other Component	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(a)	Micro plans	2.60	0.00	0.00	0.00	0.00	0.00	0.00	2.60
(b)	Documentation	0.00	0.00	0.20	0.20	0.20	0.20	0.20	1.00
(c)	Forest protection	1.00	2.50	2.50	1.50	1.50	1.50	1.00	11.50
(d)	Monitoring and Evaluation	0.00	1.00	1.00	1.00	1.00	0.50	0.50	5.00
(e)	Environmental Services	0.00	2.50	2.50	1.50	1.50	1.50	0.50	10.00
	Total	37.70	83.65	62.55	27.50	16.70	11.70	10.20	250.00



K.P. = F
(K. PRADEEPA)
Chief Conservator of Forests (T)
Thane Circle, Thane.

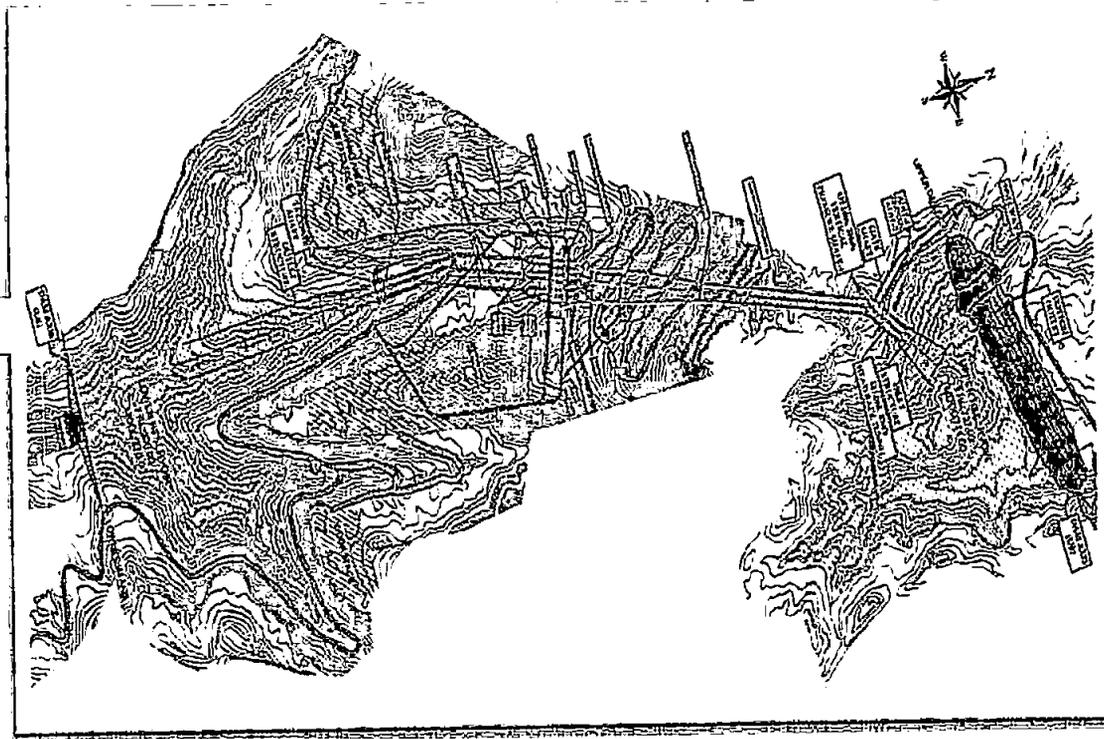


(NARESH ZURMURE)
Adl. Principal Chief Conservator of Forests
and Range Officer
Maharashtra State, Nagpur

(Shomita Biswas)
Principal Chief Conservator Of Forest
(Head Of Forest Force)
Maharashtra State, Nagpur - 440001.

Report on

Study on assessment and mitigation of impact of blasting operations on flora and fauna, nearby man-made structures and the environment during construction of JSW Bhavali Pumped Power Storage Project, Nashik



Submitted to



JSW ENERGY PSP TWO LIMITED

BKC Mumbai

By

CSIR-Central Institute of Mining and Fuel Research
Council of Scientific and Industrial Research, Ministry of Sct & Tech. GOI
CSIR-CIMFR Regional Research Centre Bilaspur
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SEPT 2025

Report on

**Study on Assessment and Mitigation of Impact of Blasting
Operations on Flora and Fauna, Nearby Man-Made Structures
and the Environment during Construction of JSW Bhavali
Pumped Power Storage Project, Nashik**

Sponsored Research Project Report

Disclaimer

This report is meant for internal use of the sponsor organization only and it should not be published in full or part by the sponsor organization or its staff. It should not be communicated/ circulated to outside parties except concerned Government Organizations.

CIMFR reserves the right to publish the results of the research for the benefit of the industry in general.


(Dr. Harsh Kumar Verma)

Sr. Pr. Scientist and Head of Section

अनुभागाध्यक्ष/Head of the Section
सीएसआईआर-केन्द्रीय खनन एवं ईंधन अनुसंधान संस्थान
क्षेत्रीय केन्द्र, बिलासपुर

Executive Summary

M/s JSW Energy PSP Two Ltd. is developing Bhavali Pumped Storage Project (BPSP) with an installed capacity of 1500MW/11670 MWH. The project is located in Igatpuri taluka of Nashik district of Maharashtra state. The project comprises of development of upper & lower reservoirs with a gross storage capacity of 0.436 TMC & 0.468 TMC respectively, out of which upper reservoir to be constructed on the hilltop with maximum dam height of 49.57 m to create the desired storage capacity while the lower reservoir will have maximum dam height of 48.15 m constructed in a natural depression downhill. As per a rough estimate approximately 30.0 lakh cum of hard rock excavation will be carried out using controlled blasting technique during construction of the Bhavali PSP.

JSW Energy PSP Two Limited requested to CSIR-Central Institute of Mining and Fuel Research for technical support and guidance for carrying out control blast design operation during construction of Bhavali PSP with special emphasis to prevent any adverse impact of blasting operation to flora and fauna of Kalsubai Harishchandragad Wildlife Sanctuary. Team of Scientists and staff members conducted a preliminary field investigation to assess the possible impact of blasting operation and evaluate the required mitigation measures.

Construction planning details of Bhavali PSP revealed that the actual operating distance of the quarry boundary from ESZ is 253 m, although, the minimum distance of FRL boundary of upper reservoir is 12.5 m from ESZ at Saddle dam point (fig. 6 of the report). Similarly housing structures of Jamunde village is also approx.. 250 m from the nearest blasting points. As per prevailing standard, the safe permissible limit of 5 mm/s peak particle velocity for all the structure may be considered as safe permissible limit.

CSIR-CIMFR Team made field investigations, reviewed the available safe limit of blast induced ground vibration, air overpressure, Noise, Dusts generation etc. Optimised controlled blast design pattern have been evolved considering the propagation characteristics of vibration and air overpressure in the prevailing rock mass condition. A comprehensive plan to implement various measures for controlling adverse impact of the blasting operation have been suggested.

Recommended measures include, use of advanced explosive and initiating system such as shock tube initiation system, emulsion explosive, varying blast hole dia., and blast design parameters considering the proximity of the ESZ, dust and flyrock control measures, use of blasting mats to suppress noise etc.

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Report on

STUDY ON ASSESSMENT AND MITIGATION OF IMPACT OF BLASTING OPERATIONS ON FLORA AND FAUNA, NEARBY MAN-MADE STRUCTURES AND THE ENVIRONMENT DURING CONSTRUCTION OF JSW BHAVALI PUMPED POWER STORAGE PROJECT, NASHIK

1.0 INTRODUCTION

Pumped Storage Projects (PSPs) are crucial in India's energy ecosystem for balancing supply and demand, ensuring grid stability, and integrating renewable energy sources. They function as a reliable energy storage technology, storing power during periods of low demand and releasing it when needed, particularly during peak hours. PSPs also help smooth out fluctuations in renewable energy generation from sources like wind and solar, preventing grid instability. The Pump storage offers multiple benefits to a power system. In addition to providing energy storage, pumped storage can provide power immediately and can be rapidly adjusted to respond to changes in energy demands. Multiple PSP project are under construction in the country.

M/s JSW Energy PSP Two Ltd is developing Bhavali Pumped Storage Project (BPSP) with an installed capacity of 1500MW/11670 MWH. The importance for Bhavali PSP, indicative installed capacity 1500 MW, in Nashik and Thane district, Maharashtra, has therefore been considered in context of the focus of State Government to increase the share of renewable energy which is available in plenty within the state in general and in the country as whole.

The Project comprises of development of upper & lower reservoirs with a gross storage capacity of 0.436 TMC & 0.468 TMC respectively, out of which upper reservoir to be constructed on the hilltop with maximum dam height of 49.57 m to create the desired storage capacity while the lower reservoir will have maximum height of 48.15 m

constructed in a natural depression downhill. Other project components are Geomembrane Faced Rockfill Dam, & Concrete Spillway, Upper Intake, Penstock, Powerhouse and GIS, Tailrace Tunnel TRT Intake/Lower Intake etc.

As per a rough estimate approximately 64.0 lakh cum of hard rock excavation will be carried out using controlled blasting technique during construction of the Bhavali PSP.

Uncontrolled blasting operation gives rise to problem of ground vibration, noise, flyrock and air over pressure and dust related problem leading to damage to the surrounding environment and structures. All these adverse impact can be reduced to safe tolerance limit by optimising the controlled blast design parameters, use of suitable advance technology and modern scientific methodologies.

Considering the availability of expertise in development and application of various controlled blasting techniques in various similar infrastructure projects with the institute, M/s JSW vide P.O. Letter No. CORP-PSP2/2025-26/1483000148 dated 16.05.2025, requested CSIR-Central Institute of Mining and Fuel Research for carrying out a scientific study initially to assess impact of blasting on surrounding environment and propose mitigation techniques of adverse impact, if any. JSW also requested CSIR-CIMFR to provide technical support in supervision controlled blasting operation during construction of project by deputing scientist and technical staff at site on continuous basis.

This report is an interim report incorporating details of preliminary assessment of impact of blasting operations on nearby environment and structures. It also contains suggestions on techniques and mitigation measures to minimise the impact of blasting operation. During course of the study, emphasis is given to the possible adverse impact to flora and fauna of Kalsubai Harischandragarh Wildlife Sanctuary.

2.0 PROJECT DETAILS

The Geographical co-ordinates of the proposed Pumped Storage Project component of upper reservoir located near to Jamunde Village in Igatpuri Taluk of Nashik district with latitude $19^{\circ}36'31.69''\text{N}$, and Longitude $73^{\circ}35'45.06''\text{N}$ and that of lower reservoir at Kalbhonde village in Shahpur Taluk of Thane district with latitude $19^{\circ}34'56.38''\text{N}$ and longitude $73^{\circ}35'10.00''\text{E}$.

Lay out of the project in plan and L-Section is presented in Fig 1 and Fig. 2 respectively. The project envisages creation of an upper reservoir (gross storage: 12.35 MCM & live storage: 11.08 MCM) by constructing 962.47 m long dam comprising of 822.47 m long Geomembrane faced rockfill dam (GRFD) with maximum height of 48.64 m from foundation, 60 m long and 61 m height ungated spillway with 4 bays of 12.5 m each; 4 blocks of 20 m length each non-overflow section of maximum height of 49.57 m from foundation, two each on either side of spillway. 80 m long saddle dam (maximum height 10 m from foundation) to reduce backwater to enter ESZ area. The lower reservoir (gross storage: 13.26 MCM; live storage: 11.71 MCM) shall be created by constructing concrete gravity dam 365.5 m long at top with maximum height of 48.15 m from foundation and 104 m long, 74 m high (from foundation) ungated spillway with 8 bays of 10.5 m each. Diffuser type Intake structure with 3 intakes (25.5 m x 10.5 m) of 42.44 m length shall be provided.

The water conductor system shall comprise of 67.96 m long three intake tunnels of 7 m diameter each with design discharge of 131.74 cumec each. 5.2 m diameter, followed steel lined pressure shaft 3 nos. of independent, 5.2 m diameter with length varying from 1568.09 m to 1594.89 m, six 3.8 m diameter branch pressure shaft after first bifurcation of design discharge 65.96 cumec each; two 2.9 m diameter 46.83 m long steel lined branch pressure shaft after second bifurcation of design discharge 32.98 cumec each.

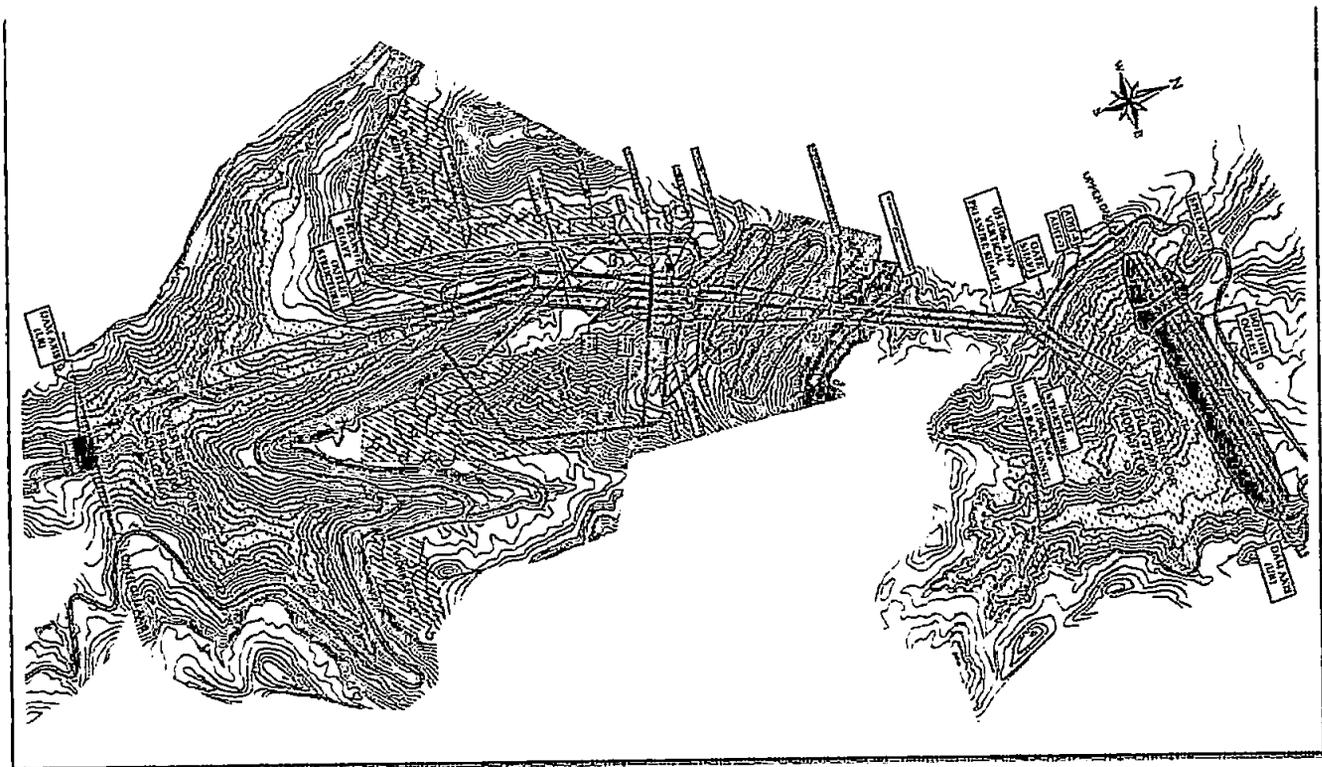


Fig. 1: Lay of Bhavali PSP Project, Igatpuri



Figure 3: Photograph showing Bhavali PSP Project site location in a google map

Underground powerhouse (167 m x 22 m x 52.9 m) housed with 7 No's. Francis vertical shaft reversible pump-turbine (5 X 250 MW & 2 X 125 MW) discharging into circular draft tube 5.20 m and 4.0 m diameter for large and small unit; two four meter diameter concrete lined branch tail race tunnel for 32.98 cumec discharge after 3rd bifurcation; six 5.2 meter diameter concrete lined branch tail race tunnel for 65.78 cumec discharge after 4th bifurcation; followed by three 7 m diameter main tail race tunnel with length varying from 621.17 m to 646.57 m, each discharging 131.74 cumec, 105 m long trapezoidal tail race pool followed by 560 m long trapezoidal tail race channel.

The project will generate 1500 MW by utilizing a design discharge of 394.84 cumecs that includes, 65.78 cumec with rated head of 425.23 m (for larger unit of 250 MW) and 32.98 cumec with rated head of 424.03 m (for smaller unit of 125 MW) for 7.78 hr. The PSP will utilize approx.. 1600 MW to pump 0.391 TMC of water to the upper reservoir in 8.79 hours. Annual energy generation by Bhavali PSP in turbine mode is 4044.06 MU whereas annual energy consumed in pump mode is 5120.53 MU.

3.0 GEOLOGICAL SET-UP OF THE PROJECT

Geological set-up of the project site play important role in controlled blasting operations and it governs propagation characteristics of the blast induced ground vibration and air overpressure. Therefore investigation of geological set-up and review of the geotechnical data of the project site was also carried out.

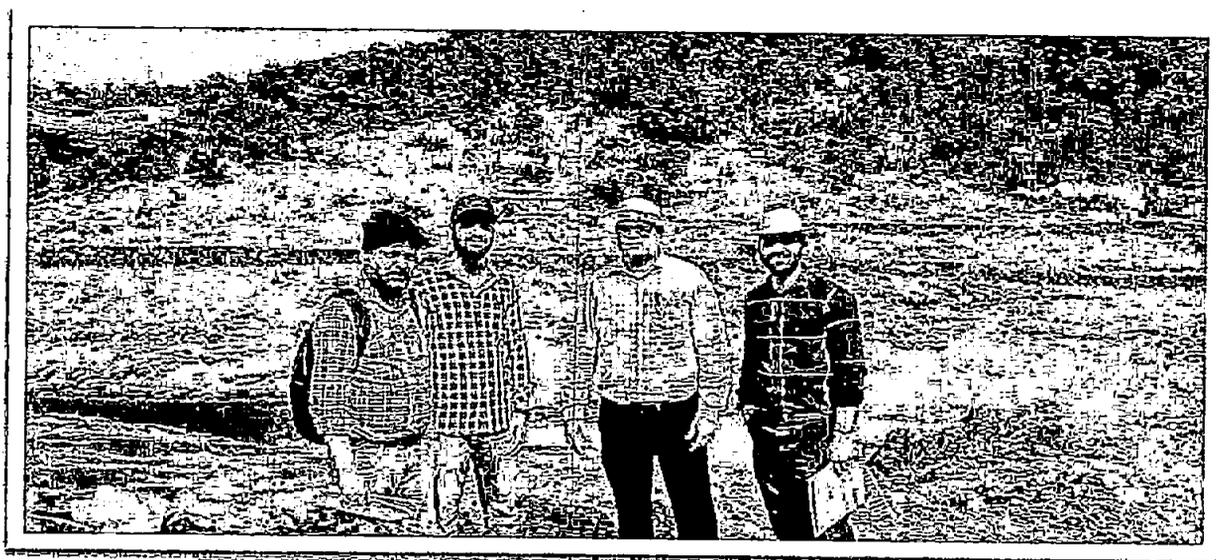


Figure 4: Photographs of field visit of CSIR-CIMFR team to Bhavali Project site

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The proposed PSP site is located on the western margin of Western Ghats of Indian Peninsula, which are occupied by thick pile of Thoilitic Basalt flows, which are stratigraphically termed as 'Deccan Traps'. The Deccan Traps cover a large area of 52000 sq.km covering a major part of Maharashtra, parts of Gujarat, Madhya Pradesh and small parts of coastal Andhra Pradesh. The basalt rock prevailing in the project area make it as hard rock terrain. It is strong rock covering all the component locations such as upper and lower reservoir areas, water conductor system, powerhouse complex and entire length of Tailrace tunnel/channel area.

As per the regional geological setup at and around the project area, the area is occupied by strong basalt rocks/Deccan trap. The rock types, as per this map, mainly belong to the Lower Ratangarh formation which prevails in the upper reservoir/dam, part of the WCS, and powerhouse complex area. In the case of the TRT, the Lower dam/reservoir area, the basalt rocks belong to the Salher formation. Both formations come under the Sahyadri group within the Deccan Trap Super group, belonging to the Cretaceous to Paleocene age. The basalt rock exposed in the project area has been observed to show thick flows and is massive and strong in nature. Amygdaloidal basalt is also observed in the Upper dam area. Weak lithological strata like red bole/green bole beds, which are observed at places in Deccan basalt rocks, are not found in the project area. No such weak layers are encountered in any of the drill holes completed in the project area, right from the upper reservoir, water conductor system, powerhouse complex, TRT/TRC, and lower dam site.

The general trend of the flow direction of basaltic rock in the area, mainly in the upper reservoir area, is observed to be in SE, SW, and NW directions, dipping at 8° to 38° degree at places. Besides flow joints, there are 3-4 sets of joints spaced and are moderately to widely spaced. Rocks are generally strong to very strong, fresh at depth, with slight to moderate weathering effect near the ground surface.

Review of the investigation reports reveals that all the sites of major components of the project are geologically mapped and explored by geophysical survey and number of drill holes. The exploration results confirm the availability of strong basalt rock at both the dam foundations and also along the underground media of tunnels, shafts, caverns etc.

The typical soil type of the area is the medium black cotton variety. There are, however, variations in the type of soil and several different varieties of soils, i.e., greyish black, brownish black, and reddish black soils are also observed. The major geomorphic landforms demarcated are scarp slopes, hills and ridges, dyke ridges, and pedimented plains, The eastern boundaries of both Bhatsa and Kalu basins are marked by steep scarps, while the central and western parts of both basins are marked by gently undulating topography interspersed with hills and ridges.

Geophysical survey using Seismic refraction method and MASW (Multi channel Analysis of Surface wave) have been carried out covering all the major components of Bhavali PSP. The broad findings are given as under. Generally, the S-waves are found to be in the range of 91-110 m/s near ground surface for unconsolidated deposits to 750m/s for the weathered/fragmented rock. Below this zone, increased Swave velocity greater than 2000m/s represents sound quality basement rock which are seen in all the profiles.

Comprehensive investigation through 23 boreholes have been carried out covering entire project components. Investigation report of bore hole survey show a good correlation with the Geophysical survey findings. In general, it is noted that the drill hole data corroborate these geophysical survey findings. The unconsolidated soil or overburden deposits, as described in the preceding paragraphs, also range from less than a meter to a couple of meters. Even the fracture zones or moderately weathered zones, with RQD values less than 50%, are generally confined to depths of 5-7 meters

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or a maximum of up to 10 meters from the ground level. Beyond this depth, generally, fresh, strong, and massive basalt rocks are recovered even in deeper holes.

4.0 STANDARDS ON SAFE LIMIT OF GROUND VIBRATION AND AIR OVERPRESSURE/NOISE

4.1 Ground Vibration

Ground vibration is an important and integral aspect of any blasting process. Damage to the surface or underground structures has been widely correlated with peak particle velocity (PPV) of ground vibrations induced by blasting. In the present study, review of blast vibration monitoring data from different tunnel construction sites with similar geological set-up have been carried out and attenuation characteristics of vibrations in tunnels have been evolved to compute near field vibration level.

When an explosive is detonated inside a blast hole explosive energy is rapidly released in the form of chemical energy in short span of time generating tremendous pressure and temperature. High temperature and pressure environment causes surrounding rock material melt, flow, crush and fracture. After certain distance away from the bore hole, these inelastic process stops and the elastic processes begin to occur. Decay of the energy is very rapid and only apportion of the explosive/ chemical energy is transformed into elastic form. The elastic disturbance propagates away in the form of seismic waves which is also termed as vibration generation zone.

Attenuation of the shock wave energy is very fast due to utilization of this energy in crushing and fracturing. Beyond fracture zone, the energy propagates as seismic wave elastically which is termed as ground vibration. Intensity of the ground vibration is governed by the blasting parameters and characteristics of the propagating medium. Generation of blast induced ground vibrations is shown in Fig 2.28 in the form of flow-chart. It may be noted that the explosive energy

inside a holes instantaneously converts in to shock and gas energy forms. The shock component causes cracks in the rock mass through high intensity of the strain pulse and stress. The cracks formed by the shock energy are further widened by the gas component of the explosive energy. After fragmentation, the energy is utilized in displacement of the rock. Unutilised explosive energy travels in the surrounding rock mass in the form of seismic waves which are termed as blast induced ground vibrations.

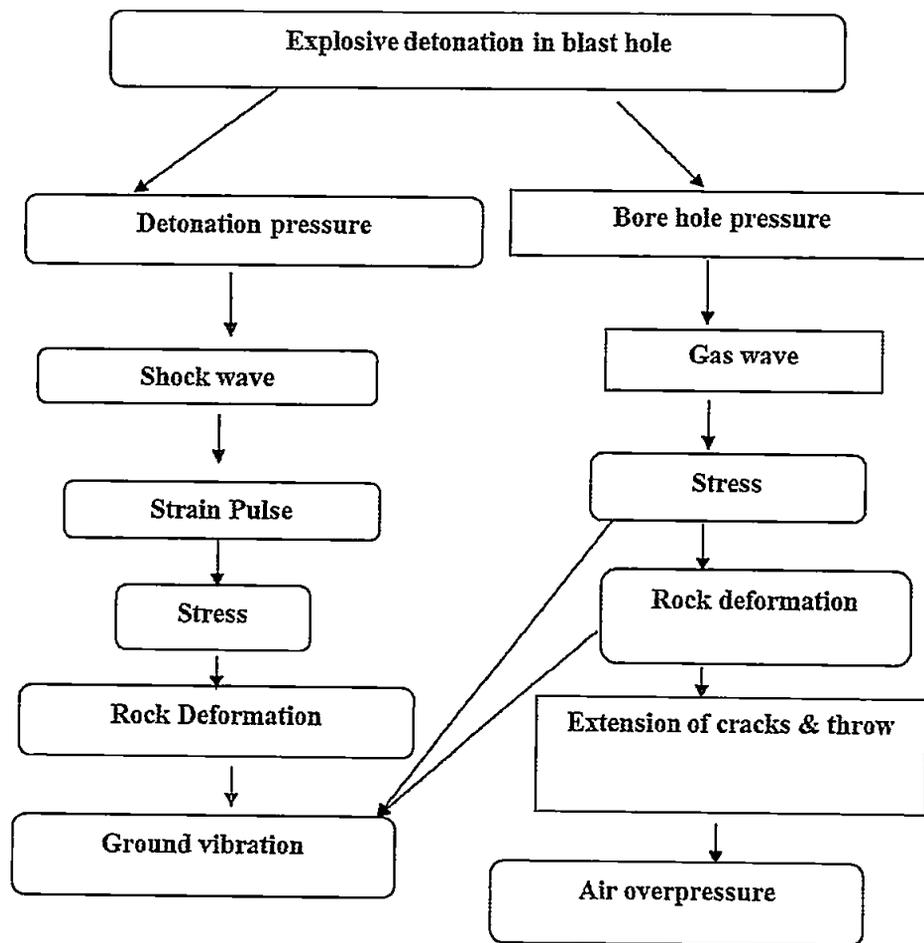


Fig. 5: Generation of Ground Vibrations due to Blasting

Most of the researchers, while formulating prediction model for blast vibration, correlated the amplitude of vibration with quantity of explosive used in a blast round and distance of monitoring location (Blair and Duvall, 1954; Duvall and Petkof, 1959). They concluded that any linear dimension of charge should be

scaled to the cube-root scaled distance due to spherical symmetry. However, in case of long cylindrical explosive charges, the linear dimension will be scaled with square-root of maximum charge per delay.

Review of different prediction models reveal that most of the empirical models provide relations among blast induced ground vibrations (peak particle velocity, V_{ppv} , in mm/s), distance of monitoring point to source (R, m) and maximum explosive charge per delay (W). United States Bureau of Mines (USBM) conducted extensive study on prediction of blast induced vibrations and structural damage. Daemen, (1983) and researchers of USBM (Duvall and Fogelson,1962; Duvall et al., 1963; Siskind et al.,1980) concluded that any linear dimension should be scaled to square root of the explosive charge as shown in Eq. 1.

$$V_{ppv} = K \left(\frac{R}{\sqrt{W}} \right)^{-\beta} \quad \text{(Eq. 1)}$$

Over the years, numerous vibration criteria and standards have been suggested by researchers, organizations, and governmental agencies. Much of this work originated from the mining industry, where vibration from blasting is a critical issue. Different countries have set their own standard on the basis of experimental investigation in the mining industry. As per the present Indian Standards, as mentioned in DGMS (Tech) (S&T) Circular No. 7 dated 29th August, 1997 depending on the type of structures and dominant excitation, the Peak Particle Velocity (PPV) on the ground adjacent to the structure shall not exceed the values given below in the Table 1.

As given in Table 1, DGMS criterion being followed in whole of the country is frequency based damage criterion. The standard specifies that damage potential of the PPV will primarily depend on the frequency of vibration. As the frequency increases, the damage potential of the vibration reduces and hence the safe permissible PPV also goes on increasing. The frequency of the vibration depends on local geological conditions. A

hard massive rock will have higher frequency and a soft jointed rock will have lower frequency. Higher the geological disturbances, less will be the frequency of vibration and therefore safe permissible PPV will also be lesser. Table 7 also reveals that the type of housing structures will decide the maximum safe PPV it can sustain. A domestic house of Kachha brick and cement/ mud-clay can sustain less value of PPV whereas an industrial building with RCC frame will sustain higher level of PPV without incurring any damages

Table 1: Permissible Peak Particle Velocity (PPV) in mm/sec as per DGMS (India) Standard

Type of Structures		Dominant Frequency, Hz		
		<8 Hz	8-25 Hz	>25 Hz
<i>(A) Buildings/structures not belonging to the owner</i>				
i.	Domestic houses /structure (Kuchha brick and cement)	5	10	15
i.	Industrial buildings (RCC and framed structures)	10	20	25
ii.	Objects of historical importance and sensitive structures	2	5	10
<i>(B) Building belonging to owner with limited span of life</i>				
i.	Domestic houses /structures (Kuchhabrick and cement)	10	15	25
ii.	Industrial buildings (RCC and framed structures)	10	25	50

In DGMS standard as mentioned above in Table 1, special provision has been given to the owner of the structure close to the blasting activities. Limit of safe vibration for residential houses not owned by the project authorities are more restrictive than the one owned by the project authorities on account of temporariness of the structures. However, irrespective of ownership and type of construction material, historical objects have been given special emphasis and the safe limit of PPV has been most restricted.

4.2 Air overpressure

When a blast is fired, it is frequently accompanied by a loud noise called air blast. Air blast is an atmospheric pressure wave consisting of high-frequency sound that is audible and low frequency sound that is sub-audible and cannot be heard. Either one or both of the sound waves can cause damage if the sound pressure is high enough. Air blast, generally is an annoyance problem, does not cause damage but may result in confrontation between the operator and those effected (Konya and Walter, 1990). Air blast is measured in decibels (dB) or in pounds per square inch (psi). Because of the wide range of over pressure, the decibel is usually used. The decibel is defined in terms of the overpressure, by the equation

$$AOP (dB) = 20 \text{ LOG } (P/P_0) \tag{Eq. 2}$$

Where,

- dB = sound level in decibels,
- P = overpressure in psi,
- P₀ = overpressure of the lowest sound that can be heard, and
- P₀ = 3 * 10⁻⁹ psi

Review of various standards reveals that at sound pressure levels below 130dB there will be audible rattle, mainly from windows and doors and from objects standing on shelves. With increasing amplitude, window panes begin to break at about 152dB. Most windows in an area would break at amplitude of 172dB, and structure damage would occur at 182dB or over (Siskind et al. 1980b., Anon, 1998., Konya et al. 1990).

For construction and quarry blasting specification, there has been long history of using 140 dB as an overpressure limitation. Recently it has become more common to make use of more restrictive limitation that were developed for surface mining operation and to apply them to all forms of blasting. For large scale surface mining operations, air overpressure can be characterized by lower frequency. For such large scale operation,

a common overpressure limit of 134 dB is recommended by United States Bureau of Mines (USBM) RI8485 (Siskind et al, 1980) as given below in Table 2.

Table 2: Typical Air overpressure criterion

Air Overpressure limits	Damage potential
180 dB	Some structural Damage
171 dB	General window breakages
140 dB	Occasional Window breakage
134 dB	US Bureau of mines recommendations for large scale surface mine blasting.

DGMS Circular suggests 90dB as the threshold for continuous occupational exposure upto 8 hours duration. However, there is no Circular from DGMS or Indian Bureau of Mines (IBM) regarding permissible safe level for air overpressure produced due to blasting. The permissible levels of air overpressure recommended by Siskind et. al, 1980(b) (Table 3) is most comprehensively used and hence same is adopted in this case also.

Table 3: Permissible level of Air overpressure (Siskind et. al, 1980(b))

Type of instruments	Permissible level (dB)
0.1 Hz high pass time	134
2.0 Hz high pass time	133
6.0 Hz high pass time	129
C-slow weighing scale (Event less than 2 sec duration)	105

The following suggestions are made to control air over pressure:

1. A deeper charge or a better-confined charge produces a low pressure pulse.
2. Detonating cord used to interconnect down line for initiating detonation in the explosive in drill holes produces more sound pressure. The sharp air shock wave

from the detonating cord is a major cause of disturbance and is annoying to the neighbors. Hence, detonating cord is to be avoided except in remote locations.

3. As each detonating hole will produce its own fingerprint in the air pressure, it is recommended to connect holes in row and holes are to be fired sequentially in such a way that the initiation sequence is moving away from the sensitive object, thereby minimizing the risk for building up more severe blast waves propagating in a direction toward the sensitive object.
4. Avoid heavy charges too close to the ground surface where they may blowout, or "crater". Such charges may also generate flyrock. Having charges too close to the ground surface is a condition comparable to having charges, which are too far apart for the depth of stemming. The closest relief is upward.
5. Avoid heavy charges too close to an open face where they may also blowout, as above. These charges may also generate flyrock. The action is similar to the above, but may take place horizontally to an open face rather than vertically to the ground surface.
6. It is helpful to avoid placing charges in open seams, clay filled seams, highly fractured zones or other weaknesses, where they may allow explosive gases to be vented.
7. Use a depth of stemming which is sufficient to prevent flyrock and blowout.
8. Less stemming will be required if interlocking in the material is of good quality. If possible, avoid the use of fine stemming or light weight stemming which can't be compacted.
9. Higher pressures may be generated by large quantities of exposed detonating materials, such as detonating cord, surface delays and portions of down lines. If the air blast overpressures is too high, it may be necessary to cover these products with sand or similar material.
10. Although it is not directly related to increased overpressures, another factor of

interest is the time related to the occupancy of the area and residential activities. Certain times may be unfavorable for the residents of a given area, such as night, evening, early morning, or times when most of the people in the area are home and conditions are relatively quiet.

4.3 FLYROCK

The rock fragments ejected from the blast called "flyrock" is a serious hazard of blasting operations, particularly when the blast is conducted in the vicinity of village and structures of ecologically sensitive zone(ESZ). The factors which influence the flyrock distance include:

- Height of stemming column in the blast holes and type/quality of stemming material
- Irregular shape of free face/top of the bench
- Excessive large burden or blasting without free face
- Muffling of the blast area and the muffling material type.
- Scattering and overlapping of delay timings of the delay detonators/relays.
- Presence of water in blastholes

The first four parameters can be controlled by properly designing the blasting pattern whereas the last two parameters are not easily controllable. The risk from flyrock can be minimised to a great extent by proper design and execution of the design. Flyrock can be further eliminated using muffle blasting and same is recommended for the blasting operation near ESZ at Bhavali PSP site.

4.4 Noise

Blasting operations in ecologically sensitive zones can cause significant noise pollution, leading to various negative impacts on wildlife, vegetation, and human health. The resulting noise can disrupt habitats, affect communication and reproductive behavior of animals, and potentially damage structures and ecosystems. As per prevailing regulation as specified in

guidelines of ministry of Environment & forests, The Noise Pollution (Regulation and Control) Rules, 2000; (As amended till 10/08/2017 vide S.O. 2555(E)), the safe permissible limit for different types zones are as given below.

Table 4: Safe limit of Noise for various zones as per The Noise Pollution (Regulation and Control) Rules, 2000

Area Code	Category of Area/Zone	Limits in dB(A)	
		Day Time (6.00 am to 10 pm)	Night Time (10.00pm-6.00am)
A	Industrial area	75	70
B	Commercial area	65	55
C	Residential area	55	45
D	Silence Zone	50	40

During optimisation of controlled blasting techniques, efforts will be made to optimise blast design parameters in a as way that the noise produced at source is minimum. Further, the explosive and initiating devices used will be of highest quality which produces less sound such as NONEL and Shock tube initiation system. Further, all blasting operation will be taken as muffle blasting so that noise is further reduced and it remains well within the specified limit.

Other measures to be implemented during blasting operation includes measures such as using quieter explosives, optimizing blast designs, and using noise barriers. Limiting blasting activities to specific times of day or year to minimize disruption to wildlife and sensitive ecosystems is also effective way to reduce adverse impact of noise. Similarly establishing buffer zones around sensitive areas to reduce the impact of blasting on ecologically sensitive zones.

Monitoring noise levels during blasting operations will be carried out by CSIR-CIMFR Team to ensure compliance with regulations and to assess the impact on the surrounding environment

4.5 Dust Generated from the Blasting Operations

Drilling and blasting are processes of detaching rock material from the parent rock. Dust causes environmental, health, safety and operational problems affecting workers and surrounding environment. The distance from the drill and blast site determines the dust concentration produced. Different types of dust particle size are produced from drilling and blasting. These include >PM10, PM10, PM2.5, Total Suspended Particles and deposited dust.

Wet blasting technique is recommended for the dust control. This technique involves mixing water with the abrasive material in the blasting nozzle. This creates a slurry that captures dust particles at their source and prevents them from becoming airborne.

Installing ventilation systems can help to remove dust particles from the air and prevent them from accumulating in the workspace. Creating barriers or enclosing the blasting area can help to contain dust and prevent it from spreading to other areas. Implementing restricted zones around blasting operations can help to protect nearby workers and prevent dust from contaminating other areas. Providing workers with proper respiratory equipment, such as respirators, can help protect them from inhaling dust particles.

5.0 IMPACT ASSESSMENT OF BLASTING OPERATION ON WILD LIFE, MAN MADE STRUCTURES AND ENVIRONMENT

Blasting shall have adverse impact on fauna using the area contiguous with the surrounding habitation area as habitat. Construction and operation activities generate noise and artificial light, which can disturb wildlife. Nocturnal animals may be particularly affected by light pollution, altering their behavior and disrupting natural processes. The noise generation has an adverse impact on terrestrial fauna and avifauna.

Intervention in the project area will impact butterflies and birds which are quite sensitive to noise and human presence. The traffic noise has detrimental effect on the

survival rates and breeding success of such fauna which reside in the small habitats along roadside communicating using acoustic signals. Sometime as a result of habitat loss and physical disturbance, the fauna shall move from the habitat along roadside. Based on the field observations and interaction with local people and forest officials, it was noted that the Project area does not constitute part of any wildlife migratory routes and construction activities won't affect animal movement. All precautions shall be taken as envisaged under the relevant acts in respect of handling of explosive material and blasting which shall invariably be carried out by a qualified blaster.

CSIR- CIMFR team visited the site to physically evaluate the proximity of various sensitive structure around the project site. Exploratory trekking was done along the main component of the project, particularly the upper reservoir area where the Kalsubai Harischandragarh Wildlife Sanctuary is in close proximity of the rock excavation works. A detailed investigation on proximity of the ESZ area with the possible blasting operation was made by the visiting team. A detailed discussion on the construction methodologies and sequence of the rock excavation was done with the JSW team to evaluate the blasting impact on the flora and fauna.

5.1 Kalsubai Harischandragarh Wildlife Sanctuary

Kalsubai Harishchandragad Wildlife Sanctuary (KHWF) located on the Sahyadri mountain ranges which is part of the Western Ghats of Maharashtra and is situated between Latitude 19°25'57" to 19°34'04" North and Longitude 73°37'51" to 73°46'25" East covering an area of 225 sq. km (15 km × 15 km dimension). The elevation of the area varies from 148 m to 1508 m above MSL while most of the area is situated near the crest line of Western Ghats. Geologically this area is part of the Deccan Trap. The Kalsubai Harishchandragad Wildlife Sanctuary is replete with abundant kinds of flora and fauna. This region receives excessive rainfall of about 600 cm. The green landscape is stocked with beautiful vegetation and shrubs like Beheda, Avali, Gulchavi, Kharvel, Siras, Aashind, Parjambhual, Hirda, and Lokhandi under the bracket of trees. The

different animals in the study area, like the leopard, jackal, hyena, barking deer, Palm civet, Indian giant squirrel, mongoose, jungle cat, and also many species of mammals and birds. The Pravara River originates on the eastern slope of Sahyadri in between Kulang and Ratangad forts.

Figure 6 is a layout of the ecologically sensitive zone (ESZ) showing the distance of the quarry of the Bhavali PSP Project. In this figure, various distances are marked from the closest blasting site. Although the minimum distance of FRL boundary of upper reservoir is 12.5 m from ESZ at Saddle dam point, the actual operating distance of the quarry boundary from ESZ is 253 m. Therefore, for all blasting operation from ESZ will be minimum 253 m.

Various researcher have performed experimental blast vibration monitoring in basalt rock formation, similar to prevailing rock mass in Bhavali Project site, near pune and Mumbai. They found that the vibration attenuation. The observed vibration data in basalt rock formation were analysed to obtain the vibration attenuation characteristics. The plot of observed vibration data in terms of peak particle velocity and square root scaled distance is presented in Fig 7. The attenuation characteristics of vibration in basalt rock formation is presented in Eq. 2 and 3 at 50% and 95% confidence intervals.

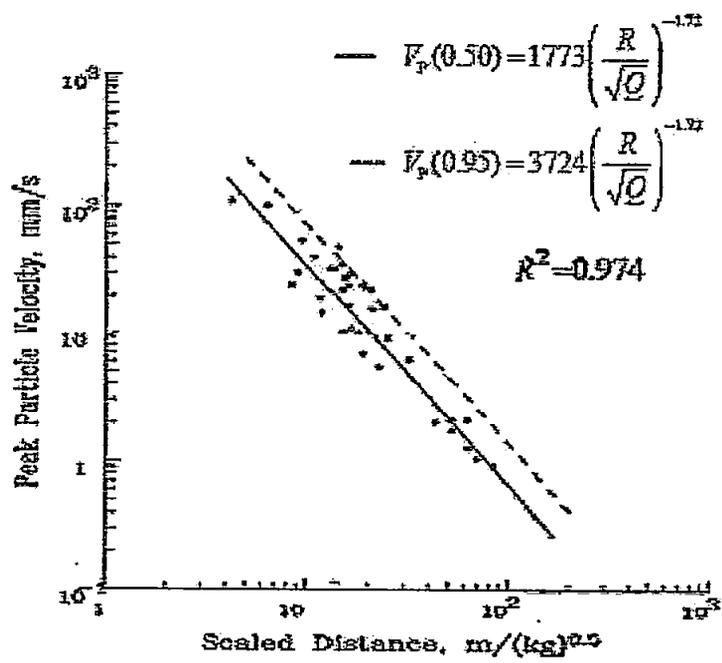


Figure 7: Plot showing attenuation characteristics of blast vibration in Basaltic rock mass formation

$$V_{ppv} = 1773 \left(\frac{R}{\sqrt{W}} \right)^{-1.72} \quad (3)$$

$$V_{ppv} = 3724 \left(\frac{R}{\sqrt{W}} \right)^{-1.72} \quad (4)$$

Where R is the distance (m) between the observation and blast and W is the quantity of explosive charge used per delay;

In Bhavali project site, the attenuation characteristics of the vibration will follow Eq. 3 and Eq. 4 at 50 % and 95% confidence intervals respectively. Equation 4 may be used for computation of safe charges and other Controlled blast design parameters considering Eq. 4. The minimum distance of 253 m is the value of R in Eq 4. The Eq. 4 will be further refined using filed data obtained by actual measurement of vibration during construction phase.

In addition to the surface excavation, underground excavation will also be done using controlled blast design parameters for rock excavation of tunnel, power house tail race tunnel etc. In all this blasting operations also, blast induced ground vibration will be controlled using optimised blast design parameters and the charge weight per delay. In underground blasting operation, problem of air overpressure, flyrock, dust and noise will not be there.

All efforts will be made to ensure that the vibration remains well with the 5.0 mm/s of peak particle velocity in all ESZ with the help of use of advanced explosive and initiating devices such as shock tube initiation systems, electronic detonators, etc. Such low vibration and AOP level will not create any problem to flora and fauna of Kalsubai Harishchandragad Wildlife Sanctuary.

5.2 IMPACT ASSESSMENT OF BLASTING OPERATIONS MAN-MADE STRUCTURES

During the course of filed investigation of the CSIR-CIMFR to Bhavali PSP site, efforts were made to locate and identify the man-made structure in and around the project site. The project site is scarcely populated and there are very few houses. It was informed that affected house within the project site have been suitably compensated and relocated. It was observed that the nearest village is Jamunde village which is close to Upper reservoir. The houses in the village are mostly mud house. This village is approx. 250 m from the site of blasting operations (Fig 8). Few more houses made of brick-mortar also observed. However, theses house are far off (>600 m) from the project site and the impact of controlled blasting operations will be insignificant on these houses (Fig 9).



Figure 8: Housing structures of Jamunde village (<250 m)

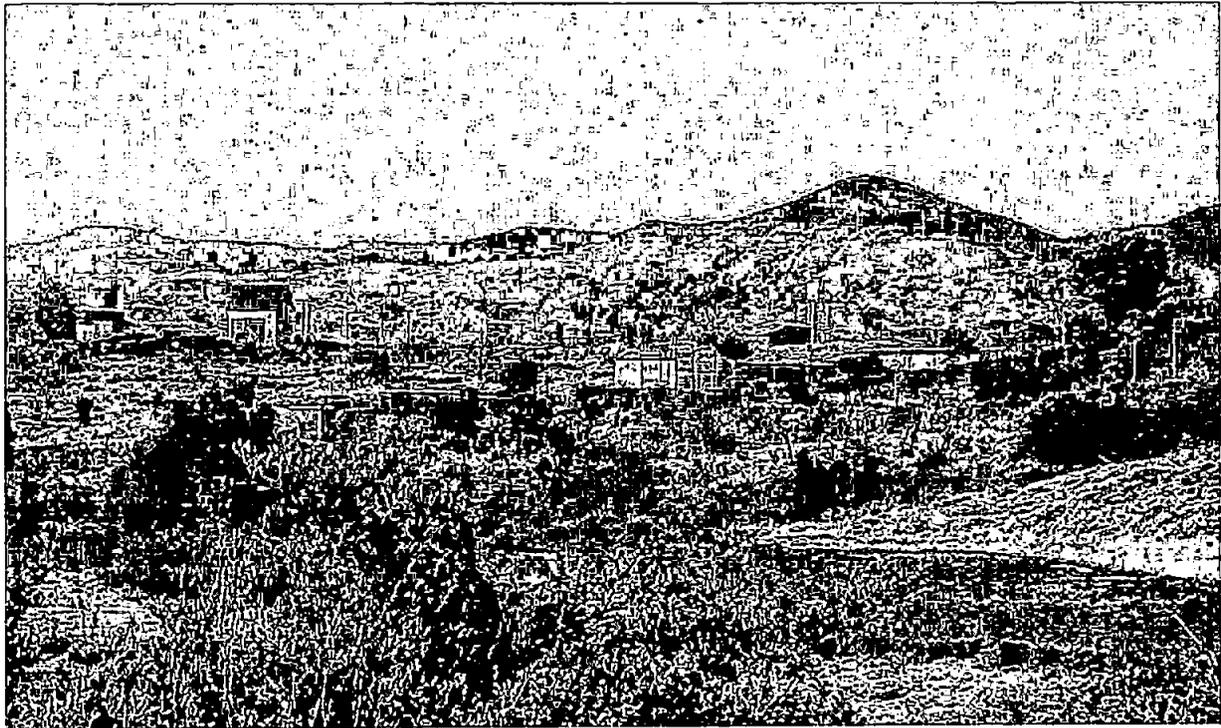


Figure 9: Housing structures in project site (> 600 m)

As per present Indian standard the safe vibration limit of vibration in terms of Peak Particle velocity is 5.0 mm/s. Base on this assessment, controlled blast design parameters will be recommended to ensure that the vibration remains less than the safe recommended PPV value of 5.0 mm/s and accordingly other parameters such as AOP, NOISE and Dust control measures will be implemented during the blasting operations.

6.0 RECOMMENDED MITIGATION MEASURES AND METHDOLOGIES

CSIR-CIMFR Team conducted a field investigation to identify and assess sensitivity of various wild life and man-made structures around the proposed Bhavali PSP Project, Igatpuri with due consideration to the proximity of the ESZ of Kalsubai Harishchandragad Wildlife Sanctuary. Following remedial measures are suggested to for mitigating adverse impact of blasting operation to ensure minimum disturbance to the nearby flora and fauna of Kalsubai Harishchandragad Wildlife Sanctuary and also the man-made structure in the close proximity of the rock excavation works.

6.0 Optimisation of controlled blast design parameters

The controlled blasting operation will only be implemented with optimised blast design parameters. The maximum charge weight of explosive in blast round will be decided using Eq. 4, which is attenuation characteristics of the blast induced ground vibration in predominant rock mass. This will ensure peak particle velocity of the vibration well within the recommended safe permissible limit as per India standard.

6.1 Controlled Blast Design Pattern

6.1.1 Formation of Benches

Any excavation that needs to be started has to be done under constricted blasting condition till a free face is created and benches are developed systematically. Initially shallow benches are formed and merged to achieve the desired bench height. Depending on the topography, holes are drilled and the desired bench height is achieved by conducting development blasts. In Bhavali PSP site, development will be on a sloping area as it forms a part of the hill. Bench preparation will be carried out by drilling shallow holes (2.5 to 3.0m) with a burden and spacing of 2.0 m x 2.5 m with a hole diameter of 45 mm. In some areas the hole depths as low as 1.5m will be required depending on the field conditions. In areas more than 500 m from ESZ, higher diameter holes and greater depth may also be used with controlled blasting operations.

6.1.2 Bench Height

Bench height is normally decided depending on the local geology, production size, type of loading machine and slope stability. For a blasting engineer the bench height is a fixed parameter. In this project site the benches are of height ranging from 3.0 m to 5.0 m to be developed in a systematic manner to form stable benches. The bench height shall match to the rock excavator for easy mucking and maneuver.

6.1.3 Blasthole Diameter

The suitability of the hole diameter is evaluated based on the compatibility to the bench height. The hole diameter is also decided on the minimum length of the charge in a blasthole, blast vibration constraints, rock structure and

minimum cost of production. The minimum length of bottom charge in a blast hole should be at least 20 times the charge diameter to yield good results. Depending on the site conditions and the need for controlling flyrock, ground vibrations etc., the hole diameter up to 45 mm can in area close to ESZ and upto 105 mm in sites at least 500 m away be used. However, the permissible maximum charge per delay needs to be complied with and control the vibrations/air overpressure and flyrock within safe limits.

6.1.4 Burden and Spacing

Burden (B) is defined as the distance from the blast hole to the nearest free face at the time of detonation. It is conventionally measured in the direction parallel to the free face. Burden with regard to delay pattern is called effective burden or true burden. Spacing (S) is defined as the distance between adjacent holes measured perpendicular to burden. The burden is the most important parameter and its assessment is made in the light of available literature.

Various burden formulae are available in the literature and all are of empirical nature. Rustan (1990) has shown that the formula developed by Langefors and Kihlstrom (1963) is only valid for hole diameters in the range of 30-89 mm. Pearson formula (Gregory, 1984) is not easy to use as the input data such as maximum tensile strength of rock and maximum detonation pressure are not readily available. Burden can be calculated taking into account the hole diameter, the bench height, density of explosive, density of rock, bucket capacity of the loading machine and mean joint spacing.

Burden generally varies from 0.25 to 0.5 times bench height. Burden also varies from 20 to 35 times the hole diameter. For the hole diameter of 45 mm proposed near ESZ, the burden value range is 2.0 – 2.5 m. For higher diameter of hole up to 105 mm, burden of 2.5 to 3.2 m may also be used.

Spacing is calculated as a function of the burden. In most of the blasting operations, spacing to burden ratio has been found to vary between one and two.

Spacing is initially calculated as 1.2 times the burden. For any other spacing to burden ratio, burden and spacing can be adjusted provided the area ($B \times S$) remains constant. A pattern of 3×5 m is equivalent to a pattern 3.4×4.4 m. Greater spacing to burden ratio is preferred for row by row initiation system. For diagonal or V pattern, S/B ratio will be between 1.0 and 1.4.

6.1.5 Charge Factor

Charge factor is the mathematical relationship between the weight of explosives and a given quantity of rock. It is normally expressed in kilograms per cubic meter. Since explosives vary in their energy content and the energy released on detonation, the charge factor is not a constant figure even for the same rock. Further, Konya and Walter (1990) have shown that the same amount of explosives can break different volumes of rock depending upon the orientation of holes with respect to the free face.

The charge factor is used basically to estimate the quantity of explosives in the hole or to plan for the explosive requirements. If soft rock is some what undercharged, it will still be muckable and if it is somewhat overcharged, excessive throw rarely occurs. On the other hand, undercharging of hard rock frequently results in a tight and blocky muckpile. Overcharging of hard rock may cause flyrock and airblast. The design of blasts in hard rock requires tighter control than in soft rock (Olofsson, 1991).

6.1.6 Blasthole Pattern and Initiation Sequence

Blast hole pattern could be square, rectangle or staggered. Each pattern has got its own place of application and needs to be initiated in a defined sequence depending on the end results. Row by row initiation with staggered pattern gives good results in blast casting and this is rarely used for conventional production blasting. Drilling errors are more in case of staggered patterns as compared to others. For a set of blast holes, several initiation sequences are possible. The initiation sequence significantly affects the blast results in respect of direction of throw, fragmentation and damage to the rock mass. Hagan (1983) suggests

that the initiation sequence for multi-row blasts should be such that (a) each charge shoots to a free face (b) effective spacing to burden ratio is as per the design (c) blasthole are effectively staggered. In order to satisfy these requirements he recommends staggered V pattern (Figure 10). To avoid blowouts in the back rows, one delay period is generally skipped.

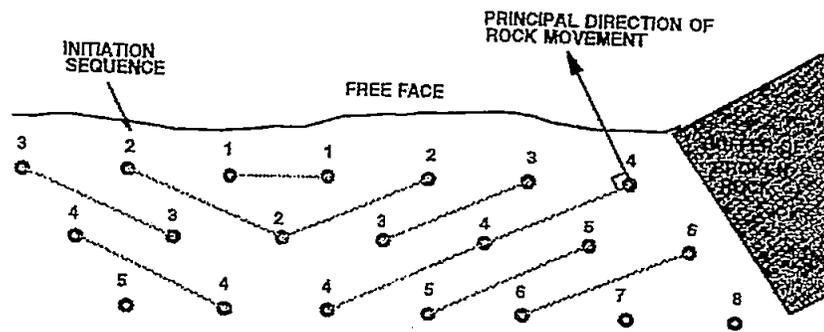


Figure 10: Staggered V pattern when blasting along side a buffered end

Figure 11 shows a diagonal sequence for a staggered pattern. Figure 12 shows the traditional V cut, but instead of blasting a rectangular block, a trapezoidal area is prepared in order to eliminate the problem of heavy confinement on the longest delay. If this pattern is employed, a corner cut as shown in the Figure 13 can be followed to further develop the bench. The last row of holes in this sequence breaks at obtuse angle in the corner, thereby causing less wall damage and a lower probability of blowout. Figures 14 and 15 show rectangular pattern initiated with a V cut or diagonal pattern depending on the block orientation and the general face conditions

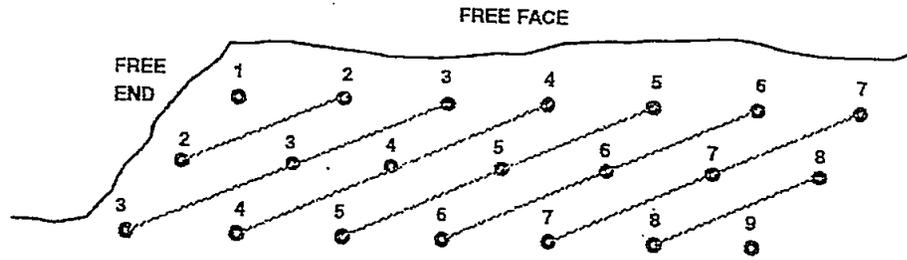


Figure 11: Staggered diagonal pattern shooting to a free face

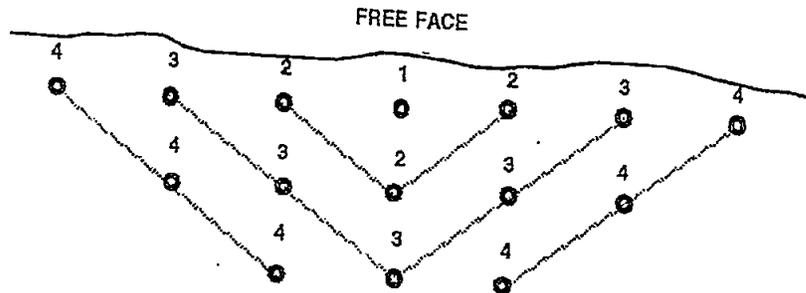


Figure 12 V cut (angle corner) progressive delay

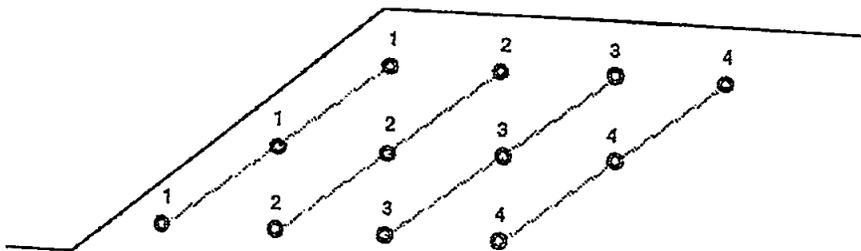


Figure 13: Angled corner cut fired on echelon pattern

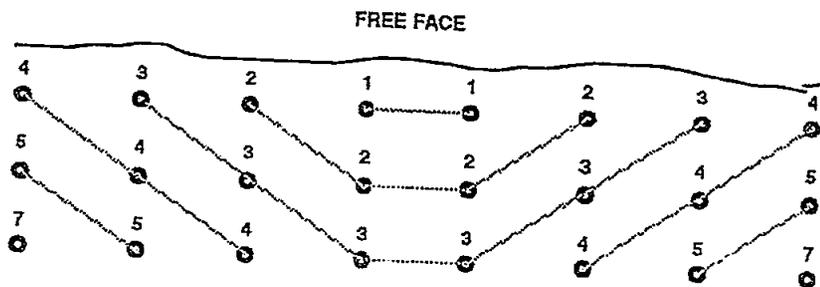


Figure 6: V cut for a rectangular pattern

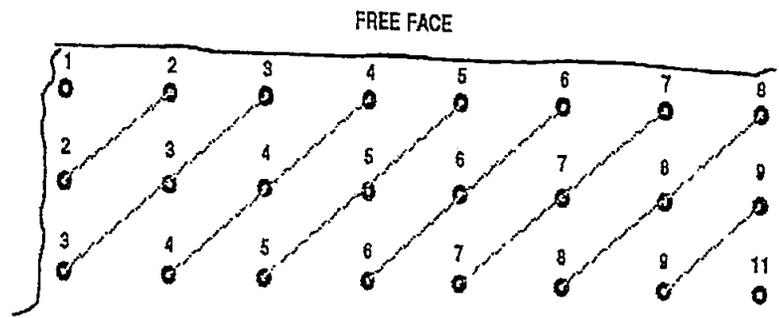


Figure 14: Diagonal sequence for a rectangular pattern

6.1.7 Delay Timing

For multi-row blasting, the rock must be allowed to move 1/3rd of the burden distance before the next row detonates. The delay intervals between the rows may vary from 10ms/m of the burden for hard rock to 30ms/m of burden for soft rock (Olofsson, 1991). An optimum inter-row delay gives good fragmentation and displacement without cut-off. Improper delay gives rise to problem of flyrock, vibration, toe and back break. For large diameter blast holes, the optimum inter-row delay usually varies from about 5ms/m of effective burden for strong massive rocks to about 10ms/m for weak/highly fissured strata (Hagan, 1983). In addition to burden and rock type Konya and Walter (1990) have suggested delay timing depending on the desired end results based on their priority. The best possible fragmentation can be achieved with delay timing of 10 - 20ms/m of burden.

6.1.8 Stemming

Stemming is an inert material filled on top of the explosive charge in a blast hole. It is essential to enhance the explosive efficiency and reduce the environmental problems related to blasting. If the stemming is inadequate, the explosive gases will vent prematurely reducing blast hole pressure and resulting in poor displacement and tight muckpile. It is also accompanied by flyrock torn from the collar region plus air blast. Often there is a further perceptible waste of energy in the form of flame indicating that the explosive reaction is incomplete at the time of venting. Stemming length varies from 0.7 to 1.5 times burden depending on the rock being blasted and the concern for fragmentation and flyrock problems (Table 5).

Table 5: Suggested stemming length for surface blasting

Case	Rock being blasted	Flyrock problem	Stemming length, m
1	Hard	Yes	1.0 – 1.3 times
2	Hard	No	0.7 – 1.0 time burden
3	Soft	Yes	1.0 – 1.3 time burden
4	Soft	No	0.7 – 1.0 time burden

There are several kinds of material that have been used for stemming. Water, mud, soil, wet clay and drilling dust are easily ejected. On the other hand, dry angular material under the effect of impulse gas pressure tends to form a compaction arch, which locks into the wall of a blasthole, thus increasing its resistance to ejection. Stemming materials can be ranked in this order from the least efficient to most efficient; air, water, wet drill cuttings, wet sand, paper cartridge of rock dust, clay dummies, wet crushed stone, dry drill cuttings, dry sand, dry crusher run stone, dry screened stone (Lippincott, 1992).

In water filled holes, gravel and crushed rock quickly settle to form a plug of stemming, not as effective as that in a dry hole but still effective. The behavior of drill cuttings can be quite different. The drill cuttings are converted to a sludge, which has little to offer, other than its own mass, in opposing explosion gas pressure.

In general, drill cuttings are preferred, as they are readily available and conveniently located at the collar of the hole, whereas other material is to be brought to the site. The optimum size of stemming material is about 5 - 25mm depending on the blast hole diameter. For a diameter of 102/115mm, 5 - 10mm crushed stone is recommended (Konya and Walter., 1990, Anon., 1993).

6.2 Noise and Air overpressure Control Measures

Noise and air overpressure control measure such as use of explosive and initiating system such as Shock Tube Initiating system (NONEL), Twin-Det/ Dual Det system for making circuitry arrangement in a blast rounds will only be used.

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No conventional initiating devices such as detonating fuse will be used. Shock tube initiating systems produces significant less air overpressure/Noise as compared to conventional Detonating fuse. AOP and Noise level will be maintained as per recommended safe permissible limit of CPCB/DGMS etc.

6.3 Restricted Timing of Blasting Operation

Blasting operation shall be conducted only in day time, preferably in afternoon so that due to phenomenon of temperature inversion, all the air overpressure wave/Noise wave are refracted to open sky rather than reflected back to the ground surface level and travelling to longer distance. In morning and evening hours, due to higher density of air near ground surface level, more amount of the air overpressure wave tend to travel longer distance and hence may be given rise to higher level of air overpressure and noise level. No surface blasting operation shall be conducted beyond sunset and sunrise. Air overpressure/ Noise due to Air pressure pulse and rock pressure pulse will be controlled using the blast design parameters such as No. of Holes, Hole Depth, bench height etc.

6.4 Dust Control Measures

During drilling operation only wet drilling shall be carried out so that no dust is produced. In blasting operation and breakage of the rock mass, dust is invariably produced. However, with muffle blasting i.e. covering the blast round with blasting mats reduced the dust generation to more than 90%. Blasting mats are used in blasting operations to contain the blast, prevent flyrock (rock fragments ejected during blasting), and reduce noise and vibrations. They help protect nearby structures, people, and the environment from potential damage and harm.

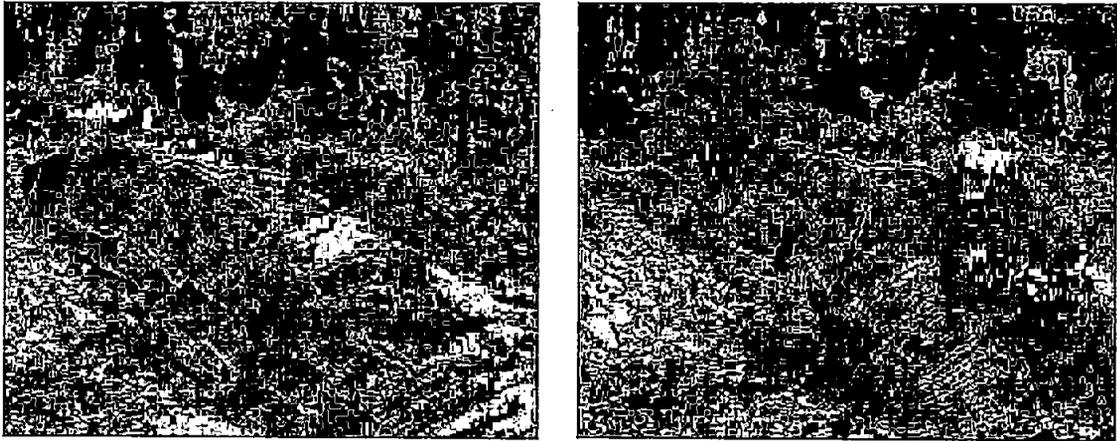


Figure 15: Photographs of blasting operation with blasting operation with blast mats

6.5 Flyrock Control Measures

As discussed in preceding section of this report a comprehensive flyrock control measure will be adopted while carrying out the blasting operation which included, designing the controlled blast design parameters as per the prevailing rock mass, use of blasting mats, charging holes after identifying the weak zone in the strata , adequate stemming length and stemming materials. In area close to ESZ, a provision of the barricade is also recommended. It will not only prevent any flyrock crossing the construction but will also be helpful in reducing noise/ air overpressure level.

6.6 CSIR-CIMFR Supervision of the Blasting Operation

JSW Energy PSP two Limited have requested CSIR-Central Institute of Mining and Fuel Research for technical support and guidance during construction of Bhavali PSP project considering not only its proximity with ESZ of Kalsubai Harishchandragad Wildlife Sanctuary but also to prevent rock mass damage to the surrounding structures during construction of various components of the project. CSIR-CIMFR Team have accepted the same and agreed to supervise and guide the team for all day to day to blasting operation by deputing the technical staff with necessary equipment at site.

6.7 Continuous monitoring of vibration and air overpressure/ noise level

All day to day controlled blasting operation will be carried out under supervision of expert team of CSIR-CIMFR who will be stationed at site. The team will guide execution team and follow the optimised blast design pattern. During blasting operations, blast induced ground vibration and AOP/Noise level will be monitored in all sensitive location such as closest ESZ points using advance tri-axial seismographs. Multiple seismographs will be used to monitor the parameters at different locations simultaneously.

6.8 Documentation of Blasting parameters

CSIR-CIMFR team will develop a system of documentation for each round of the blasting operations. Records of the blast induced ground vibration and air overpressure/ Noise will be also maintained meticulously and same may be submitted to the regulatory agencies, if required.

7.0 CONCLUSION AND RECOMMENDATIONS

JSW Energy PSP 2 Limited requested to CSIR-Central Institute of Mining and Fuel Research for technical support and guidance for carrying out control blast design operation during construction of Bhavali PSP with special emphasis to prevent any adverse impact of blasting operation to flora and fauna of Kalsubai Harishchandragad Wildlife Sanctuary. Team of Scientists and staff members of CSIR-CIMFR Team conducted preliminary field investigation to assess the possible impact of blasting operations and evaluated the required mitigation measures.

CSIR-CIMFR team suggested a series of mitigation measures to prevent the adverse impact on flora and fauna of Kalsubai Harishchandragad Wildlife Sanctuary, man-made structures and surrounding environment.

Based on the input on rock mass obtained from the geotechnical investigation report, Controlled blast design parameters are suggested to ensure that ground

vibration level remains well within the safe permitted limit as per prevailing Indian Standard. These parameters will be further calibrated and optimised during construction of the project as per data obtained through real time measurement using advance seismographs. Mitigation measure for control of Air overpressure/ Noise/ Dust and flyrock is given in this preliminary report.

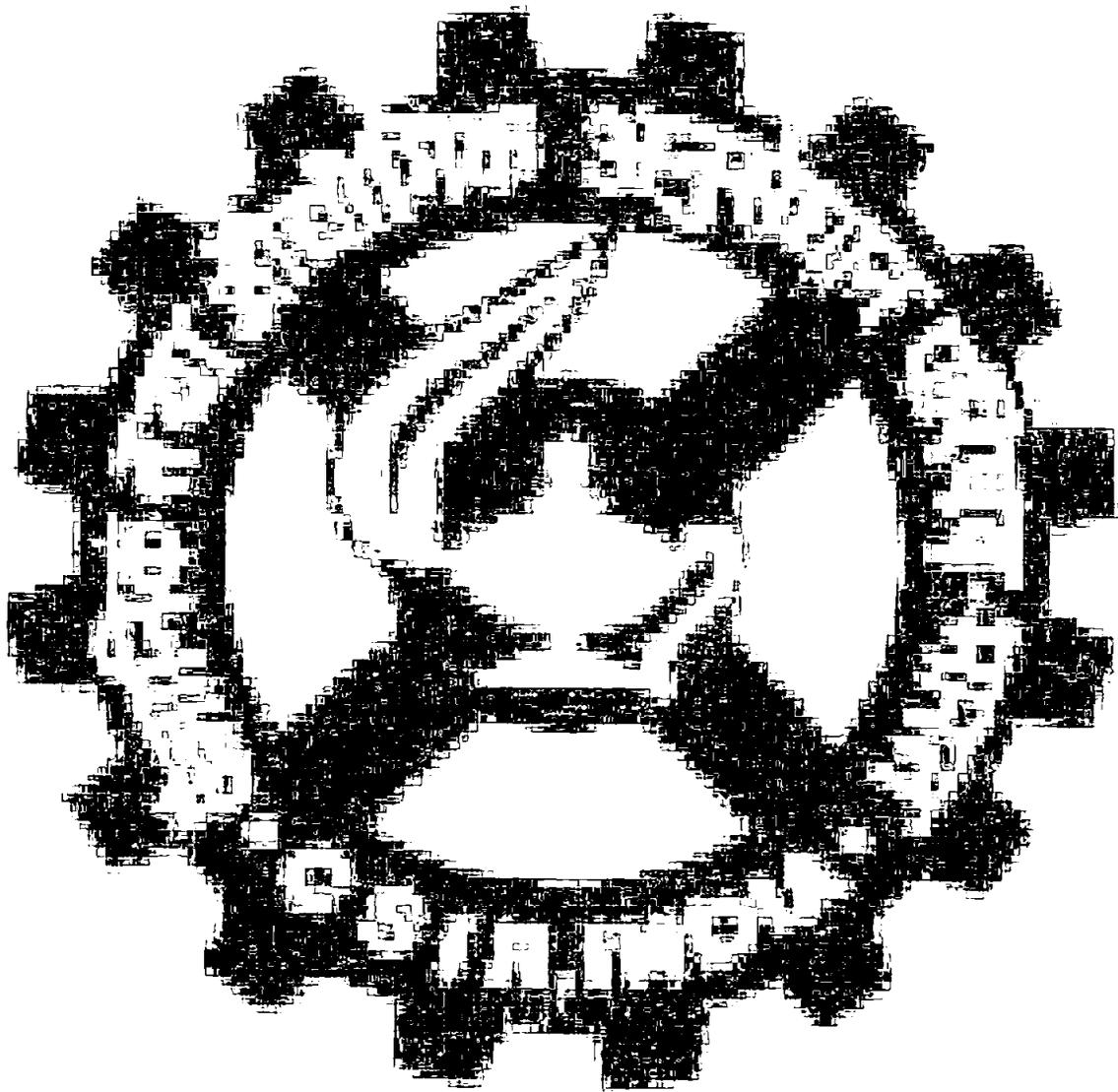
CSIR-CIMFR Team also agreed to provide continuous technical support during construction phase of Bhavali PSP by deputing project staff with necessary equipment such as blast induced ground vibration and AOP/Noise monitoring system. Entire blasting operation will be supervised by the CSIR-CIMFR team. A system of documentation will be developed and meticulous record of each blasting round together with the vibration and AOP observed from each blast rounds will be kept for future review also

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NOTE





भारत सरकार
Govt. of India
विद्युत मंत्रालय
Ministry of Power
केन्द्रीय विद्युत प्राधिकरण
Central Electricity Authority
जल विद्युत परियोजना मूल्यांकन प्रभाग
Hydro Project Appraisal Division

OFFICE MEMORANDUM

Subject: Accord of Concurrence to Bhavali Off-stream Open Loop Pumped Storage Project, 1500 MW (5 x 250 MW + 2 x 125 MW) in Maharashtra by M/s. JSW Energy PSP Two Limited under Section 8 of the Electricity Act, 2003 - regarding.

Detailed Project Report (DPR) of the Bhavali Off-stream Open Loop Pumped Storage Project, 1500 MW (5 x 250 MW + 2 x 125 MW) in Maharashtra by M/s. JSW Energy PSP Two Limited was uploaded in the DPR Approval Process Monitoring System (DAPMS) portal of CEA on 05.09.2024 for concurrence, as per Guidelines for Acceptance, Examination and Concurrence of Detailed Project Reports for Pumped Storage Schemes Version 3.0

2. Undersigned is directed to convey the decision of Authority taken in the meeting held on 06.09.2024, to accord concurrence to Bhavali Off-stream Open Loop Pumped Storage Project (PSP) in exercise of the powers conferred upon the Authority under Section 8 of the Electricity Act, 2003.

3. The undertaking by M/s. JSW Energy PSP Two Limited is attached at Annex-I. The salient features of the scheme are given in Annex-II.

4. This concurrence is subject to fulfilment of the following conditions: -

- i. M/s. JSW Energy PSP Two Limited shall comply with the suggestions/ observations of Central Water Commission (CWC) as given in Annex-III.
- ii. M/s. JSW Energy PSP Two Limited shall comply with the suggestions/ observations of Central Electricity Authority (CEA) as given in Annex-IV.
- iii. M/s. JSW Energy PSP Two Limited shall comply with the suggestions/ observations of Geological Survey of India as given in Annex- V.
- iv. M/s. JSW Energy PSP Two Limited shall comply with the suggestions/ observations of CSMRS as given in Annex-VI.

- v. M/s. JSW Energy PSP Two Limited shall make provisions to install the instruments (list attached at Annex-VII) in appropriate number at suitable locations in project as per relevant IS codes in consultation with CWC. Further, it is to mention that the list of instruments attached at Annex-VII is not exhaustive and may be modified by CEA in future. M/s. JSW Energy PSP Two Limited shall be responsible for installing adequate instrumentation in the project to ensure safety and monitor project health effectively.
- vi. M/s. JSW Energy PSP Two Limited shall communicate results of explorations/ investigations from time to time for appraisal of CEA/ CWC/ GSI/ CSMRS regularly.
- vii. Examination of Cost Estimates of Pumped Storage Projects is exempted from Concurrence Process. However, additional chapters as per Guidelines for Formulation of Detailed Project Reports for Pumped Storage Schemes Version 3.0, shall be submitted by M/s. JSW Energy PSP Two Limited to the Authority within 60 days from date of uploading the DPR on CEA portal so as to ascertain the project cost in accordance with the limit specified by the Central government from time to time. It will not be vetted by CEA/CWC.
- viii. M/s. JSW Energy PSP Two Limited shall use the NCSDP approved parameters for design purposes.
- ix. In case geological surprises in works of the project are met, M/s. JSW Energy PSP Two Limited shall systematically maintain a record of geological surprises and treatment provided. The same may be immediately brought to the knowledge of Standing Committee for matters pertaining to Geological Uncertainties/ Surprises and Natural Disaster Events faced in the Hydroelectric Projects constituted vide OM date 23.10.2023 (Annex-VIII).
- x. M/s. JSW Energy PSP Two Limited shall obtain Environment and Forest clearance from MoEF&CC and shall submit a copy to CEA.
- xi. M/s. JSW Energy PSP Two Limited shall obtain Clearance from National Board of Wildlife and shall submit a copy to CEA, if applicable.
- xii. M/s. JSW Energy PSP Two Limited shall obtain Land availability certificate before actual start of the project and shall submit a copy to CEA.
- xiii. M/s. JSW Energy PSP Two Limited shall obtain NoC from Ministry of Defence and shall submit a copy to CEA, if applicable.
- xiv. If Scheduled Tribe population is getting affected at project site, clearance under Forest Right Act/ Ministry of Social Justice & Empowerment/ State Government shall be obtained by M/s. JSW Energy PSP Two Limited and shall submit the same to CEA.
- xv. Suitable R&R plan shall be prepared by M/s. JSW Energy PSP Two Limited and submitted to MoEF&CC for obtaining their clearance.
- xvi. M/s. JSW Energy PSP Two Limited shall set up a sound and scientific safety management system which shall include:

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- Establishing procedures to identify hazards that could give rise to the potential of injury, health impairment or death and measures to control impact of such hazards.
 - Setting up an Early Warning System to deal with hazardous events such as Glacial Lake and Landslide Outburst Floods, Earthquakes, cloudburst, Flash Floods, Avalanches, Dam Break event, etc.
 - Establishing Standard Operating Procedure to deal with these hazardous events.
- xvii. M/s. JSW Energy PSP Two Limited shall obtain clearance from Ministry of Home Affairs regarding participation of foreign companies in tender works packages and shall comply with the conditioned stipulated therein.
- xviii. M/s. JSW Energy PSP Two Limited shall take measures for averting the flooding of the powerhouse as per conditions contained in Annex-IX and appropriate preventive measures of Disaster Management in case of Dam failure or sudden release of water as per conditions contained in Annex-X.
- xix. M/s. JSW Energy PSP Two Limited shall comply with the "Guidelines for participation of foreign Companies in tender work packages of Hydroelectric Projects in sensitive areas, 2009" as issued by Ministry of Power vide letter no. 7/1/2002-DO (NHPC Limited) [Vol.II] dated 03.09.2009 (Annex-XI).
- xx. M/s. JSW Energy PSP Two Limited shall deploy modern tools / software for construction monitoring of the project by establishing IT based monitoring systems and linking the same to CEA network.
- xxi. M/s. JSW Energy PSP Two Limited shall ensure availability of adequate quantities of rock/sand from quarries/excavated muck/burrow areas to meet the requirement of coarse & fine aggregates for both wearing & non-wearing surfaces.
- xxii. Fly ash and fly ash based products shall be used in the construction of various works to the extent possible in accordance with MoEF&CC (Erstwhile MoEF) notification dated 14.09.1999 and its amendment dated 27.08.2003 and as revised on 06.11.2008. Construction material surveys shall include the required investigations for use of fly ash and fly ash based products in various works, infrastructure facilities etc. and their feasibility shall be ascertained by M/s. JSW Energy PSP Two Limited.
- xxiii. Information in respect of tying up essential inputs/statutory clearances, results of investigations/ studies shall be submitted by M/s. JSW Energy PSP Two Limited to CEA/CWC/GSI/CSMRS on receipt of same from time to time.
- xxiv. The broad technical aspects of the project proposal in the project report have been scrutinized in CEA in consultation with CWC, GSI and other concerned agencies. The scrutiny is based on the data, assessment and certificates presented in the report and information/clarifications received as compliances to the observations on the assumption that the data and information furnished

are accurate and have been collected reliably by the project authorities from dependable sources and/or after carrying out detailed surveys and investigations as presented in the report.

- xxv. M/s. JSW Energy PSP Two Limited shall comply strictly the "Public Procurement (Preference to make in India) Order, 2017 (PPP-MII Order)" issued by Department of Industrial Policy and Promotion, Ministry of Commerce & Industry, Govt. of India vide its letter no. P-45021/2/2017-B.E.-II dated 15.06.17. (Copy enclosed Annex-XII).
 - xxvi. M/s. JSW Energy PSP Two Limited shall register units of the project in e-gen portal and map data on PM Gati Shakti Portal.
 - xxvii. M/s. JSW Energy PSP Two Limited shall strictly comply with the provisions mentioned in Central Electricity Authority regulations for "Safety requirements for construction, operation and maintenance of electrical plants and electrical lines, 2011" and amendment thereof, if any.
 - xxviii. M/s. JSW Energy PSP Two Limited shall strictly comply with the provisions mentioned in Central Electricity Authority regulations for "Measures relating to Safety and Electric Supply, 2010" and amendment thereof, if any.
 - xxix. M/s. JSW Energy PSP Two Limited shall approach CTU to seek connectivity as per CERC Regulations.
 - xxx. M/s. JSW Energy PSP Two Limited shall submit the updated DPR to the State Govt., Appropriate Electricity Regulatory Commission, Central Transmission Utility and co-basin States within seven days from the date of issue this Office Memorandum.
5. Developer has informed that project is scheduled to be completed in 46 months from zero date, i.e., 01.03.2025.
 6. Concurrence is subject to compliance by M/s. JSW Energy PSP Two Limited of various policies/ guidelines etc. issued by Govt. of India from time to time.
 7. Monthly Status Report of compliance of the conditions stipulated in para 4 of this Concurrence letter shall be submitted by M/s. JSW Energy PSP Two Limited to HPA division, CEA.
 8. Monthly Progress Report of the project shall be submitted to Hydro Project Monitoring (HPM) Division of CEA. Three (3) copies of half-yearly reports both on physical progress of the scheme and expenditure actually incurred, duly certified by statutory auditors shall be submitted to the Authority till the Commercial Operation Date of the plant. The project authorities shall give free accessibility to CEA officers and staff to have on the spot assessment of various aspects of the project.

9. Monthly status of the project from date of concurrence to date of Commercial Operation (COD) shall be furnished by M/s. JSW Energy PSP Two Limited to HPA division, CEA as per the proforma enclosed at Annex -XIII.

10. In case time gap between Concurrence accorded to the scheme by CEA and award of one of major civil packages (either of Dam/ Embankment/ HRT/ Powerhouse) by M/s. JSW Energy PSP Two Limited is three years or more, a fresh Concurrence of CEA shall be obtained by M/s JSW. Energy PSP Two Limited.

Revalidation of Concurrence can also be considered, in case, the reason for delay in award of one of major civil packages (either of Dam/Embankment/HRT/ Powerhouse) is beyond the control of developer. However, proposal for revalidation shall be submitted three months before the expiry of validity of the Concurrence, which is three years from the date of issue of this Concurrence Memorandum.

11. In case, changes are made in design parameters, during construction, due to site conditions or otherwise, the same shall be submitted to CEA under intimation to concerned appraising Organization (CWC/GSI/CSMRS) for their approval at the design stage itself, well before execution of work in the form of Memorandum of Changes (MoC). The execution of such changes shall remain suspended till approval of the Authority on MoC.

12. The Authority reserves the right to revoke the concurrence, if the conditions stipulated in the concurrence letter are not complied with to the satisfaction of the Authority.

This issues with the approval of the Competent Authority.

Signed by Jyoti Singh

Date: 24-09-2024 17:19:38

(Jyoti Singh)
Deputy Director

To,

1. Whole Time Director, M/s. JSW Energy PSP Two Limited , NTH Complex 4th Floor, A-2, Shaheed Jeet Singh Marg, Qutab Institutional Area, New Delhi 110016.
2. Secretary, MoEF&CC, Govt. of India, Paryavaran Bhawan, CGO Complex, Lodhi Road, New Delhi-110003.
3. Chairperson, Central Electricity Regulatory Commission, 3rd & 4th Floor, Chanderlok Building, 36, Janpath, New Delhi-110001.
4. Chairperson, Central Water Commission, Sewa Bhawan, R.K. Puram, New Delhi-110066.
5. Additional Chief Secretary to Government, Department of Energy, 3rd Floor, Main Building, Mantralay, Mumbai-32. (email: ministertanpure@gmail.com)
6. Chairman-cum-Managing Director, Power Grid Corporation of India Limited, Saudamini, Plot No.2, Sector 29, Gurgaon-122001 (Haryana).

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7. Chairman, Central Transmission Utility of India Limited, Floors No. 5-10, Tower 1, Plot No. 16, IRCON International Tower, Institutional Area, Sector 32, Gurugram, Haryana - 122001
8. Adviser (Energy), NITI Aayog, Yojana Bhawan, New Delhi-110001.
9. Member (D&R), Central Water Commission, Sewa Bhawan, RK Puram, New Delhi-110066.
10. Joint Secretary (Hydro), Ministry of Power, Shram Shakti Bhawan, Rafi Marg, New Delhi-110119.
11. Chief Engineer (HPA/ PSP&PA-I/ F&CA/ CD/ Legal/ HPP&I/ HETD&RM/ HPM), CEA, Sewa Bhawan, RK Puram, New Delhi-110066.
12. Chief Engineer Design (NW&S) & Nodal Officer for Single Window Clearance Cell, CWC, Sewa Bhawan (S), RK Puram, New Delhi-110066.
13. Director (LHIM & EPE Division), Geological Survey of India, A-II, Pushpa Bhawan, Madangir Road, New Delhi-110062.
14. Director, CSMRS, Olof Palme Marg, Hauz Khas, New Delhi-110016.
15. Director PA(N) & Nodal Officer for Single Window Clearance Cell, CWC, Sewa Bhawan(S), RK Puram, New Delhi-110066.
16. Director {Hydrology(S)/ CMDD (E&NE)/ Embankment (E&NE)/ HCD(E&NE)/ Gates Design (E&NE)/ FE&SA/ ISM-1/ CA-HWF/ CB&PM/ Instrumentation}, CWC, Sewa Bhawan (S), RK Puram, New Delhi-110066.

Copy to:

17. Chairperson, Central Electricity Authority, Sewa Bhawan, RK Puram, New Delhi-110066.
18. Member (Power System/ Hydro/ Planning/ Grid Operation & Distribution/ Thermal/ Economic & Commercial), CEA, Sewa Bhawan, RK Puram, New Delhi-110066.

PART-II

(To be filled by the concerned Deputy Conservator of Forest)

State Serial No. of proposal : MH-088/2022

1. Location of the project/Scheme : Maharashtra

- (i) State / Union Territory : Maharashtra
(ii) District : Thane, Nashik
(iii) Forest Division : Shahapur, West Nashik(Nashik)
(iv) Area of forest land proposed for diversion (in ha.) : 243.74
(v) Category of the Proposal: Hydel

2. Legal status of forest land proposed for diversion

S. No.	Division	Forest Land(ha.)	Legal Status
1	Shahapur	97.92	Reserved Forest
2	Shahapur	9.68	Protected Forest
3	Shahapur	73.85	Private Forest
4	West Nashik(Nashik)	62.29	Reserved Forest
Total		243.74	

Division 1. : Shahapur

3. District wise area to be diverted in the division

S. No.	District	Area(ha.)
1	Thane	181.45
Total		181.45

4. Details of Vegetation available in the forest land proposed for diversion

(i) Density of vegetation

S. No.	Area(in ha.)	Density	Eco-Class
1	73.85	0.2	Eco 1
2	107.6	0.6	Eco 1
Total.		181.45	

(ii) Species-wise local/scientific names and girth-wise enumeration of trees at FRL

S. No.	Scientific Name	Local Name	(0-30)cm.	(31-60)cm.	(61-90)cm.	(91-120)cm.	(121-150)cm.	(>150)cm.
1	Tectona Grandis	Sag	157	102	8	1	0	0
2	Others	other species	18155	13537	3440	938	442	153
3	Adina cordifolia	Hedu	90	64	19	9	4	3
4	Terminalia Tomentosa	Ain	11345	10184	1663	475	163	49
5	Gmelina Arborea	Shivan	263	265	6	14	2	3
Total			30010	24152	5136	1437	611	208
Sub Total (No of Trees.)			61554					

(iii) Species-wise local/scientific names and girth-wise enumeration of trees at FRL-2 meter

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No.	Scientific Name	Local Name	30)cm.	60)cm.	90)cm.	120)cm.	150)cm.	>150)cm.
1	Tectona Grandis	sag	157	102	8	1	0	0
2	Others	other species	18285	12579	3228	876	416	137
3	Terminalia Tomentosa	Ain	11204	9596	1531	424	147	43
4	Adina cordifolia	Hedu	88	59	18	9	4	2
5	Gmelina Arborea	Shivan	275	263	6	14	2	3
Total			30009	22599	4791	1324	569	185
Sub Total (No of Trees.)			59477					

(iv) Species-wise local/scientific names and girth-wise enumeration of trees at FRL-4 meter

S. No.	Scientific Name	Local Name	(0-30)cm.	(31-60)cm.	(61-90)cm.	(91-120)cm.	(121-150)cm.	(>150)cm.
1	Tectona Grandis	sag	157	102	8	1	0	0
2	Others	other species	18365	11742	3043	834	395	132
3	Terminalia Tomentosa	Ain	11127	9035	1417	396	135	41
4	Adina cordifolia	Hedu	86	55	18	7	4	2
5	Gmelina Arborea	Shivan	274	245	6	14	2	3
Total			30009	21179	4492	1252	536	178
Sub Total (No of Trees.)			57646					

5. Working plan prescription for the forest land proposed for diversion :

Tropical Moist Deciduous Forest

6. Brief note on vulnerability of the forest area to erosion :

The project involves construction two new reservoirs. However, these reservoirs will be constructed at the place of natural depressions. No cutting or levelling of land is required

7. Approximate distance of the proposed site for diversion from boundary of forest(in km.) : 0

8. Significance of the forest land proposed for diversion from wildlife point of view

(i). Details of wildlife present in and around the forest land proposed for diversion : Presence of wild animals like hyaena, wolf, jackal, leopard, angulates like Nilgai, Four Horned antelopes, spotted Deer, Barking Deer and numerous species of avifauna in the forest as well as in the revenue areas is not uncommon.

(ii). Whether forms part of national park, wildlife sanctuary, biosphere reserve, tiger reserve, elephant corridor, wildlife migration corridor etc. : No

(iii). Whether the forest land proposed for diversion is located within eco-sensitive zone(ESZ) of the Protected Area notified under Wildlife(Protection) Act, 1972 (Note: In case, ESZ of a Protected Area is not notified, then, 10kms distance from boundary of the Protected Area should be treated as ESZ): No

(iv). Whether any national park, wildlife sanctuary, biosphere reserve, tiger reserve, elephant corridor, wildlife migration corridor etc., is located within 1 Km. from boundary of the forest land proposed for diversion : No

(v). Whether any rare/endangered/unique species of flora and fauna found in the area : No

9.

Details of any protected archaeological/heritage site/defence establishment or any other important monument located in the area, if any

(i). Whether any protected archaeological/heritage site/defence establishment or any other important monument is located in the area : No

10. Comment as to the reasonability of the extent of the forest land proposed for diversion

(i). Whether the requirement of forest land as proposed by the user agency is unavoidable and bare minimum for the project : Yes

11. Details of violation(s), if any ,committed

(i). Whether any work in violation of the Act or guidelines issued under the Act has been carried out : No

12. Whether work in violation is still in progres(Yes/No) : NIL

13. Details of compensatory afforestation scheme

(i). Patch wise details of non-forest or Revenue forest land to be provided by User Agency for CA

Patch Wise Details						
S.no	District Name	Village	Area(in ha.)	khasra	KML file	Present Owner file
1	Ratnagiri	Chorvane	245.735	71 to 75, 91 to 98, 101 to 104, 113, 114		

(ii). Upload a scanned copy of the Geo-referenced map of the forest land proposed for C.A. prepared by using DGPS or Total Station:

(iii). Upload a copy of Survey of India Toposheet indicating boundary of forest land proposed for C.A:

(iv). Copy of CA scheme details:

(iv). Copy of CA scheme details: NA

Additional information Details

S. No.	Documents	Remarks
		NIL

Division 2. : West Nashik(Nashik)

3. District wise area to be diverted in the division

S. No.	District	Area(ha.)
1	Nashik	62.29
Total		62.29

4. Details of Vegetation available in the forest land proposed for diversion

(i) Density of vegetation

S. No.	Area(in ha.)	Density	Eco-Class
1	62.29	0.5	Eco 1
Total.	62.29		

(ii) Species-wise local/scientific names and glrth-wise enumeration of trees at FRL

S. No.	Scientific Name	Local Name	(0-30)cm.	(31-60)cm.	(61-90)cm.	(91-120)cm.	(121-150)cm.	(>150)cm.
1	Others	Aamantegali	14	4	0	0	0	0
2	Others	Aapta	0	4	2	0	0	0
2	Dioscorea Macrotuberosa	Aapan	100	05	18	2	2	4

5	Others	Ain	557	815	118	10	4	0
6	Others	Aliv	15	26	4	0	0	0
7	Mangifera Indica	Amba	62	140	70	65	63	99
8	Cassia Fistula	Bahava	6	9	1	1	0	0
9	Others	Bambu	1	0	0	0	0	0
10	Others	Bhendi	1	2	1	1	0	0
11	Others	Bibla	0	0	0	0	0	1
12	Mimusops Elengi	Bogada	20	0	0	0	0	0
13	Others	Bokar	0	2	0	0	0	0
14	Lagerstroemia Parviflora	Bonda	182	254	66	11	3	0
15	Zizyphus Jujuba	Borkut	1	0	0	0	0	0
16	Others	Butuska	0	3	0	0	0	0
17	Others	Chanda	5	3	0	0	0	0
18	Others	Chinch	0	1	0	0	0	0
19	Others	Dhaman	1	0	0	0	0	0
20	Others	Dhavda	1	0	0	0	0	0
21	Others	Dhayati	5	1	0	0	0	0
22	Others	Dinni	1	0	0	0	0	0
23	Others	Ela	1	5	4	1	4	1
24	Artocarpus Heterophyllus	Fanas	2	5	1	0	0	0
25	Others	Gaal	13	5	0	1	1	0
26	Others	Gawa	2	0	0	0	0	0
27	Others	Ghatvel	1	2	0	0	0	0
28	Others	Gol	1	1	0	0	0	0
29	Others	Gulchay	315	126	6	1	1	1
30	Others	Hirda	174	239	90	41	31	35
31	Others	Jambul	586	660	163	96	25	0
32	Others	Kadipata	0	1	0	0	0	0
33	Others	Kalamb	0	1	0	0	0	0
34	Others	Kanchan	4	4	0	0	0	0
35	Others	Kandar	0	1	0	0	0	0
36	Others	Karambi	249	178	49	26	12	13
37	Others	Karap	33	61	45	7	2	1
38	Others	Karel	19	8	4	1	0	0
39	Others	Karval	18	11	1	1	0	1
40	Others	Karvand	1	0	0	0	0	0
41	Others	Karwa	0	2	0	0	0	0
42	Others	Kavandar	13	3	0	0	0	0
43	Others	Kharmati	1	0	0	0	0	0
44	Others	Kirmira	10	0	0	0	0	0
45	Others	Kobat	0	1	0	0	0	0
46	Others	Koyakhar	0	5	0	1	0	1
47	Others	Koyambal	1	8	0	0	1	0
48	Others	Kuda	23	6	0	0	0	0
49	Others	Kumbha	42	43	12	1	2	0
50	Others	Lokhandi	6	1	0	0	0	0
51	Others	Moh	27	11	2	0	0	0
52	Others	Palas	12	12	4	0	0	0
53	Others	Pangara	3	0	1	1	0	0
54	Others	Patgiri	1	0	0	0	0	0
55	Others	Payer	8	19	2	4	0	1
56	Others	Payir	0	8	1	0	1	0
57	Others	Peru	0	1	0	0	0	0
58	Others	Pombal	1	0	0	0	0	0
59	Others	Savar	0	1	0	1	0	0
60	Others	Shendri	31	20	1	1	0	0
61	Gmelin Arborea	Shivan	11	4	1	0	0	0
62	Others	Tambat	1	1	0	0	0	0

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64	Others	Tura	0	1	0	0	0	0
65	Ficus Racemosa	Umbar	28	86	52	70	52	151
66	Others	Varas	72	147	25	8	7	0
67	Others	Vila	12	11	3	3	0	1
68	Others	Yelvachi	0	1	0	0	0	0
69	Others	Pabha	97	10	1	0	0	0
Total			2830	3089	748	358	211	310
Sub Total (No of Trees.)			7546					

(iii) Species-wise local/scientific names and girth-wise enumeration of trees at FRL-2 meter

S. No.	Scientific Name	Local Name	(0-30)cm.	(31-60)cm.	(61-90)cm.	(91-120)cm.	(121-150)cm.	(>150)cm.
1	Others	Aamantegali	13	4	0	0	0	0
2	Others	Aapta	0	4	2	0	0	0
3	Others	Aasan	103	92	17	3	1	4
4	Others	Aavla	21	11	0	2	0	0
5	Others	Aliv	15	25	4	0	0	0
6	Mangifera Indica	Amba	61	124	66	62	57	90
7	Others	Ain	520	744	110	9	2	0
8	Cassia Fistula	Bahava	6	9	1	1	0	0
9	Others	Bambu	1	0	0	0	0	0
10	Others	Bhendi	1	2	1	1	0	0
11	Others	Bibla	0	0	0	0	0	1
12	Others	Bogada	20	0	0	0	0	0
13	Others	Bokar	0	2	0	0	0	0
14	Lagerstroemia Parviflora	Bonda	175	233	59	10	2	0
15	Zizyphus Jujuba	Borkut	1	0	0	0	0	0
16	Others	Butuska	0	1	0	0	0	0
17	Others	Chanda	4	3	0	0	0	0
18	Others	Chinch	0	1	0	0	0	0
19	Others	Dhaman	1	0	0	0	0	0
20	Others	Dhavda	1	0	0	0	0	0
21	Others	Dhayati	5	1	0	0	0	0
22	Others	Dinni	1	0	0	0	0	0
23	Others	Ela	1	5	4	1	3	1
24	Others	Fanas	1	5	1	0	1	0
25	Others	Gaal	11	5	0	1	0	0
26	Others	Gawa	2	0	0	0	0	0
27	Others	Ghatvei	1	1	0	0	0	0
28	Others	Gol	1	1	0	0	0	0
29	Others	Gulchay	293	118	6	1	1	1
30	Others	Hirda	158	226	75	40	27	31
31	Others	Jambul	520	580	122	76	22	0
32	Others	Kadipata	0	1	0	0	0	0
33	Others	Kalamb	0	1	0	0	0	0
34	Others	Kanchan	4	4	0	0	0	0
35	Others	Kandar	0	1	0	0	0	0
36	Others	Karambi	232	168	48	25	11	10
37	Others	Karap	31	56	42	6	2	1
38	Others	Karel	18	7	4	1	0	0
39	Others	Karval	16	11	1	1	0	0
40	Others	Karwa	0	2	0	0	0	0
41	Others	Kavandar	12	2	0	0	0	0
42	Others	Kharmati	1	0	0	0	0	0
43	Others	Kirmira	10	0	0	0	0	0
44	Others	Kobat	0	1	0	0	0	0

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47	Others	Kuda	23	6	0	0	0	0
47	Others	Kumbha	40	40	12	1	2	0
48	Others	Lokhandi	6	1	0	0	0	0
49	Others	Moh	27	11	2	0	0	0
50	Others	Pabha	90	9	1	0	0	0
51	Others	Palas	12	12	4	0	0	0
52	Others	Pangara	3	0	1	1	0	0
53	Others	Patgiri	1	0	0	0	0	0
54	Others	Payer	8	19	2	4	0	1
55	Others	Payir	0	8	1	0	1	0
56	Others	peru	0	1	0	0	0	0
57	Others	Pombal	1	0	0	0	0	0
58	Others	Savar	0	1	0	1	0	0
59	Others	Shendri	23	20	1	1	0	0
60	Others	Shivan	11	4	1	0	0	0
61	Others	Tambat	1	1	0	0	0	0
62	Others	Toran	8	8	0	0	0	0
63	Others	Tura	0	1	0	0	0	0
64	Others	Umbar	23	83	49	64	48	143
65	Others	Varas	69	143	24	8	6	0
66	Others	Vila	12	11	2	3	0	1
67	Others	Yelvachi	0	1	0	0	0	0
68	Others	Yelvachi	0	1	0	0	0	0
Total			2620	2843	663	324	187	286
Sub Total (No of Trees.)			6923					

(iv) Species-wise local/scientific names and girth-wise enumeration of trees at FRL-4 meter

S. No.	Scientific Name	Local Name	(0-30)cm.	(31-60)cm.	(61-90)cm.	(91-120)cm.	(121-150)cm.	(>150)cm.
1	Others	Aamantegali	13	4	0	0	0	0
2	Others	Aapta	0	4	2	0	0	0
3	Pterocarpus Marsupium	Aasan	98	85	17	3	1	4
4	Others	Aavla	19	10	0	2	0	0
5	Others	Ain	505	693	98	9	2	0
6	Others	Aliv	15	23	4	0	0	0
7	Mangifera Indica	Amba	52	113	57	55	52	78
8	Others	Bahava	6	9	0	1	0	0
9	Others	Bambu	1	0	0	0	0	0
10	Others	Fanas	0	3	1	0	0	0
11	Others	Gaal	11	5	0	1	1	0
12	Others	Gawa	2	0	0	0	0	0
13	Others	Gol	1	1	0	0	0	0
14	Others	Gulchay	257	108	5	1	1	1
15	Others	Hirda	139	207	66	31	26	25
16	Others	Jambul	472	506	98	54	19	0
17	Others	Kadipata	0	1	0	0	0	0
18	Others	kalamb	0	1	0	0	0	0
19	Others	Kanchan	4	4	0	0	0	0
20	Others	Kandar	0	1	0	0	0	0
21	Others	Karambi	211	146	39	20	9	9
22	Others	Karap	28	51	38	4	2	1
23	Others	Karel	11	7	4	1	0	0
24	Others	Karval	16	11	0	1	0	1
25	Others	Karwa	0	2	0	0	0	0
26	Others	Kavandar	11	2	0	0	0	0
27	Others	Kharmati	1	0	0	0	0	0
28	Others	Kirmira	10	0	0	0	0	0
29	Others	Kobat	0	1	0	0	0	0
30	Others	Kovakhar	0	5	0	1	0	1

31	Others	Koyambal	1	5	0	0	1	0
32	Others	Kuda	22	6	0	0	0	0
33	Others	Kumbha	34	35	10	1	2	0
34	Others	Lokhandi	6	1	0	0	0	0
35	Others	Moh	27	11	2	0	0	0
36	Others	Pabha	77	9	1	0	0	0
37	Others	Palas	11	12	4	0	0	0
38	Others	Pangara	3	0	1	1	0	0
39	Others	Patgiri	1	0	0	0	0	0
40	Others	Payer	8	18	2	4	0	1
41	Others	Payir	0	8	1	0	1	0
42	Others	Peru	0	1	0	0	0	0
43	Others	Pombal	1	0	0	0	0	0
44	Others	Savar	0	1	0	1	0	0
45	Others	Shendri	16	16	1	1	0	0
46	Others	Shivan	10	3	1	0	0	0
47	Others	Tambat	1	1	0	0	0	0
48	Others	Toran	7	6	0	0	0	0
49	Others	Tura	0	1	0	0	0	0
50	Others	Umbar	17	74	45	51	43	124
51	Others	Varas	68	136	18	7	5	0
52	Others	Vila	12	11	2	3	0	1
53	Others	Yelvachi	0	1	0	0	0	0
54	Others	Bhendi	1	2	1	1	0	0
55	Mimusops Elengi	Bogada	16	0	0	0	0	0
56	Others	Bokar	0	2	0	0	0	0
57	Lagerstroemia Parviflora	Bonda	164	212	47	9	2	0
58	Zizyphus Jujuba	Borkut	1	0	0	0	0	0
59	Others	Chanda	4	3	0	0	0	0
60	Others	Chinch	0	1	0	0	0	0
61	Others	Dhaman	1	0	0	0	0	0
62	Others	Dhavda	1	0	0	0	0	0
63	Others	Dhayati	5	1	0	0	0	0
64	Others	Ela	1	4	4	1	3	1
65	Others	Butuska	0	1	0	0	0	0
66	Others	Yelvachi	0	1	0	0	0	0
Total			2399	2586	569	264	170	247
Sub Total (No of Trees.)			6235					

5. Working plan prescription for the forest land proposed for diversion : NIL

6. Brief note on vulnerability of the forest area to erosion :

the project involve construction of new resevoirs. However, the resevoirs will be constructed at the place of natural depression. the project agency has proposed a site specific

7. Approximate distance of the proposed site for diversion from boundary of forest(in km.) : 0

8. Significance of the forest land proposed for diversion from wildlife point of view

- Details of wildlife present in and around the forest land proposed for diversion : The
- (i). presence of animals such as leopards, hyena, wolf, jackal, hares, wild boar, porcupine and birds such as bee eater, grey hornbill, sunbirds is observed in this area
 - (ii). Whether forms part of national park, wildlife sanctuary, biosphere reserve, tiger reserve, elephant corridor, wildlife migration corridor etc. : No

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 (iii). of the Protected Area notified under Wildlife(Protection) Act, 1972 (Note: In case, ESZ of a Protected Area is not notified, then, 10kms distance from boundary of the Protected Area should be treated as ESZ): No

(iv). Whether any national park, wildlife sanctuary, biosphere reserve, tiger reserve, elephant corridor, wildlife migration corridor etc., is located within 1 Km. from boundary of the forest land proposed for diversion : No

(v). Whether any rare/endangered/unique species of flora and fauna found in the area : No

9.

Details of any protected archaeological/heritage site/defence establishment or any other important monument located in the area, if any

(i). Whether any protected archaeological/heritage site/defence establishment or any other important monument is located in the area : No

10. Comment as to the reasonability of the extent of the forest land proposed for diversion

(i). Whether the requirement of forest land as proposed by the user agency is unavoidable and bare minimum for the project : Yes

11. Details of violation(s), if any ,committed

(i). Whether any work in violation of the Act or guidelines issued under the Act has been carried out : No

12. Whether work in violation is still in progres(Yes/No) : NIL

13. Details of compensatory afforestation scheme

(i). Patch wise details of non-forest or Revenue forest land to be provided by User Agency for CA

S.no	District Name	Village	Area(in ha.)	khasra	KML file	Present Owner file
1	Ratnagiri	Chorvane	245.735	71 to 75, 91 to 98, 101 to 104, 113, 114		

(ii). Upload a scanned copy of the Geo-referenced map of the forest land proposed for C.A. prepared by using DGPS or Total Station:

(iii). Upload a copy of Survey of India Toposheet indicating boundary of forest land proposed for C.A:

(iv). Copy of CA scheme details:

(iv). Copy of CA scheme details: NA

Additional information Details

S. No.	Documents	Remarks
		NIL

14. District Profile

S.no	District Name	Geographical area of the district (in ha.)	Forest area of the district (in ha.)	Total forest area diverted since 1980 (in ha.)	No. of Approved Cases	Forest Land including penal C.A. (in ha.)	Progress of compensatory afforestation as on(date)	A) Forest land (in ha.)	B) Non-forest land (in ha.)
1	Nashik								
2	Thane	135778.00	56799.90	4427.5996	37	1209.2982	31/03/2025	1209.136	36.605

15.

Site inspection report of the DFO/CCF/Nodal Officer highlighting important facts pertaining to the forest land

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Division Name	Circle	Site inspected By	Whether site inspected	No. of times site visited	Site inspection report	Date of visit
West Nashik(Nashik)	Nashik	DFO	Yes	One		24/10/2024
Shahapur	Thane	DFO	Yes	One		23/12/2024
	Nashik	CF	Yes	One		10/04/2025
		Nodal Officer	No		No Data	

(Specific recommendation of the DFO/CCF/Nodal Officer with (Part II, III & Part IV)).

16.

Specific recommendation of the DFO/CCF/Nodal Officer for acceptance or otherwise of the proposal with reason

Division	Circle	Recommendation By	Recommendation	Reason	Letter	Whether CF agreed
West Nashik(Nashik)	Nashik	DFO	Recommended	In case of allotted land, within the project area the user agency shall not utilize/acquire the land parcel without a separate/additional diversion proposal. Additionally, the project involves construction of tunnel work may require stability studies from national level institutions. considering the project is recommended for approval 62.29 ha		

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recommended for acceptance on following grounds

1. Demand for the power is on steady rise with an average annual rate of 8.9% in the country. The project aims at augmentation of present installed capacity of hydro power in the country by 1500 MW. The Government of Maharashtra has executed Memorandum of Understanding with the Project Proponent for development of the extant project.

2. The Hydro Energy Project is an established, proven and cost effective technology for clean and cheap electricity. Demand for the power is on steady rise in the State of Maharashtra. The project has potential to bridge the gap between demand and supply of electricity in Maharashtra.

3. The project will generate significant employment opportunities for the people of Maharashtra for the decades together and will create infrastructure facilities to accelerate socio economic development of the region.

4. The project is site specific and requirement of Forest Land is assessed to barest minimum &

	Nashik	CF	Recommended	recommended for acceptance. Recommended as mentioned in Part III	Yes
	Thane	CF	Recommended	The JSW Energy PSP two limited proposed 243.74 ha. for hydro energy project in Jamunde village of Igatpuri Tehsil of Nashik District and Kalbhonde, Kothal village in Shahapur Tehsil of Thane district for Pumped storage of 1500 MW capacity. The government of Maharashtra has signed a MOU with user agency. This project is aimed to provide cheap and clean and green energy. This is a public utility project.	Yes
		Nodal Officer	Recommended	Recommended	

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**JSW Energy PSP Two Limited**Regd. Office : JSW Centre,
Bandra Kurla Complex,
Bandra (East), Mumbai - 400 051CIN.: U40106MH2021PLC367136
Phone +91 22 4286 1000
Fax +91 22 4286 3000
Website www.jsw.in**UNDERTAKING****(Regarding Dam Safety)**

Certified that the permission will be obtained from the Dam Safety Authority, if required, after Stage-I approval, for the proposal involving diversion of forest land for construction of the Bhavali Pumped Storage Project (1500 MW) located in Nashik and Thane District in the State of Maharashtra.

For JSW Energy (PSP) Two Limited

(Authorized Signatory)

Place : NashikDate : 28/10/2025



भारत सरकार
Govt. of India
विद्युत मंत्रालय
Ministry of Power
केन्द्रीय विद्युत प्राधिकरण
Central Electricity Authority
जल विद्युत परियोजना मूल्यांकन प्रभाग
Hydro Project Appraisal Division

OFFICE MEMORANDUM

Subject: Accord of Concurrence to Bhavali Off-stream Open Loop Pumped Storage Project, 1500 MW (5 x 250 MW + 2 x 125 MW) in Maharashtra by M/s. JSW Energy PSP Two Limited under Section 8 of the Electricity Act, 2003 - regarding.

Detailed Project Report (DPR) of the Bhavali Off-stream Open Loop Pumped Storage Project, 1500 MW (5 x 250 MW + 2 x 125 MW) in Maharashtra by M/s. JSW Energy PSP Two Limited was uploaded in the DPR Approval Process Monitoring System (DAPMS) portal of CEA on 05.09.2024 for concurrence, as per Guidelines for Acceptance, Examination and Concurrence of Detailed Project Reports for Pumped Storage Schemes Version 3.0

2. Undersigned is directed to convey the decision of Authority taken in the meeting held on 06.09.2024, to accord concurrence to Bhavali Off-stream Open Loop Pumped Storage Project (PSP) in exercise of the powers conferred upon the Authority under Section 8 of the Electricity Act, 2003.
3. The undertaking by M/s. JSW Energy PSP Two Limited is attached at **Annex-I**. The salient features of the scheme are given in **Annex-II**.
4. This concurrence is subject to fulfilment of the following conditions: -
 - i. M/s. JSW Energy PSP Two Limited shall comply with the suggestions/ observations of Central Water Commission (CWC) as given in **Annex-III**.
 - ii. M/s. JSW Energy PSP Two Limited shall comply with the suggestions/ observations of Central Electricity Authority (CEA) as given in **Annex-IV**.
 - iii. M/s. JSW Energy PSP Two Limited shall comply with the suggestions/ observations of Geological Survey of India as given in **Annex- V**.
 - iv. M/s. JSW Energy PSP Two Limited shall comply with the suggestions/ observations of CSMRS as given in **Annex-VI**.

- v. M/s. JSW Energy PSP Two Limited shall make provisions to install the instruments (list attached at Annex-VII) in appropriate number at suitable locations in project as per relevant IS codes in consultation with CWC. Further, it is to mention that the list of instruments attached at Annex-VII is not exhaustive and may be modified by CEA in future. M/s. JSW Energy PSP Two Limited shall be responsible for installing adequate instrumentation in the project to ensure safety and monitor project health effectively.
- vi. M/s. JSW Energy PSP Two Limited shall communicate results of explorations/ investigations from time to time for appraisal of CEA/ CWC/ GSI/ CSMRS regularly.
- vii. Examination of Cost Estimates of Pumped Storage Projects is exempted from Concurrence Process. However, additional chapters as per Guidelines for Formulation of Detailed Project Reports for Pumped Storage Schemes Version 3.0, shall be submitted by M/s. JSW Energy PSP Two Limited to the Authority within 60 days from date of uploading the DPR on CEA portal so as to ascertain the project cost in accordance with the limit specified by the Central government from time to time. It will not be vetted by CEA/CWC.
- viii. M/s. JSW Energy PSP Two Limited shall use the NCSDP approved parameters for design purposes.
- ix. In case geological surprises in works of the project are met, M/s. JSW Energy PSP Two Limited shall systematically maintain a record of geological surprises and treatment provided. The same may be immediately brought to the knowledge of Standing Committee for matters pertaining to Geological Uncertainties/ Surprises and Natural Disaster Events faced in the Hydroelectric Projects constituted vide OM date 23.10.2023 (Annex-VIII).
- x. M/s. JSW Energy PSP Two Limited shall obtain Environment and Forest clearance from MoEF&CC and shall submit a copy to CEA.
- xi. M/s. JSW Energy PSP Two Limited shall obtain Clearance from National Board of Wildlife and shall submit a copy to CEA, if applicable.
- xii. M/s. JSW Energy PSP Two Limited shall obtain Land availability certificate before actual start of the project and shall submit a copy to CEA.
- xiii. M/s. JSW Energy PSP Two Limited shall obtain NoC from Ministry of Defence and shall submit a copy to CEA, if applicable.
- xiv. If Scheduled Tribe population is getting affected at project site, clearance under Forest Right Act/ Ministry of Social Justice & Empowerment/ State Government shall be obtained by M/s. JSW Energy PSP Two Limited and shall submit the same to CEA.
- xv. Suitable R&R plan shall be prepared by M/s. JSW Energy PSP Two Limited and submitted to MoEF&CC for obtaining their clearance.
- xvi. M/s. JSW Energy PSP Two Limited shall set up a sound and scientific safety management system which shall include:

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- Establishing procedures to identify hazards that could give rise to the potential of injury, health impairment or death and measures to control impact of such hazards.
 - Setting up an Early Warning System to deal with hazardous events such as Glacial Lake and Landslide Outburst Floods, Earthquakes, cloudburst, Flash Floods, Avalanches, Dam Break event, etc.
 - Establishing Standard Operating Procedure to deal with these hazardous events.
- xvii. M/s. JSW Energy PSP Two Limited shall obtain clearance from Ministry of Home Affairs regarding participation of foreign companies in tender works packages and shall comply with the conditioned stipulated therein.
- xviii. M/s. JSW Energy PSP Two Limited shall take measures for averting the flooding of the powerhouse as per conditions contained in **Annex-IX** and appropriate preventive measures of Disaster Management in case of Dam failure or sudden release of water as per conditions contained in **Annex-X**.
- xix. M/s. JSW Energy PSP Two Limited shall comply with the "Guidelines for participation of foreign Companies in tender work packages of Hydroelectric Projects in sensitive areas, 2009" as issued by Ministry of Power vide letter no. 7/1/2002-DO (NHPC Limited) [Vol.II] dated 03.09.2009 (**Annex-XI**).
- xx. M/s. JSW Energy PSP Two Limited shall deploy modern tools / software for construction monitoring of the project by establishing IT based monitoring systems and linking the same to CEA network.
- xxi. M/s. JSW Energy PSP Two Limited shall ensure availability of adequate quantities of rock/sand from quarries/excavated muck/burrow areas to meet the requirement of coarse & fine aggregates for both wearing & non-wearing surfaces.
- xxii. Fly ash and fly ash based products shall be used in the construction of various works to the extent possible in accordance with MoEF&CC (Erstwhile MoEF) notification dated 14.09.1999 and its amendment dated 27.08.2003 and as revised on 06.11.2008. Construction material surveys shall include the required investigations for use of fly ash and fly ash based products in various works, infrastructure facilities etc. and their feasibility shall be ascertained by M/s. JSW Energy PSP Two Limited.
- xxiii. Information in respect of tying up essential inputs/statutory clearances, results of investigations/ studies shall be submitted by M/s. JSW Energy PSP Two Limited to CEA/CWC/GSI/CSMRS on receipt of same from time to time.
- xxiv. The broad technical aspects of the project proposal in the project report have been scrutinized in CEA in consultation with CWC, GSI and other concerned agencies. The scrutiny is based on the data, assessment and certificates presented in the report and information/clarifications received as compliances to the observations on the assumption that the data and information furnished

are accurate and have been collected reliably by the project authorities from dependable sources and/or after carrying out detailed surveys and investigations as presented in the report.

- xxv. M/s. JSW Energy PSP Two Limited shall comply strictly the "Public Procurement (Preference to make in India) Order, 2017 (PPP-MII Order)" issued by Department of Industrial Policy and Promotion, Ministry of Commerce & Industry, Govt. of India vide its letter no. P-45021/2/2017-B.E.-II dated 15.06.17. **(Copy enclosed Annex-XII)**.
- xxvi. M/s. JSW Energy PSP Two Limited shall register units of the project in e-gen portal and map data on PM Gati Shakti Portal.
- xxvii. M/s. JSW Energy PSP Two Limited shall strictly comply with the provisions mentioned in Central Electricity Authority regulations for "Safety requirements for construction, operation and maintenance of electrical plants and electrical lines, 2011" and amendment thereof, if any.
- xxviii. M/s. JSW Energy PSP Two Limited shall strictly comply with the provisions mentioned in Central Electricity Authority regulations for "Measures relating to Safety and Electric Supply, 2010" and amendment thereof, if any.
- xxix. M/s. JSW Energy PSP Two Limited shall approach CTU to seek connectivity as per CERC Regulations.
- xxx. M/s. JSW Energy PSP Two Limited shall submit the updated DPR to the State Govt., Appropriate Electricity Regulatory Commission, Central Transmission Utility and co-basin States within seven days from the date of issue this Office Memorandum.
5. Developer has informed that project is scheduled to be completed in 46 months from zero date, i.e., 01.03.2025.
6. Concurrence is subject to compliance by M/s. JSW Energy PSP Two Limited of various policies/ guidelines etc. issued by Govt. of India from time to time.
7. Monthly Status Report of compliance of the conditions stipulated in para 4 of this Concurrence letter shall be submitted by M/s. JSW Energy PSP Two Limited to HPA division, CEA.
8. Monthly Progress Report of the project shall be submitted to Hydro Project Monitoring (HPM) Division of CEA. Three (3) copies of half-yearly reports both on physical progress of the scheme and expenditure actually incurred, duly certified by statutory auditors shall be submitted to the Authority till the Commercial Operation Date of the plant. The project authorities shall give free accessibility to CEA officers and staff to have on the spot assessment of various aspects of the project.

9. Monthly status of the project from date of concurrence to date of Commercial Operation (COD) shall be furnished by M/s. JSW Energy PSP Two Limited to HPA division, CEA as per the proforma enclosed at Annex –XIII.

10. In case time gap between Concurrence accorded to the scheme by CEA and award of one of major civil packages (either of Dam/ Embankment/ HRT/ Powerhouse) by M/s. JSW Energy PSP Two Limited is three years or more, a fresh Concurrence of CEA shall be obtained by M/s JSW. Energy PSP Two Limited.

Revalidation of Concurrence can also be considered, in case, the reason for delay in award of one of major civil packages (either of Dam/Embankment/HRT/ Powerhouse) is beyond the control of developer. However, proposal for revalidation shall be submitted three months before the expiry of validity of the Concurrence, which is three years from the date of issue of this Concurrence Memorandum.

11. In case, changes are made in design parameters, during construction, due to site conditions or otherwise, the same shall be submitted to CEA under intimation to concerned appraising Organization (CWC/GSI/CSMRS) for their approval at the design stage itself, well before execution of work in the form of Memorandum of Changes (MoC). The execution of such changes shall remain suspended till approval of the Authority on MoC.

12. The Authority reserves the right to revoke the concurrence, if the conditions stipulated in the concurrence letter are not complied with to the satisfaction of the Authority.

This issues with the approval of the Competent Authority.

Signed by Jyoti Singh

Date: 24-09-2024 17:19:38

(Jyoti Singh)
Deputy Director

To,

1. Whole Time Director, M/s. JSW Energy PSP Two Limited , NTH Complex 4th Floor, A-2, Shaheed Jeet Singh Marg, Qutab Institutional Area, New Delhi 110016.
2. Secretary, MoEF&CC, Govt. of India, Paryavaran Bhawan, CGO Complex, Lodhi Road, New Delhi-110003.
3. Chairperson, Central Electricity Regulatory Commission, 3rd & 4th Floor, Chanderlok Building, 36, Janpath, New Delhi-110001.
4. Chairperson, Central Water Commission, Sewa Bhawan, R.K. Puram, New Delhi-110066.
5. Additional Chief Secretary to Government, Department of Energy, 3rd Floor, Main Building, Mantralay, Mumbai-32. (email: ministertanpure@gmail.com)
6. Chairman-cum-Managing Director, Power Grid Corporation of India Limited, Saudamini, Plot No.2, Sector 29, Gurgaon-122001 (Haryana).

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7. Chairman, Central Transmission Utility of India Limited, Floors No. 5-10, Tower 1, Plot No. 16, IRCON International Tower, Institutional Area, Sector 32, Gurugram, Haryana - 122001
8. Adviser (Energy), NITI Aayog, Yojana Bhawan, New Delhi-110001.
9. Member (D&R), Central Water Commission, Sewa Bhawan, RK Puram, New Delhi-110066.
10. Joint Secretary (Hydro), Ministry of Power, Shram Shakti Bhawan, Rafi Marg, New Delhi-110119.
11. Chief Engineer (HPA/ PSP&PA-I/ F&CA/ CD/ Legal/ HPP&I/ HETD&RM/ HPM), CEA, Sewa Bhawan, RK Puram, New Delhi-110066.
12. Chief Engineer Design (NW&S) & Nodal Officer for Single Window Clearance Cell, CWC, Sewa Bhawan (S), RK Puram, New Delhi-110066.
13. Director (LHIM & EPE Division), Geological Survey of India, A-II, Pushpa Bhawan, Madangir Road, New Delhi-110062.
14. Director, CSMRS, Olof Palme Marg, Hauz Khas, New Delhi-110016.
15. Director PA(N) & Nodal Officer for Single Window Clearance Cell, CWC, Sewa Bhawan(S), RK Puram, New Delhi-110066.
16. Director {Hydrology(S)/ CMDD (E&NE)/ Embankment (E&NE)/ HCD(E&NE)/ Gates Design (E&NE)/ FE&SA/ ISM-1/ CA-HWF/ CB&PM/ Instrumentation}, CWC, Sewa Bhawan (S), RK Puram, New Delhi-110066.

Copy to:

17. Chairperson, Central Electricity Authority, Sewa Bhawan, RK Puram, New Delhi-110066.
18. Member (Power System/ Hydro/ Planning/ Grid Operation & Distribution/ Thermal/ Economic & Commercial), CEA, Sewa Bhawan, RK Puram, New Delhi-110066.

Annexure-12
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The Electricity Act, 2003

MINISTRY OF LAW AND JUSTICE
(Legislative Department)

New Delhi, the 2nd June, 2003. Jyaishta 12, 1925 (Saka)

The following Act of Parliament received the assent of the President on the 26th May, 2003, and is hereby published for general information:

THE ELECTRICITY ACT, 2003
[No.36 of 2003]

[26th May, 2003]

An Act to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and generally for taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers and supply of electricity to all areas, rationalization of electricity tariff, ensuring transparent policies regarding subsidies, promotion of efficient and environmentally benign policies, constitution of Central Electricity Authority, Regulatory Commissions and establishment of Appellate Tribunal and for matters connected therewith or incidental thereto.

Be it enacted by Parliament in the Fifty-fourth Year of the Republic of India as follows:-

PART I

PRELIMINARY

Section 1. (Short title, extent and commencement) --- (1) This Act may be called the Electricity Act, 2003.

(2) It extends to the whole of India except the State of Jammu and Kashmir.

(3) It shall come into force on such date as the Central Government may, by notification, appoint:

Provided that different dates may be appointed for different provisions of this Act and any reference in any such provision to the commencement of this Act shall be construed as a reference to the coming into force of that provision.

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PART III

GENERATION OF ELECTRICITY

Section 7. (Generating company and requirement for setting up of generating station):

Any generating company may establish, operate and maintain a generating station without obtaining a licence under this Act if it complies with the technical standards relating to connectivity with the grid referred to in clause (b) of section 73.

Section 8. (Hydro-electric generation): --- (1) Notwithstanding anything contained in section 7, any generating company intending to set-up a hydro-generating station shall prepare and submit to the Authority for its concurrence, a scheme estimated to involve a capital expenditure exceeding such sum, as may be fixed by the Central Government, from time to time, by notification.

(2) The Authority shall, before concurring in any scheme submitted to it under sub-section (1) have particular regard to, whether or not in its opinion,-

(a) the proposed river-works will prejudice the prospects for the best ultimate development of the river or its tributaries for power generation, consistent with the requirements of drinking water, irrigation, navigation, flood-control, or other public purposes, and for this purpose the Authority shall satisfy itself, after consultation with the State Government, the Central Government, or such other agencies as it may deem appropriate, that an adequate study has been made of the optimum location of dams and other river-works;

(b) the proposed scheme meets the norms regarding dam design and safety.

(3) Where a multi-purpose scheme for the development of any river in any region is in operation, the State Government and the generating company shall co-ordinate their activities with the activities of the person responsible for such scheme in so far as they are inter-related.

Section 9. (Captive generation):

(1) Notwithstanding anything contained in this Act, a person may construct, maintain or operate a captive generating plant and dedicated transmission lines:

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Central Electricity Authority



सत्यमेव जयते

Guidelines for Acceptance, Examination and Concurrence of Detailed Project Report for Pumped Storage Schemes

New Delhi
July, 2024
(Version 3.0)

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SECTION-1

REQUIREMENT FOR COCURRENCE OF PUMPED STORAGE SCHEMES

1.1 Provisions under the Electricity Act, 2003

1.1.1 As per Section 8(1) of the Electricity Act, 2003, any generating company intending to set up a hydro generating station shall prepare and submit to the Authority for its concurrence, a scheme estimated to involve a capital expenditure exceeding such sum, as may be fixed by the Central Government, from time to time, by notification.

1.1.2 As per Section 8(2) of the Electricity Act, 2003, the Authority shall before concurring to any scheme submitted to it, have particular regard to, whether or not in its opinion,

a) the proposed river-works will prejudice the prospects for the best ultimate development of the river or its tributaries for power generation, consistent with the requirements of drinking water, irrigation, navigation, flood control, or other public purposes, and for this purpose the Authority shall satisfy itself, after consultation with the State Government, the Central Government, or such other agencies as it may deem appropriate, that an adequate study has been made of the optimum location of dams and other river-works.

b) The proposed scheme meets the norms regarding dam design and safety.

1.1.3 As per Section 8(3), where a multi-purpose scheme for the development of any river in any region is in operation, the State Government and the generating company shall co-ordinate their activities with the activities of the persons responsible for such scheme in so far as they are inter-related.

1.2. Capital Expenditure exceeding which Concurrence is required

1.2.1 In compliance with Section 8(1) of the Electricity Act, 2003, the Central Government vide Notification No. SO 550(E) dated 18.04.2006 modified vide Notification No. SO 490(E) dated 28.01.2014 has fixed the following limits of capital expenditure for various categories of hydroelectric schemes exceeding which the scheme is to be submitted to the Authority for concurrence:

i) ₹ 2500 crores, provided that –

a) the scheme is included in National Electricity Plan (NEP) as notified by Central Electricity Authority (CEA) and conforms to the capacity and type.

b) the site for setting up the generating station has been allocated through the transparent process of bidding in accordance with the guidelines issued by Central Govt.

ii) ₹ 1000 crores for any other scheme not covered by para i (a) and i (b) of clause.

SECTION-2

SUBMISSION AND ACCEPTANCE OF DPR

2.1 For Power Projects

- 2.1.1 The Generating Company / Project Developer intending to set up a pumped storage station shall submit the DPR to the Authority for its concurrence as required under Section 8 of the Electricity Act, 2003.

Generating Company / Project Developer shall prepare the DPR of Pumped storage Scheme as per latest version of "Guidelines for Formulation of Detailed Project Reports for Pumped Storage Schemes" published by CEA.

2.1.2 Submission of DPR

Generating Company / Project Developer shall upload DPR on **DPR Approval Process Monitoring System (DAPMS)** portal of CEA (<https://ceaclearance.gov.in/>) and submit 8 copies of DPR including pre-DPR chapters approved by respective appraising groups along with six soft copies on compact disks/ pen drives to HPA division, CEA. CEA shall check whether clearance of Chapters/aspects have been included as per the Checklists attached at **Appendix-1(a)** and **Appendix-1(b)**. Further, developer shall submit an undertaking in the format prescribed at **Appendix-1(c)**.

2.2 For Multi-Purpose Projects

- 2.2.1 DPRs of multipurpose projects involving drinking water, irrigation, power, flood control, navigation etc. shall be submitted to CWC for clearance of Technical Advisory Committee (TAC) of Ministry of Jal Shakti (MoJS). In case DPRs of these schemes are submitted to the Authority, the Authority shall not accept the same and redirect these to CWC/ MoJS for examination/appraisal.

The views of the Authority on power portion of the scheme viz. power planning and cost estimates shall be submitted to CWC for accord of clearance by Technical Advisory Committee of MoJS. Detailed examination of Pumped Storage Scheme shall be undertaken by the Authority after DPR of the power portion is submitted to it for accord of concurrence under Section 8 of the Electricity Act, 2003.

- 2.2.2 DPRs of power projects, involving flood moderation aspects only in addition to power generation shall be accepted in CEA and referred to CWC for examination of the flood moderation aspects. Detailed examination of such schemes could be continued by CEA (as per procedure mentioned above in Para 2.1) along with appraisal of scheme by CWC/ MoJS for flood moderation aspects. However, the date of acceptance of such scheme in CEA for concurrence would be reckoned from the date of clearance of flood moderation aspects by CWC/ MoJS.

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SECTION-3
EXAMINATION AND CONCURRENCE OF DPR

3.1 Examination Procedure

3.1.1 To discharge its obligation under Section 8 of the Electricity Act, 2003, the Authority may take the assistance of Central Water Commission, Ministry of Jal Shakti, Geological Survey of India (GSI), Central Soil and Materials Research Station (CSMRS) etc. The Authority may also consult the State Government or Central Government or such other Government agencies as it may deem appropriate (as per Section 8(2) of Electricity Act, 2003).

3.1.2 The comments / queries raised by the Authority shall be promptly replied by the Generating Company / Project Developer preferably within a period of 7 working days and not more than 15 working days, failing which the DPR shall stand returned to the generating company.

3.1.3 Concurrence of DPR

The Authority acts as a single agency in so far as concurrence of the Pumped Storage Schemes is concerned. However, as per the demarcation of responsibility in Govt. of India, the following aspects related to Pumped Storage Schemes are assigned to CWC/ MoJS:

- 3.1.3.1 Hydraulic Structures for hydropower
- 3.1.3.2 Water Management
- 3.1.3.3 Flood Control
- 3.1.3.4 Dam Safety
- 3.1.3.5 Regulation and development of inter-state rivers and river basins
- 3.1.3.6 Water laws legislation
- 3.1.3.7 International water laws
- 3.1.3.8 The matter regarding rivers common to India and neighboring countries.

CEA therefore consults CWC/ MoJS on issues related to Inter-State/ International clearance, Hydrology, design of Hydraulic Structures, Dam design & Safety, Construction Material & geotechnical aspects, Construction methodology and Machinery, Cost of civil works, etc.

The examination of a Pumped Storage Scheme is an interactive process and involves appraisal of various aspects like Design and safety of the dam, Hydel civil design, Electro-mechanical design etc.

3.2 Concurrence to the Scheme

3.2.1 In case the Pumped Storage Scheme is found technically viable with necessary inputs and clearances having been tied-up, the Authority may accord concurrence for

implementation of the Pumped Storage Scheme, under Section 8 (2) of the Electricity Act, 2003.

- 3.2.2 The intimation regarding accord of concurrence to Pumped Storage schemes is conveyed to the Generating Company / Project Developer, Ministry of Power, other concerned Government Departments, State Government and appropriate Regulatory Commission.

3.3 Submission of updated DPR

- 3.3.1 During the DPR preparation process, if changes are suggested by CEA/CWC/GSI/CSMRS which have an impact on the design of the scheme, then Generating Company / Project Developer is required to update the DPR incorporating all the suggested modifications as agreed by them during the deliberations, upload the same on online DPR clearance portal of CEA and submit the same on compact disk along with 6 (six) nos. of hard copies for record of the Authority.

- 3.3.2 The Generating Company / Project Developer is also required to submit the updated DPR to concerned State Government, the Regulatory Commission and the Transmission Utility under intimation to the Authority.

3.4 Information regarding Financial Closure

After the finances for the project is tied up, the Generating Company / Project Developer shall inform the details of the financial package to the Authority.

3.5 Time Frame for accord of Concurrence

In case the Pumped Storage Scheme is found technically viable with necessary inputs/ clearances having been tied up, the Authority may accord concurrence for implementation of the pumped storage scheme, as far as practicable, within a period of 50 (fifty) days from the date of submission of 8 sets of DPR complete in all respects/ acceptance of Complete DPR by CEA from Developer.

3.6 Validity of Concurrence

- 3.6.1 In case the time gap between the concurrence to the scheme by the Authority and the actual start of the work of the project by the generating company is three years or more, a fresh concurrence of the Authority shall be obtained by the Generating Company/ Project Developer before the start of actual work.

Revalidation of Concurrence may also be considered, in case the reasons for not starting of works are beyond the control of generating company. However, proposal for revalidation shall be submitted three months before the expiry of validity of Concurrence, which is three years from the date of issue of Concurrence letter.

The Generating Company may apply for revalidation of the Concurrence giving justification after getting due authorization of the appropriate Government. The Authority will consider the request for extension of the validity based on the merit.

- 3.6.2 The Authority reserves the right to revoke the concurrence, if the conditions stipulated in the Office Memorandum conveying the Concurrence are not complied with to the satisfaction of the Authority.

3.7 Transfer of Concurrence

In case, any generating company acquires any Pumped Storage Scheme already Concurred by the Authority through NCLT or through allotment by State Government or by any other means, then generating company shall apply for its Transfer of Concurrence to the Authority in accordance with the procedure laid down by the Authority (given at Appendix-2).

3.8 Subsequent changes in the Project parameters

In case of changes or any deviations in the parameters of the project from those concurred by the Authority, necessitated on account of site conditions, they must be brought to the notice of the Authority on immediate basis with appropriate justification for its approval prior to implementation of such changes else Authority may decide as per clause 3.6.2.

Also, Central Electricity Authority's Guidelines for Examination and Approval of Changes in Design of Structures / Equipment of Hydroelectric Projects including Pumped Storage Projects (PSPs) subsequent to Accord of Concurrence by CEA are available on the Authority's website (www.cea.nic.in).

3.9 Availability of Guidelines

Central Electricity Authority's "Guidelines for Acceptance, Examination and Concurrence of Detailed Project Reports for Pumped Storage Schemes" are available on the Authority's website (www.cea.nic.in).

Central Electricity Authority's "Guidelines for Formulation of Detailed Project Reports for Pumped Storage Schemes" are available on the Authority's website (www.cea.nic.in).

3.10 Applicability of Guidelines

These guidelines are applicable to all the pumped storage projects which require concurrence of the Authority under section 8 of Electricity Act irrespective of their date of submission.

Checklist – 1

S. No	ITEM	REMARKS
1.	Name of the project	
2.	Location a) State(s) b) District(s) c) Taluka(s)/Tehsil(s) d) Basin e) River f) Longitude/Latitude g) Survey of India Topographical Map reference No.(s) h) Earthquake Zone number i) Complete address for correspondence along with pin code/ e-mail, FAX, Telephone numbers of Nodal Officer and Alternate Nodal Officer.	
3.	Whether the scheme is included in the National Electricity Plan. If so, whether the capacity and type of the scheme are same as given in the NEP.	* Yes / No
4.	Category of the project a) Power Project b) Power Project having reservoir for flood moderation. c) Multipurpose Project	*
5.	In case of category 4c) above, whether the clearance of Technical Advisory Committee of Ministry of Jal Shakti is available.	* Yes / No
6.	Mode of formation of the Generating Company in terms of Clause-2(28) of Electricity Act, 2003.	*
7.	Whether the Generating Company is Registered with the Registrar of the Company. Whether Article of Association has Generation as one of the objectives of the Company	* Yes / No
8.	What is the mode of allocation of the scheme whether through i) MOU route upto 100 MW ii) Tariff based bidding iii) MOU route with equity participation of State Govt. If so %age of State Govt. equity iv) Any other mode	*
9.	Whether authorization of the Competent Government in favour of the company to establish, operate and maintain specific Power Station available	* Yes /No
10.	Whether land availability Certificate from State Government available	Yes/No
11.	Whether State Govt. authorised the company to utilize water of that stretch of river.	Yes/No
12.	Whether Cost Estimates enclosed Present Day & Completed Cost - For Generating Companies in Central, State, Private and Joint Sectors and For SEBs & State power Utilities	*Yes/No

13.	Financial Analysis/ How the project is going to be financed.	
14	Whether arrangement for absorption/ dispatch of power made	Yes/ No
15	Whether arrangements for wheeling/ evacuation of Power made	Yes/ No
16.	Whether any agreement with the transmission company to provide evacuation system made. If so details of the agreement.	Yes/ No
17.	Whether Consent of STU/ State Govt. for availability of off peak power/energy (for pumped storage scheme) is obtained.	Yes/ No
18.	Whether salient features of the Project filled up in the prescribed format.	Yes/ No
19	Status of CWC /other affected States clearance from inter-state angle, if applicable	*
20.	Status of Defence clearance, if required	*
21.	Whether the area is likely to have any Environmental and Ecological problems due to the altered surface water pattern If yes, whether preventive measures have been discussed	Yes /No
22	Status of MoEF&CC Clearance from Environment/ & Forest angle	
23.	Status of Clearance from Indian Board of Wild-Life	
24	Status of Clearance under Forest Rights Act from Ministry of Social Justice & Empowerment/ State Government (In case Scheduled Tribe population is affected)	
25	Whether Rehabilitation and Resettlement Plan from State Revenue Department enclosed.	Yes/No
26	Whether approvals of CEA/ CWC/ GSI/ CSMRS have been obtained and included in the DPR in respect of following aspects -	*
	i). Gen. Layout by HCD Dte., CWC & HE&TD/ HPP&I Div., CEA	Yes/No
	ii). Hydrological Aspects by Hydrology Dte., CWC	Yes/No
	iii). Power Potential Aspects by HPA/ HPP&I Div. CEA	Yes/No
	iv). Foundation Engg. and Seismic Aspects by FE&SA Dte, CWC	Yes/No
	v). Geological Aspects by GSI	Yes/No
	vi). Construction Material Aspects by CSMRS	Yes/No
	vii). Inter-State Aspects by ISM Dte, CWC	Yes/No
	viii) Design of transmission system upto pooling point by PSPA Div., CEA	Yes/No
	ix) Dam/Barrage Design aspects by CMDD/BCD Dte., CWC	Yes/No
	x) Gates/HM Design aspects by Gates Design Dte., CWC	Yes/No
	xi) Hydel Civil Design aspects by HCD Dte., CWC	Yes/No
	xii) E&M Design aspects by HE&TD/ HPP&I Div, CEA	Yes/No
27	International Clearance by MoJS	Yes/No

Note : In case marked 'Yes' in the Check List, attach the supporting document.

* : Must for examination of DPR

Checklist – 2

- A. Following chapters/documents should be available in the DPR
- i) Basin Planning*
 - ii) Power supply position in the State and justification of the scheme from power demand and supply considerations
 - iii) Project layout map and drawings
 - iv) Hydrology*
 - v) Power Potential Studies
 - vi) Geology
 - vii) Construction Material and Geotechnical aspects
 - viii) Foundation Engineering and Seismicity aspects
 - ix). Inter-State* aspects
 - x) Design of civil structures
 - xi) Design of Electrical & Mechanical equipment
 - xii) Power evacuation aspects (Transmission of Power and Communication Facilities (upto Cooling Point)).
 - xiii) Set of drawings giving general layout of the project, civil components, E&M equipment, Single Line switching scheme etc.
- B. Completeness and relevance of material given in the above chapters needs to be checked.

*Note: Chapters on Basin Planning, Inter-state Aspects and Hydrology are not required for Off-stream closed loop type PSPs.

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Undertaking by Project Developer

To whomsoever it may concern

Ref. No:

Date:

This is to certify that the chapters of Detailed Project Report of the Pumped Storage Project in district, state, bearing DPR ID no. on DPR Approval Process Monitoring System, submitted by M/s., is aligned with the pre-DPR chapters on various aspects approved by the appraising groups of CEA, CWC, GSI and CSMRS. Further, observations provided by the appraising groups have been duly incorporated in the DPR.

Signature of CEO (in case of Private Company) / Director (in case of PSU)

- Name:
- CIN No.
- Address:
- Email:
- Contact No.:
- Seal:

Government of India
Central Electricity Authority
Sewa Bhavan, R.K.Puram
New Delhi-110066.

No. CEA/103/18/2010-HPA/1452

Dated : 29th December, 2010

OFFICE MEMORANDUM

Subject: Modified modalities for transfer of Techno Economic Clearance (TEC)/ Concurrence/ Techno-Economic Appraisal (TEA)/ Appraisal (in case of future J&K Projects) of Hydro Electric Schemes already cleared/ concurred/ appraised by CEA.

Modalities of simplified transfer of Techno-Economic Clearance of Hydro Electric Schemes already cleared by CEA were issued by CEA vide letter no. 103/18/98/HAD/CEA dated 8-10-99. After enactment of 'The Electricity Act, 2003', these have been modified and the modified procedure is given below which supersedes the earlier one:

I. FOR SCHEMES WITHOUT ANY CHANGE IN SCHEME FEATURES AND COST ESTIMATES

- i) In case the new agency furnishes a certificate to the effect that there is no change in the cost estimates and the project features as were cleared/ concurred/ appraised by the Authority originally, the Techno Economic Clearance (TEC)/ Concurrence/ Techno-Economic Appraisal (TEA)/ Appraisal (in case of J&K Projects) will be transferred to it by the approval of Authority in its internal meeting on receipt of the following:
 - a) A request by the new agency for transfer of Techno Economic Clearance (TEC)/ Concurrence/ Techno-Economic Appraisal (TEA)/ Appraisal (in case of J&K Projects).
 - b) Approval of the Competent Government(s) for transfer of the scheme to the new agency
 - c) Implementation Agreement between the new agency and the Competent Government (s).
 - d) Certificate to the effect that developer would abide by stipulations of Electricity Act, 2003 and Amendments there to.
 - e) Certificate to the effect that developer would abide by the provisions of Hydro Power Policy 2008 and other policies & guidelines etc. issued by the Govt. of India from time to time.
 - f) Certificate to the effect that developer would abide by the provisions of "Guidelines for participation of foreign companies in tenders for work packages of Hydroelectric Projects in sensitive areas, 2009" (Annexure) and seek prior clearance from Ministry of Home Affairs, if applicable, and not obtained earlier.
- ii) The above transfer of Techno Economic Clearance (TEC)/ Concurrence/ Techno-Economic Appraisal (TEA)/ Appraisal (in case of J&K Projects) shall be subject to

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furnishing the following by the new agency within ONE YEAR of the transfer of Techno Economic Clearance (TEC)/ Concurrence/ Techno-Economic Appraisal (TEA)/ Appraisal (in case of J&K Projects).

- a) Valid Environment and Forest clearance in the name of the new agency.
- b) Clearance of CWC from inter-State/ Country aspects. Clearance from MOWR, if so warranted.

II. FOR SCHEMES ENVISAGING CHANGES IN SCHEME FEATURES AND / OR COST ESTIMATES

- i) In case the new agency envisages changes in the parameters of the project and/or cost estimates with respect to the Techno Economic Clearance (TEC)/ Concurrence/ Techno-Economic Appraisal (TEA)/ Appraisal (in case of J&K Projects) already accorded by the Authority, the "In Principle" transfer of Techno Economic Clearance (TEC)/ Concurrence/ Techno-Economic Appraisal (TEA)/ Appraisal (in case of J&K Projects) in the name of new agency shall be effected, on submission of the documents mentioned at 1(i) (a)/ (b)/ (c)/ (d)/ (e)/ (f). Such transfer shall be valid for a period of TWO YEARS within which, the new agency shall furnish the following in respect of the revised scheme, for consideration of fresh Techno Economic Clearance (TEC)/ Concurrence/ Techno-Economic Appraisal (TEA)/ Appraisal (in case of J&K Projects), by the Authority as per the extant procedure being followed for accord of Concurrence/ Appraisal (in case of J&K Projects) to new schemes:
 - a) Preparation and submission of DPR as per prevalent guidelines issued by CEA.
 - b) Updated hydrology, optimization studies, technical parameters, Cost estimates, etc., with supporting design calculations, details, drawings etc.
 - c) Comparative statement of features as Techno Economic Clearance (TEC)/ Concurrence/ Techno-Economic Appraisal (TEA)/ Appraisal (in case of J&K Projects) and as now proposed with justification for necessitating changes.
 - d) Clearance of CWC from Inter-State/Country aspects. Clearance from MOWR, if so warranted.
 - e) Valid Environment and Forest clearance in the name of the new agency.

Authority shall have the right to revoke the transfer of Techno Economic Clearance (TEC)/ Concurrence/ Techno-Economic Appraisal (TEA)/ Appraisal (in case of J&K Projects), if any, of the conditions stipulated in para I & II above are not fulfilled.

Sd/-

(Amarjeet Singh)
Secretary, CEA

Copy to:

1. Minister of Power, Govt. of India, Shram Shakti Bhawan, New Delhi.
2. Secretary (Power), Ministry of Power, Shram Shakti Bhawan, New Delhi.
3. Special Secretary, Ministry of Power, Shram Shakti Bhawan, New Delhi.
4. Additional Secretary, Ministry of Power, Shram Shakti Bhawan, New Delhi.
5. Joint Secretary (Hydro), Ministry of Power, Shram Shakti Bhawan, New Delhi.
6. Chairperson, CEA
7. Chairman, CWC
8. Member (Hydro), CEA
9. All Members of CEA
10. All Members of CWC
11. Chief Secretary, All State Governments – with request for circulation to all developers of HE Projects in the State.
12. Secretary (Power), All State Governments
13. All Chairmen of SEBs
14. All State Vidyut Nigam Ltd.
15. CMDs of NHPC, SJVNL, THDC, NEEPCO, NTPC
16. All Chief Engineers, CEA
17. CERC
18. SERCs.
19. CEA Website.

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Annexure

No. 7/1/2002-DO(NHPC) [Vol.II]
Government of India
Ministry of Power

Shram Shakti Bhawan, Rafi Marg
New Delhi, dated-03.09.2009

OFFICE MEMORENDUM

Sub: Guidelines for participation of foreign companies in tenders for work packages of Hydroelectric Projects in sensitive areas.

The Government hereby lays down the following guidelines for participation of foreign companies in tenders for work packages of Hydroelectric Projects in sensitive areas.

1. (a) These guidelines may be called "Guidelines for participation of foreign companies in tenders for work packages of Hydroelectric Projects in sensitive areas, 2009" and shall be applicable from the date of their issue.

2. (a) These guidelines have been framed, on the considerations that:-

National security will be a critical determinant while making choices in regard to hydro-electric projects in sensitive regions and border areas. Along the border, the concerned area may extend to a width of 50 kms on the Indian side of the international border with neighbouring countries. Every hydro-electric project, within this belt, with foreign participation of any form will need prior security clearance. This would extend to both public and private sector projects.

Prior clearance would apply in the case of similar hydro-electric projects being set up in certain sensitive locations, even if these are away from the border. Specific guidelines will be drawn up in consultation with the Ministry of Home Affairs to draw up a list of such sensitive locations.

Security aspects of hydro projects also need to be kept in view elsewhere as well. These would involve ensuring the safety and security of structures such as dams, intakes, tunnels, etc. Security implications shall inevitably form part of any pre-contract discussions and must be addressed prior to the actual commencement of the project or assigning of a project to any party.

3. (a) These guidelines shall be applicable to all Hydro-Electric Projects, being set up in the Central and State Sector and by Independent Power Producers with foreign participation of any form, regardless of the Project size or investment limit, located in the State of Jammu & Kashmir, in the North Eastern States including Sikkim and within an aerial distance of 50 kilometers on the Indian side of the international border with neighboring countries or of the line of control (LOC) with Pakistan, or the Line of Actual Control (LAC) with Tibet Autonomous region (China), or within any notified restricted/Protected areas, or within sensitive locations as identified by Ministry of Home Affairs from time to time.
4. (a) The State Government, before allotting any Hydro-Electric project covered by criteria at 3 above to a foreign company or to a company involving foreign collaboration in any form including Build Own Operate (BOO) or Build Operate

Transfer (BOT), shall seek prior clearance from Ministry of Home Affairs.

- (b) Similarly, a Developer of any Hydro-Electric Project covered by the criteria at 3 above, before appointing a foreign contractor or sub-contractor, shall seek prior clearance from Ministry of Home Affairs, through the State Government concerned. The details of the foreign companies shall be provided by the Developer.
 - (c) In case of a bid process for selection of a developer, contractor or sub-contractor such clearance from Ministry of Home Affairs shall be sought at the stage of Request for Qualification (RFQ).
5. (a) The Ministry of Home Affairs shall give its clearance/advise within 6 weeks on the reference from the State Government or from the Developer through the State government, as to whether the foreign developer/ contractor/ sub- contractor needs to be eliminated on the grounds of national security, invoking a clauses to be inserted in all bid documents to the effect that any bid can be rejected without assigning any reason.
- (b) The period of 6 weeks shall commence from the date complete details are made available in the reference/questionnaire to the Ministry of Home Affairs.
 - (c) If the clearance/advice from Ministry of Home Affairs is not received within 6 weeks, the bid process would continue its normal course.
6. Once a foreign developer/ contractor/ sub-contractor has been qualified at the RFQ stage to submit his commercial bid, he should not be eliminated on the ground of national security.
- 7.(a) The project developer would evaluate and determine the optimum number of foreign employees required to be deployed at the project being awarded or sub-contracted to a foreign company, keeping in view the project's requirements, location and technical necessities. The number of foreign employees would be kept to the minimum and be confined only to technical/supervisory staff.
- (b) Foreign employees would ordinarily be expected to confine their stay and movements to the designated place of stay and project site. Any visits outside the project site in any Restricted/Protected areas would only be undertaken after permission from the competent authority is obtained through the company in which they are employed, failing which they will be liable to action as per prevalent rules and orders. It will be the specific responsibility of the developer to ensure that the contract with the foreign company carries a clause that if the personnel of that Company are found indulging in activities prejudicial to India's national security interest, then the project developer may cancel the contract without any liability.
 - (c) The project developer shall furnish the list of foreigners (consultants, contractors, employees or retainers) proposed to be engaged in the project, with their full particulars (passport details, job profile/expertise, duration/location of stay, etc.) well in advance, which would be vetted before issue of visa.

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- (d) The Ministry of Power will certify in case of CPSUs, the project completion time and the requirement of the foreign personnel, while in case of all other projects, this will be certified by the concerned State Government.
- 8. (a) The Ministry of External Affairs in consultation with Ministry of Home Affairs will decide on the kind of Visa to be issued.
 - (b) While issuing visa/work permits, the Ministry of External Affairs will impose the necessary restrictions on specific individuals or on employees of specific companies that need to be watched, as well as the total number of visas issued at a given point of time in respect of project, so as to ensure compliance of the guidelines. Particular care would also be taken in respect of projects which are already allotted or where contracts and sub-contracts are already allotted, in the interest of national security.
- 9. If any equipment or electrical gadgets are proposed to be imported for the execution/implementation of the project, the promoters and CPSU's shall provide the equipment details, purpose, import route, etc., to the Department of Power/Energy in the State Government or to the ministry of Power as the case may be.
- 10. Considering the importance of security and safety aspects of all Hydro-Electric Projects including Hydro-Electric Projects not covered at criterion 3 above, Central Electricity Authority will, in consultation with Ministry of Home Affairs, also address the issue of ensuring safety and security of structures such as dams, intakes, tunnels etc. and, where considered necessary, issue guidelines for the purpose. These guidelines will be taken into account while according concurrence under Section 8 of the Electricity Act, 2003. Observance of such security guidelines by Hydro-Electric Projects that do not require Central Electricity Authority's concurrence under Section 8 of the Electricity Act, 2003, will be ensured by the respective State Government.
- 11. Prior clearance of security implications should inevitably form part of any pre-contract negotiations and must be addressed prior to the actual commencement of the Project or assigning of a Project to any Party.
- 12. The Ministry of Power shall ensure implementation of these guidelines by the CPSU's under its administrative control. The primary responsibility of ensuring compliance of these guidelines in respect of other Developers shall be that of the State Governments in consultation with the Ministry of Home Affairs.

Sd/-
(Kamal Bose)
Under Secretary to the Govt, of India
Tel. No. 2332.4357

To

Energy/Power Secretaries of all the State Governments

Copy forwarded to :

1. Foreign Secretary, South Block, New Delhi
2. Secretary (R) R&AW, New Delhi.
3. Home Secretary, North Block, New Delhi
4. Director Intelligence Bureau, New Delhi
5. Secretary, Deptt. of Industrial Policy, Udyog Bhawan, New Delhi.
6. Secretary, Department of Heavy Industry, Udyog Bhawan, New Delhi.
7. Dy. National Security Adviser, Sardar Patel Bhawan, New Delhi.
8. Defence Secretary, South Block, New Delhi
9. Principal Secretary to PM, PMP, South Block New Delhi.
10. Secretary, Department of Economic Affairs, North Block, New Delhi.
11. Cabinet Secretariat (Shri K.L. Sharma Director) Rashtrapati Bhawan, New Delhi.
12. Chairperson CEA, R.K. Puram, New Delhi.

Copy also to in the Ministry of Power :

PS to Minister of Power/PS to Minister of State for Power
PS to secretary (Power)/Sr. PPS to AS(AK)/PPS to AS
(GBP)PS to all Joint secretaries
Economic Adviser
All Directors/Deputy Secretaries



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THE DAM SAFETY ACT, 2021

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THE DAM SAFETY ACT, 2021

ACT NO. 41 OF 2021

[13th December, 2021.]

An Act to provide for surveillance, inspection, operation and maintenance of the specified dam for prevention of dam failure related disasters and to provide for institutional mechanism to ensure their safe functioning and for matters connected therewith or incidental thereto.

BE it enacted by Parliament in the Seventy-second Year of the Republic of India as follows:—

CHAPTER I
PRELIMINARY

1. Short title, extent and commencement.—(1) This Act may be called the Dam Safety Act, 2021.

(2) It extends to the whole of India.

(3) It shall come into force on such date¹ as the Central Government may, by notification in the Official Gazette, appoint.

2. Declaration as to expediency of Union control.—It is hereby declared that it is expedient in the public interest that the Union should take under its control the regulation of uniform dam safety procedure for specified dam to the extent hereinafter provided

3. Application.—Save as provided under this Act, it applies to the owner of every specified dam, —

(a) being a public sector undertaking or institution or a body owned or controlled by the Central Government or a State Government or jointly by one or more Governments, as the case may be; and

(b) being an undertaking or company or institution or a body other than those owned or controlled by the State Government or the Central Government, as the case may be.

4. Definitions.—In this Act, unless the context otherwise requires, —

(a) "alteration of dam" means alterations or repairs as may directly affect the safety of the dam or reservoir;

(b) "annual report" means a report giving the activities of the Authority and the State Dam Safety Organisation and the safety status of the specified dams falling under their jurisdiction during each financial year;

(c) "appurtenant structure" means the structure being—

(i) spillways, either in the dam or separate therefrom;

(ii) low level outlet structure and water conduits such as tunnels, pipelines or penstocks, either through the dam or its abutments or reservoir rim;

1. 30th December, 2021. *vide* notification No. S.O.5422(E), dated 30th December, 2021. *see* Gazette of India, Extraordinary, Part II, sec. 3 (ii).

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- (iii) hydro-mechanical equipment including gate, valve, hoist, elevators;
 - (iv) energy dissipation and river training structure; and
 - (v) other associated structures acting integrally with the dam or its reservoir or reservoir rim;
- (d) "Authority" means the National Dam Safety Authority established under section 8;
- (e) "dam" means any artificial barrier and its appurtenant structure constructed across rivers or tributaries thereof with a view to impound or divert water which also include barrage, weir and similar water impounding structures but does not include—

- (a) canal, aquaduct, navigation channel and similar water conveyance structures;
 - (b) flood embankment, dike, guide bund and similar flow regulation structures;
- (f) "dam failure" means any failure of the structure or operation of a dam which leads to uncontrolled flow of impounded water resulting in downstream flooding, affecting the life and property of the people and the environment including flora, fauna and riverine ecology.

Explanation.—For the purposes of this clause, failure in the operation shall mean such faulty operations of the dam which are inconsistent with the operation and maintenance manual;

(g) "dam incident" means all such problems occurring to a dam that have not degraded into a dam failure, and includes—

- (i) any structural damage to the dam and the appurtenant structure;
- (ii) any unusual reading of any instrument in the dam;
- (iii) any unusual seepage or leakage through the dam body;
- (iv) any unusual change in the seepage or leakage regime;
- (v) any boiling or artesian condition noticed below the dam;
- (vi) any sudden stoppage or unusual reduction in seepage or leakage from the foundation or body of the dam or any of its galleries;
- (vii) any malfunction or inappropriate operation of gates;
- (viii) occurrence of flood, the peak of which exceeds the available flood discharge capacity of the dam or seventy per cent. of the approved design flood;
- (ix) occurrence of flood, which resulted in encroachment on the available freeboard, or the approved design freeboard;
- (x) any unusual erosion in the near vicinity up to five hundred metres downstream of the spillway or waste-weir; and

(xi) any other occurrence which a prudent dam engineer may relate to dam safety concerns;

(h) "dam safety unit" means a dam safety unit of any specified dam referred to in section 30;

(i) "distress condition" means the occurrence or potential development of such conditions in the dam or appurtenance structure or its reservoir or reservoir rim, which if left unattended to, may impede the safe operation of dam for its intended benefits or may pose serious risks to the life and property of people and the environment including flora, fauna and riverine ecology;

(j) "documentation" means all permanent records including electronic records concerning investigation, design, construction, operation, performance, maintenance, major repair, alteration, enlargement and safety of dams and includes design memorandum, construction drawings, geological reports, reports of specialised studies simulating structural and hydraulic response of the dam, changes made in design and drawings, quality control records, emergency action plan, operation and maintenance manual, instrumentation readings, inspection and testing reports, operational reports, and dam safety review reports and other similar reports;

(k) "enlargement of dam" means any change in the scope of an existing dam or reservoir, which raises water storage elevation or increases the volume of water impounded by the dam;

(l) "Government" means the Central Government or a State Government, as the case may be;

(m) "inspection" means on-site examination of any component of a dam and its appurtenant structure;

(n) "investigation" means collection of evidence, detailed examination, analysis or scrutiny of a specific problem pertaining to the dam and its appurtenant or a part thereof and includes laboratory testing, in-situ testing, geological exploration, model testing and mathematical simulation of the problem;

(o) "National Committee" means the National Committee on Dam Safety constituted under section 5;

(p) "notification" means a notification published in the Official Gazette and the term "notify" shall be construed accordingly;

(q) "operation of dam" means elements of the use, control and functioning of the dam which may primarily affect the storage, release of water and the structural safety of the dam;

(r) "operation and maintenance manual" means the written instructions that provide operation procedures, maintenance procedures, emergency procedures and any other features necessary for the safe operation of dam;

(s) "owner of specified dam" means the Central Government or a State Government or jointly by one or more Governments or public sector undertaking or local authority or company and any or all of such persons or organisations, who own, control, operate, or maintain a specified dam;

(t) "prescribed" means prescribed by rules made by the Central Government or, as the case may be, by the State Government;

(u) "regulations" means the regulations made by the Authority under this Act;

(v) "remedial measures" means such structural or non-structural measures, as may be required in relation to the specified dam or appurtenant structure or reservoir or reservoir rim or catchment area of reservoir for the purpose of removing or mitigating the distress condition of the specified dam;

(w) "reservoir" in relation to a dam shall mean any spread of water impounded by a specified dam;

~~(x) "specified dam" means a dam constructed before or after the commencement of this Act, which is:~~

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~~(i) above fifteen metres in height, measured from the lowest portion of the general foundation area to the top of dam; or~~

~~(ii) between ten metres to fifteen metres in height and satisfies at least one of the following, namely: —~~

~~(A) the length of crest is not less than five hundred metres; or~~

~~(B) the capacity of the reservoir formed by the dam is not less than one million cubic metres; or~~

~~(C) the maximum flood discharge dealt with by the dam is not less than two thousand cubic metres per second; or~~

~~(D) the dam has specially difficult foundation problems; or~~

~~(E) the dam is of unusual design;~~

(y) "State Committee" means the State Committee on Dam Safety constituted under sub-section (1) of section 11;

(z) "State Dam Safety Organisation" means the State Dam Safety Organisation established under section 14; and

(za) "vulnerability and hazard classification" means the system or systems of classifying dams on the basis of their condition, location, damage or hazard potential.

CHAPTER II

NATIONAL COMMITTEE ON DAM SAFETY

5. Constitution of National Committee.—(1) With effect from such date as the Central Government may, by notification, appoint, there shall be constituted, for the purposes of this Act, a National Committee to be known as the National Committee on Dam Safety consisting of the following members, namely: —

(a) the Chairman, Central Water Commission—Chairperson, *ex officio*;

(b) not exceeding ten representatives of the Central Government not below the rank of Joint Secretary to that Government or equivalent dealing with matters relating to dam engineering or dam safety, nominated by the Central Government—Members, *ex officio*;

(c) not exceeding seven representatives of the State Governments of the level of Engineer-in-Chief or equivalent by rotation, nominated by the Central Government—Members, *ex officio*; and

(d) not exceeding three specialists in the field of dam safety and allied fields nominated by the Central Government—Members.

(2) The National Committee shall be constituted within a period of sixty days from the date of commencement of this Act, and shall be reconstituted for every three years thereafter.

6. Functions of National Committee.—(1) The National Committee shall discharge such functions as specified in the First Schedule as may be necessary to prevent dam failure related disasters and to maintain standards of dam safety.

(2) The National Committee may, in discharge of its functions, constitute such sub-committees as it may consider necessary to assist it and the secretarial assistance to the National Committee and the sub-committees shall be provided by the Authority.

Full title of the Project: Diversion of Forest Land for construction of Bhavali Pumped Storage Project (1500 MW) in Thane & Nasik Districts of Maharashtra State
File No.: FP/MH/HYD/153240/2022
Date of Proposal: 06/03/2022

(Sr. No. 2 of Checklist)
JUSTIFICATION
Of Site Specificity

The Pumped Storage Project is essentially a "site-specific" project as it requires a particular type of topographical and geo-technical conditions with availability of water source at a close proximity to the identified project site. The sites of elevation variance are required to create upper & lower reservoirs of desired capacity. The reservoirs are critical for storing water for long duration. Their location should compulsorily be fulfilling the geo-technical criteria needed for establishing the Pumped Storage Project. Since this project requires water as a means to store energy, a techno-commercially viable water source, with sufficient capacity, to fill up the reservoir one time at the beginning of its operation and to supply for losses during its operation (mainly evaporation loss, quarterly or semi-annually or annually) has to be available in close proximity of project.

The proposed site has initially been identified by the Government of Maharashtra. Attempts were also made to explore the possibilities for alternate sites based on topographical, geological, geo-technical and techno-economic feasibility parameters. However, the JSW Energy PSP Two Limited has found proposed 275.00 Ha. of land, including Forest & Non-Forest, in Jamunde village of Igatpuri Tehsil of Nasik District and Kalbhonde, Kothale villages in Shahapur Tehsil of Thane District as most suitable site for the proposed project. The Government of Maharashtra has entered into an agreement by signing the Memorandum of Understanding for setting up of the extant project in Jamunde village of Igatpuri Tehsil of Nasik District and Kalbhonde, Kothale villages in Shahapur Tehsil of Thane District.

A detailed alternative study to find out the best optimized alignment of water conductor system on left bank of the upper reservoir along with other appurtenant structures was carried out. The location of powerhouse has also been selected based on the due consideration being given to topographical and Geological features. An attempt to optimize the orientation of PH on account of Geo-logical requirements viz-a-viz angle of deviation w.r.t. to the flow direction along the WCS has been done. The location of powerhouse is positioned in such way as to avoid the requirement of upstream surge shaft on the Headrace tunnel.

Underground power house is more suitable as compare to surface powerhouse. Therefore, the following three "alternative layouts" of the project have been developed for techno economic comparison and the pros and cons of all the alternatives are discussed below: -

Alternative I:

This alternative envisages the construction of following Major Components:

- ❖ Construction of Upper and lower dam of Height 47.0 m and 70.0 m respectively from the lowest natural surface level.
- ❖ Construction of Upper and Lower intake.
- ❖ one number of 11m dia water conductor system comprising of about 475.0 m long Head Race Tunnel (HRT) bifurcated into two penstocks of 7.7m dia of 647.107m length and each penstock is trifurcated into 3 branch penstocks of 4.0m dia and 135.32m long, 6 No's of each 5.0m TRT of length 90m is connected to the surge chamber in the downstream end in-turn connected to one number of tail race tunnel (TRT) of 11m dia and 808.75 m long.
- ❖ Downstream underground surge chamber on Tail Race Tunnel

- ❖ An underground powerhouse and Transformer cavern, the arrangement of powerhouse is positioned under high cover zone of about 365m or more.

Alternative II:

This alternative envisages the construction of following Major Components:

Upper and Lower dam is similar to Alternative-1.

Construction of Upper intake, the location of lower intake is same as Alternative-1.

one number of 1.1m dia water conductor system would comprise of about 1605.302 m long Head race tunnel bifurcated into two numbers of 7.7m dia penstocks of length 169.90m in which each penstock intern trifurcated into small branch penstock of 4.0m dia and tail race tunnel (TRT) 358.52m long

Underground Powerhouse location is similar to Alternative-1 but positioned under optimized top cover to avoid problems related to high cover zone on the underground caverns.

Alternative III:

This alternative envisages the construction of following Major Components:

- ❖ Upper and Lower dam is similar to Alternative-1.
- ❖ Construction of Upper intake, the location of lower intake is same as Alternative-1.
- ❖ One number of HRT of 1.1m dia 653m long bifurcated into two numbers of 7.7m dia with a length of 1704.11m at the upstream surge chamber of 25m dia and each penstock is divided into branch penstock of 4.0 m dia and 76m long and tail race tunnel (TRT) 213.5m long.
- ❖ Surface Powerhouse location shifted downstream towards lower reservoir but involves deep surface cut

Conclusion

- ❖ Both the alternative for underground scheme has similar arrangement except minor changes in the length of various tunnels. In Alternative 2 the Power House location is located such that D/S Surge Chamber get eliminated. The overall impact is reduction in the overall cost. Hence Alternative-2 has been selected for the further studies as compare to Alternative-1.
- ❖ Also, based on Techno-Economic comparison of all the alternatives, Alternative-2 has less Levellised Tariff as compared to Alternative-1 & 3.

Hence, considering Techno-Economic Parameter underground power house with Alternative-2 is chosen for the development of the proposed PSP.

The above layout was received by the CEA/ CWC and further modification in Water Conductor System was suggested; like, instead as one HRT and Pressure Shaft, three HRT(s) & PS(s) were suggested. Accordingly, further layout was optimized and details of the same are given in the Salient Features mentioned in this note.

The proposed site involves 243.74 Ha. of Forest Land and 31.08 Ha. of Non- Forest Land. Attempts have been made to minimize the use of Forest Land for the project. However, the Forest Land cannot be avoided or no alternative can be substituted. The Forest Land proposed for diversion is, thus, unavoidable. The barest minimum Forest Land, to the extent of 243.74 Ha., is proposed to be diverted in the extant proposal.

Date: / /2025
Place: Mumbai
Office Seal:



(Signature)
(Lalit Parab)

Authorized Signatory
JSW Energy PSP Two Limited, Mumbai

15/10

Summary Note on Alternative Analysis for Bhavali Pumped Storage Project

Conceptualization of Bhavali Pumped Storage Project was done through adopting careful evaluation criteria to ensure technical feasibility, economic viability and environmental sustainability. The foremost considerations involve identifying suitable locations for both the upper and lower reservoirs, ensuring the availability of reliable water sources, determining the most techno-economically viable alignment for the Water Conductor System (WCS) and finalizing the most optimal powerhouse location.

In addition to these technical aspects, the process of alternative site analysis was done following a holistic approach that incorporates the following criteria:

- **Minimization of ecological and social impacts:** ensure minimum disruption to local ecosystems, wildlife habitats, and communities.
- **Optimal utilization of available head:** The natural elevation difference at the project site should be maximized to achieve higher efficiency and energy output.
- **Minimum land acquisition:** Reducing the extent of land required for reservoirs, access roads, and associated facilities helps lower costs and mitigate displacement.
- **Ease and feasibility of construction:** Select site with most suitable Geological conditions & terrain, safety of construction activities and accessibility to all major components with minimum conflict and disruption adjoining areas.
- **Minimal interference with existing infrastructure:** Project layout was finalized keeping in minimum conflict with other infrastructures like nearby roads, settlements, transmission lines, and other facilities to avoid conflicts and additional costs.
- **Geological suitability and stability of reservoir banks:** Site configuration was firmed up while ensuring long-term structural stability, minimizing risks of seepage, slope failure, or reservoir-induced hazards.

Based on these considerations, a detailed analysis of potential alternatives was undertaken for the upper reservoir, lower reservoir, WCS alignment, powerhouse location, and transmission line corridor. This comparative study was carried out as part of investigation and Detailed Project Report (DPR) preparation stage. These alternatives were discussed in detail with concerned departments in Central Electricity Authority (CEA) before awarding Technical concurrence to this project.

The layout alternatives were discussed in detail during the Expert Appraisal Committee (EAC), MoEF&CC meeting. Furthermore, the proposal was appraised for Grant of Environmental Clearance before the Expert Appraisal Committee (River Valley and Hydroelectric Projects), MoEF&CC, in its 14th meeting held on 31st August 2024. In the meeting, it was recommended that *"As the project cover area is located in Western Ghats, the EAC sub-committee shall conduct site visit for assessing the ground conditions and possible environmental impacts due to project comprehensively before further consideration of the proposal"*.

In compliance of the above, Dr. Ajay Kumar Lal, Member EAC (Hydro & River Valley project) and Dr. P. R. Sakhare Members & Representative from MoEF&CC visited the Proposed Bhavali Pumped Storage Project" site on 2nd & 3rd Jan., 2025 and the findings of the site visit were discussed amongst the Hon'ble EAC members at Additional Agenda Item 22.4 in the 22nd EAC Meeting held on 10th Jan., 2025. In the site visit report, it has been recommended

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that," The proposed project site is topographically stable and not prone to landslides, with minimal risk of adverse geological impacts, provided safeguards and TOR conditions are followed.

Considering the above, the Hon'ble Expert Appraisal Committee (River Valley and Hydroelectric Projects) recommended the proposal for grant of prior Environmental Clearance in its 32nd meeting held on 29th May, 2025.

Alternatives Examined

During the planning phase, three alternative project layouts were identified and investigated thoroughly. Extensive surface and sub-surface investigations were conducted at multiple potential sites to assess technical, environmental, and social implications. The selection process aimed to achieve an optimal balance between techno-economic viability, environmental conservation, and social acceptability. Ultimately, the most suitable alternative was chosen as the basis for further project development. These detailed analyses for these three alternatives is already submitted as part of the Forest Diversion Proposal (Proposal no: FP/MH/HYD/153240/2022 for ready reference summary of these three options is placed below;

A detailed alternative study has been carried out to find out the best optimized location for upper and lower dam, powerhouse location and water conductor system based on topographical survey and geological traverse. The main parameters considered during identification & finalization of the reservoirs were: proximity between the two reservoirs; capacity; topography & geological setup; reservoir water tightness & head. Typically, in a Pumped storage hydropower project, the lower and upper reservoir locations are selected in local depressions at close vicinity which can be connected by a short water conductor system

Selection of Upper Reservoir

The Topography of the proposed area of upper reservoir depicts small depression around the top of hill area showing possibility of creation of reservoir. The capacity of the upper reservoir is proposed with a target live storage of 0.40 TMC), so as the scheme can be operated for a peaking power generation of about 8 hours. The vegetation density in most of the reservoir is very low. The boundary of the project has been fixed keeping in view the safe distance from the nearby Villages, Wildlife and ESZ. During detailed geological assessment, no adverse geological features were observed in this area and this location appears to be geologically suitable for water retention in the reservoir. No major social environmental issues are expected to be involved in this particular location.

Selection of Lower Reservoir

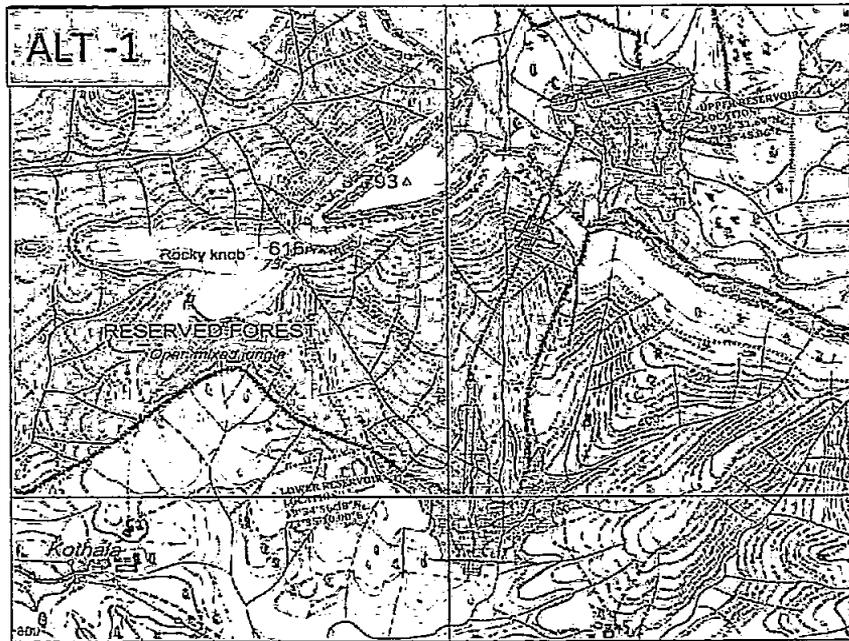
Having Finalized the location of upper reservoir and based on the basic technical parameters required for the pumped storage project only one location was found suitable for lower reservoir which is located in natural depression and allowing to create the desired live storage capacity of 0.40 TMC. This location is within the technical suitability requirements and no major Social and environmental issues were noticed for this particular area.

Selection of Water Conductor System & Power house

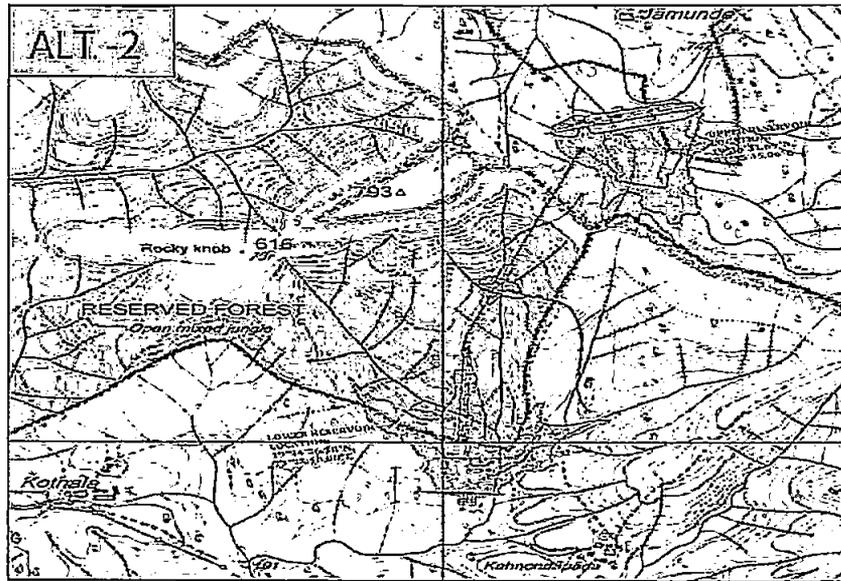
The alignment of water conductor system along the left bank of the upper reservoir has been selected based on the study of various alternate arrangements to arrive at the most optimized alignment of WCS based on the present level of Geological features, Topographical features and availability of sufficient rockmass cover. Further, detailed

alternative study has been carried to find out the best optimized sizing/configuration of water conductor system along with other appurtenant structures having minimum length to avoid energy losses with due considerations on the requirement of surge arrestors for both upstream and downstream. Three alternatives of Powerhouse were studied (1) near upper reservoir with underground power house (2) near lower reservoir with underground power house (3) near lower reservoir with surface power house option. The arrangement of powerhouse is positioned in such way to avoid/minimize the requirements of additional large underground surge chambers at u/s and d/s of the water conductor system.

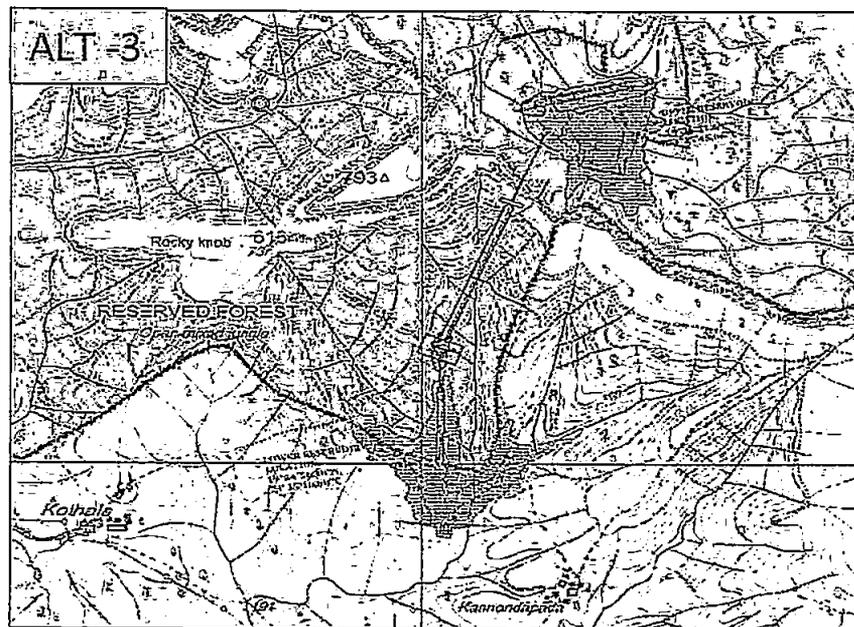
Topomap of Alternative-1



Topomap of Alternative-2



Topomap of Alternative-3



Comparative Assessment of Alternatives

Sl. No.	Parameter	Alternative - 1	Alternative - 2	Alternative - 3
1	Storage Capacity	12000 MWh	12000 MWh	12000 MWh
2	Installed Capacity	1500 MW	1500 MW	1500 MW

Sl. No.	Parameter	Alternative - 1	Alternative - 2	Alternative - 3
3	Upper Reservoir FRL/MDDL	EL. 737m / EL. 711m	EL. 737m / EL. 711m	EL. 737m / EL. 711m
4	Upper Reservoir Available Live Storage	0.40 TMC	0.40 TMC	0.40 TMC
5	Type of powerhouse	Underground	Underground	Surface
6	Upper Dam Type / Length	Rockfill dam, 956 m	Rockfill dam, 956 m	Rockfill dam, 956 m
7	Lower Reservoir FRL/MDDL	EL. 300m / EL. 270m	EL. 300m / EL. 270m	EL. 300m / EL. 270m
8	Lower Reservoir Live Storage	0.40 TMC	0.40 TMC	0.40 TMC
9	Lower Dam Type / Length	Rockfill Dam, 470 m	Rockfill Dam, 470 m	Rockfill Dam, 470 m
10	Maximum Gross Head	467m	467m	467m
11	L/H Ratio of Water Conductor System	4.4m	4.4m	5.0m
12	Water Availability (Initial Filling & Replenishment)	Self- yield from the catchment	Self- yield from the catchment	Self- yield from the catchment
13	Type of Land for Project	Mostly Forest	Mostly Forest	Mostly Forest
14	Environmental Impacts	Moderate, manageable with mitigation plans (CAT, Comp. Afforestation, Wildlife Plan)	Moderate, manageable with mitigation plans (CAT, Comp. Afforestation, Wildlife Plan)	Comparably High - larger forest diversion, greater disturbance
15	Social impact	Limited R&R	Limited R&R	Limited R&R
16	Social Issues	None	None	None
17	Technical Viability	Technically feasible, but higher project & forest cost	Fully feasible, stable, and optimized layout with minimum project & forest cost	Technically feasible, but higher project & forest cost
18	Land Requirement			

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Sl. No.	Parameter	Alternative - 1	Alternative - 2	Alternative - 3
i	Total Area (Ha.)	301.64	291.51	314.13
ii.	Forest Area (ha.)	272.64	261.51	283.13

Conclusion

- ✓ Both the **Alternative-1** and **Alternative-2** for underground scheme has similar arrangement except changes in the length of various tunnels and location of Powerhouse. In **Alternative-1** the underground power house is seated in high rockmass cover of about 400 m near upper reservoir which leads to longer lengths of Access tunnels and large surge chamber in the tail race tunnel. In **Alternative -2** the Power House location is located such that D/S Surge Chamber get eliminated and tunnel lengths are small. The overall impact is reduction in the **land requirement, construction period and the project cost for Alternative-2.**
- ✓ **Alternative-3** which envisages a surface powerhouse scheme, entails very deep cutting of more than 130 m near the lower reservoir. This raises concerns regarding long-term operational issues such as flooding, continuous dewatering and slope stability. Moreover, the scheme would require massive excavation works, leading to an increased land requirement for project components and disposal of excavated material as well as extended timelines for execution. The overall impact of additional mitigations for dewatering arrangements, increased land requirements and slope stabilization measures for deep pit shall increase the project cost.

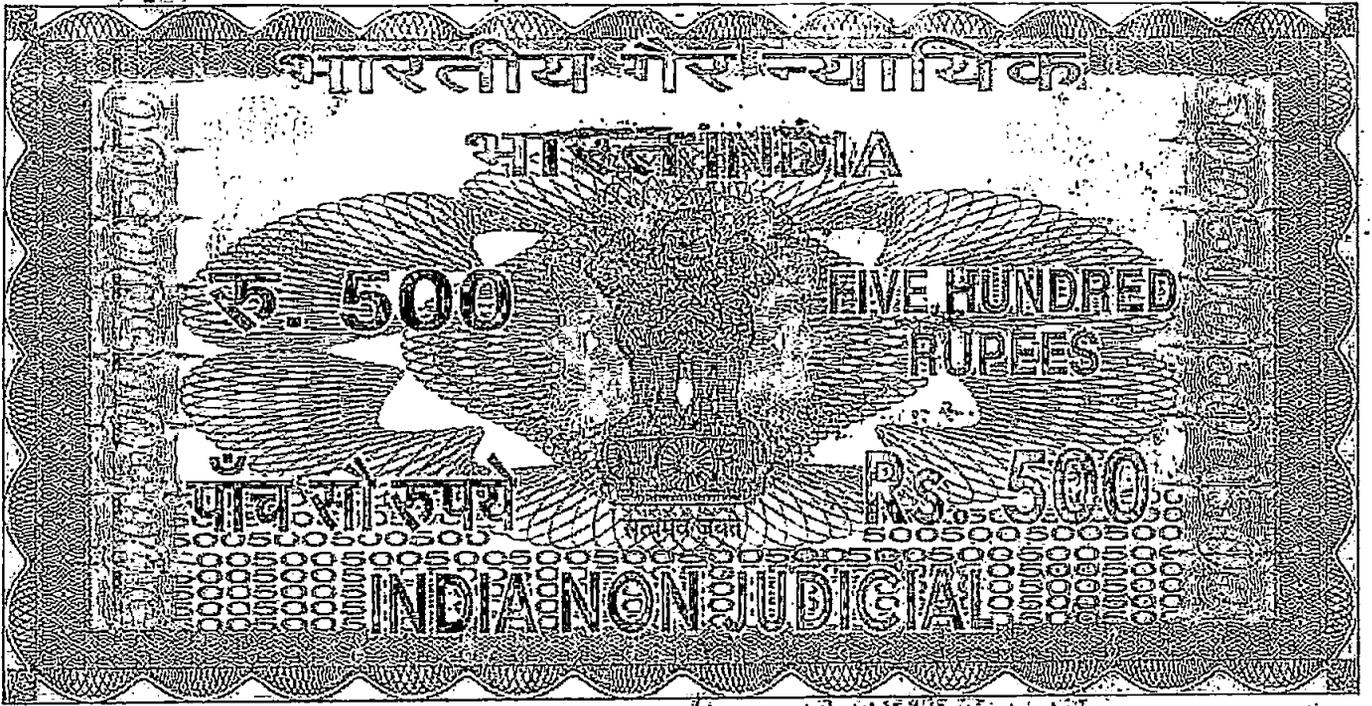
Considering above aspects, **Alternative-2** (Underground Power house Scheme) is more feasible than any other alternative in terms of techno-economic parameters and environmental impact.

During the review process by CEA/CWC, it was recommended that the Water Conductor System be optimized for operational flexibility. Instead of a single Head Race Tunnel (HRT) and pressure shaft, the design was revised to include **three HRTs and pressure shafts**. These modifications has optimized the project layout for constructability, operational flexibility and successfully reduced the overall land requirement to **275.00 ha**.

It is respectfully submitted that the selected project site involves **243.74 ha of Forest land** and **31.05 ha of non-forest land**. Every effort has been made to minimize forest land use; however, due to the specific topographical configuration of the reservoirs and the essential nature of the project components, diversion of forest land is unavoidable. Accordingly, only the barest minimum extent—**243.74 ha of Forest land** is proposed for diversion under the present proposal.

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Annexure - 14.1
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महाराष्ट्र MAHARASHTRA

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प्रधान मुद्रांक कार्यालय, मुंबई
प.मु.वि.क्र. ८०००९९

- 1 OCT 2024

सक्षम अधिकारी

श्रामतो सुपभा चव्हाण

This stamp paper forms an integral part of the Energy Storage Facility Agreement executed on 10.10.2024 between

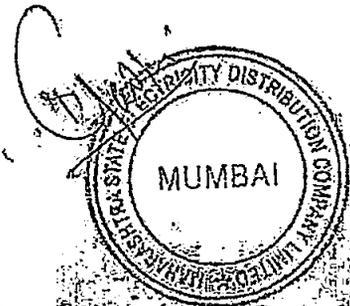
MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LIMITED

And

JSW ENERGY PSP TWO LIMITED



Handwritten signature





महाराष्ट्र MAHARASHTRA

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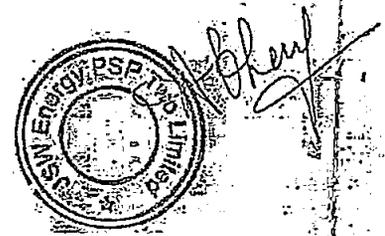
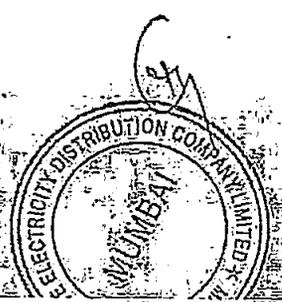
जिल्हा कोषागार कार्यालय, ठणे
10 OCT 2024
प्रमुख लिपीक / लिपीक
10-10-2024

This stamp paper forms an integral part of the Energy Storage Facility Agreement executed on 10.10.2024 between

MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LIMITED

And

JSW ENERGY PSP TWO LIMITED



**Pumped Hydro Energy Storage Facility Agreement
(PHESFA)**

Between

Maharashtra State Electricity Distribution Co. Ltd

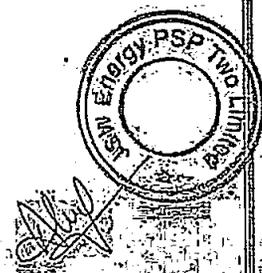
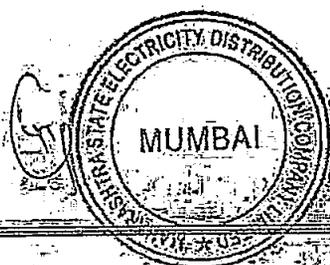
And

JSW Energy PSP Two Limited

for

**Procurement of 1500 MW energy storage capacity
(For 8 Hours discharge with maximum 5 hours
continuous discharge)**

for 40 Years



ENERGY STORAGE (PUMPED HYDRO STORAGE) FACILITY AGREEMENT

This Pumped Hydro Energy Storage Facility Agreement (ESFA) (hereinafter referred to as "Agreement") is entered into on this 10th day of October, 2024,

BETWEEN

1. **MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LIMITED**, incorporated under The Companies Act 1956 (1 of 1956) having its registered office at Prakashgad, Plot G 9, Prof. Anant Kanekar Marg, Bandra (East), Mumbai 400 051, (hereinafter referred to individually, as 'MSEDCL' or "Procurer" which expression shall, unless repugnant to the context or meaning thereof, include its successors and assignees) of the **FIRST PART**;

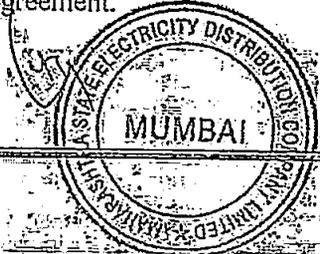
AND

2. **M/S JSW ENERGY PSP TWO LIMITED**, incorporated under the Companies Act, 2013 having its registered office at JSW Centre, Bandra Kurla Complex, Bandra (East), Mumbai, Maharashtra, India, 400 051 (hereinafter referred to as "Developer" which expression shall, unless repugnant to the context or meaning thereof, include its successor and assignees of the **SECOND PART**.

The Developer and MSEDCL shall be individually referred to as a "Party" and collectively as "Parties".

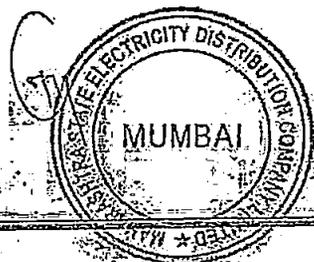
WHEREAS:

- A. MSEDCL has resolved to procure energy storage capacity for 1500 MW (For 8 Hours discharge with maximum 5 Hours continuous discharge) from a Pumped Hydro Storage based Energy Storage System ("PHESS") for a period of 40 Years in accordance with the terms and conditions to be set forth in this Agreement.
- B. Procurer had invited proposals by its "Tender No. CE/PP/PHSP/T01" dated 09.03.2024 prescribing the technical, commercial terms and conditions for selection of Bidders for procurement of 2,000 MW (additional 2000 MW under green shoe) (For 8 Hours discharge with maximum 5 Hours continuous discharge) from Pumped Hydro Storage based Energy Storage System (PHESS) connected to its STU/MSETCL/CTU system and located anywhere in India for a period of 40 Years. Pursuant to this, MSEDCL has received proposals from bidders including, inter alia, from JSW Neo Energy Limited.
- C. MERC vide order dated July 12, 2024 read along with the order dated July 24, 2024 has accorded approval for procuring capacity of 2000 MW (additional 2000 MW under Green Shoe Option). After evaluation of the Proposal received, MSEDCL had accepted the bid of the JSW Neo Energy Limited for development of 1500 MW capacity of Pumped Hydro Storage based Energy Storage System (PHESS) located near Jamunde village in Igatpuri Tehsil/Mandal of Nashik district and Kalbhonde and Kothale village in Shahpur Taluka of Thane district in Maharashtra and issued its Letter of Award No MSEDCL/PHSP/Tender/31235, dated October 7, 2024 (herein after called the "LOA") to the JSW Neo Energy Limited "Selected Bidder" requiring, inter alia, the execution of this Agreement.



- D. JSW Neo Energy Limited has promoted and incorporated the Energy Storage System Developer ("Special Purpose Vehicle" or "SPV"), in accordance with the terms of the Tender and has requested the Procurer through a letter bearing number JSWNE/MSEDCL/PSP/LOA/1500MW/001 dated 08.10.2024 to accept JSW Energy PSP Two Limited as the entity which shall undertake and perform the obligations and exercise the rights of the Selected Bidder under the LOA, including the obligation to enter into this Agreement pursuant to the LOA for executing the Project.
- E. By its letter dated 09.10.2024 bearing reference No. JSWEPSTL/ MSEDCL/ PSP/ LOA/1500MW/001, the Developer has also joined in the said request of JSW Neo Energy Limited to Procurer to accept it as the entity which shall undertake and perform the obligations and exercise the rights of the Selected Bidder including the obligation to enter into this Agreement pursuant to the LOA. The Developer has further represented to the effect that it has been promoted by the single business entity/ Consortium for the purposes hereof.
- F. Procurer has agreed to the said request of the JSW Neo Energy Limited and the Developer and has accordingly agreed to enter into this Agreement along with the Developer for execution of the Project, subject to and on the terms and conditions set forth hereinafter.
- G. Procurer acknowledges that simultaneously with the execution of this Agreement, the Developer has submitted Bank Guarantee towards Performance Security for the amount and in the manner set out in Clause 4.5.
- H. Request for Selection (RfS) No. CEPP/PHSP/T01 dated 09.03.2024 "prescribed the technical, commercial terms and conditions for selection of Bidders for undertaking RFS for Procurement of 1000 MW x 8 Hours discharge with 5 hours continuous discharge / day Storage for 40 Years from Pumped Hydro Storage based Energy Storage System conducted by Procurer shall also be part of the ESFA.

NOW, THEREFORE, in consideration of the foregoing and the respective covenants and agreements set forth in this Agreement, the receipt and sufficiency of which is hereby acknowledged, and intending to be legally bound hereby, the Parties agree as follows:



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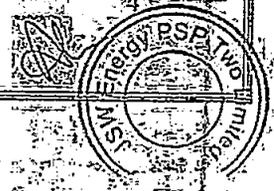
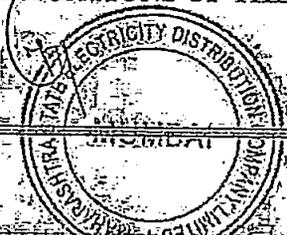
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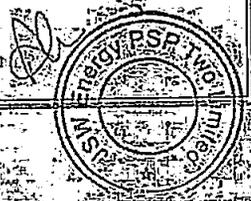
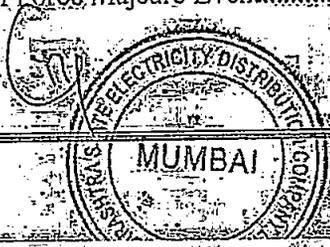
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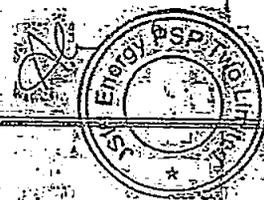
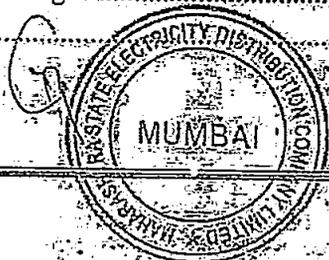
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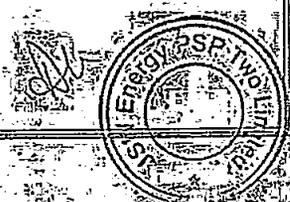
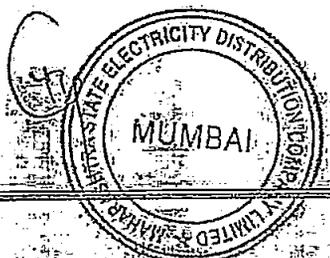
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ARTICLE 1: DEFINITION AND INTERPRETATION

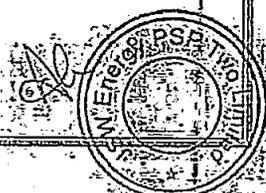
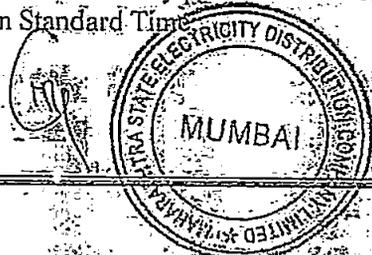
1.1 Definitions

The words and expressions beginning with capital letters and defined in this Agreement (including those in Article 21) shall, unless the context otherwise requires, have the meaning ascribed thereto herein, and the words and expressions defined in the Schedules and used therein shall have the meaning ascribed thereto in the Schedules.

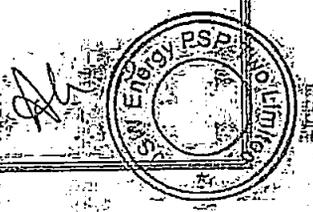
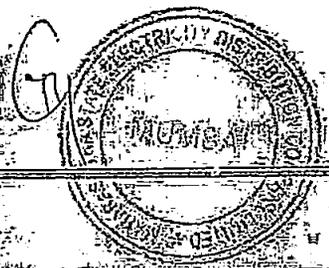
1.2 Interpretation

1.2.1 In this Agreement, unless the context otherwise requires,

- a) references to any legislation or any provision thereof shall include amendment or re-enactment or consolidation of such legislation or any provision thereof so far as such amendment or re-enactment or consolidation applies or is capable of applying to any transaction entered into hereunder;
- b) references to laws of state of Maharashtra, laws of India or Indian law or regulation having the force of law shall include the laws, acts, ordinances, rules, regulations, bye laws or notifications which have the force of law in the territory of India and as from time to time may be amended, modified, supplemented, extended or re-enacted;
- c) references to a "person" and words denoting a natural person shall be construed as a reference to any individual, firm, company, corporation, society, trust, Government, state or agency of a state or any association or partnership (whether or not having separate legal personality) of two or more of the above and shall include successors and assigns;
- d) the table of contents, headings or sub-headings in this Agreement are for convenience of reference only and shall not be used in, and shall not affect, the construction or interpretation of this Agreement;
- e) the words "include" and "including" are to be construed without limitation and shall be deemed to be followed by "without limitation" or "but not limited to" whether or not they are followed by such phrases;
- f) references to "construction" or "building" or "installation" or "maintenance" include, unless the context otherwise requires, investigation, design, developing, engineering, installation, processing, fabrication, testing, commissioning, putting into commercial operation and other activities incidental to the construction, and "construct" or "build" or "install" or "maintain" shall be construed accordingly;
- g) references to "development" include, unless the context otherwise requires, construction, augmentation, up gradation and other activities incidental thereto, and "develop" shall be construed accordingly;
- h) any reference to any period of time shall mean a reference to that according to Indian Standard Time



- i) any reference to 'day' shall mean a reference to a calendar day;
- j) references to a "business day" shall be construed as a reference to a day (other than a Sunday) on which banks in Mumbai generally open for business;
- k) any reference to month shall mean a reference to a calendar month as per the Gregorian calendar;
- l) references to any date or period shall mean and include such date, period as may be extended pursuant to this Agreement;
- m) any reference to any period commencing "from" a specified day or date and "till" or "until" a specified day or date shall include both such days or dates; provided that if the last day of any period computed under this Agreement is not a business day, then the period shall run until the end of the next business day;
- n) the words imparting singular shall include plural and vice versa;
- o) references to any gender shall include the other and the neutral gender;
- p) "lakh" means a hundred thousand (1,00,000) and "crore" means ten million (10,000,000);
- q) "indebtedness" shall be construed so as to include any obligation (whether incurred as principal or surety) for the payment or repayment of money, whether present or future, actual or contingent.
- r) references to the "winding-up", "dissolution", "insolvency", or "reorganization" declaration of "Corporate Insolvency Resolution Process (CIRP)" or Liquidation process of a company or corporation shall be construed so as to include any equivalent or analogous proceedings under the law of the jurisdiction in which such company or corporation is incorporated or any jurisdiction in which such company or corporation carries on business including the seeking of liquidation, winding-up, reorganization, dissolution, arrangement, protection or relief of debtors;
- s) save and except as otherwise provided in this Agreement, any reference, at any time, to any agreement, deed, instrument, license or document of any description shall be construed as reference to that agreement, deed, instrument, license or other document as amended, varied, supplemented, modified or suspended at the time of such reference; provided that this Sub-clause shall not operate so as to increase liabilities or obligations of the Procurer hereunder or pursuant hereto in any manner whatsoever;
- t) any agreement, consent, approval, authorization, notice, communication, information or report required under or pursuant to this Agreement from or by any Party shall be valid and effective only if it is in writing under the hand of a duly authorized representative of such Party, as the case may be, in this behalf and not otherwise;



- u) the Schedules and Recitals to this Agreement form an integral part of this Agreement and will be in full force and effect as though they were expressly set out in the body of this Agreement;
- v) references to Recitals, Articles, Clauses, Sub-clauses or Schedules in this Agreement shall, except where the context otherwise requires, mean references to Recitals, Articles, Clauses, Sub-clauses and Schedules of or to this Agreement, and references to a Paragraph shall, subject to any contrary indication, be construed as a reference to a Paragraph of this Agreement or of the Schedule in which such reference appears;
- w) the damages payable by either Party to the other of them, as set forth in this Agreement, whether on per diem basis or otherwise, are mutually agreed genuine pre-estimated loss and damage likely to be suffered and incurred by the Party entitled to receive the same and are not by way of penalty (the "Damages"); and
- x) Time shall be of the essence in the performance of the Parties' respective obligations. If any time period specified herein is extended, such extended time shall also be of the essence.

1.2.2 Unless expressly provided otherwise in this Agreement, any Documentation required to be provided or furnished by the Developer to Procurer shall be provided free of cost and in three copies, and if the Procurer is required to return any such Documentation with their comments and/or approval, they shall be entitled to retain two copies thereof.

1.2.3 The rule of construction, if any, that a contract should be interpreted against the parties responsible for the drafting and preparation thereof, shall not apply.

1.2.4 Any word or expression used in this Agreement shall, unless otherwise defined or construed in this Agreement, bear its ordinary English meaning and, for these purposes, the General Clauses Act 1897 shall not apply.

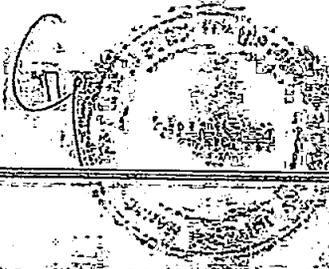
1.3 Measurements and arithmetic conventions

All measurements and calculations shall be in the metric system and calculations done to two (2) decimal places, with the third digit of five (5) or above being rounded up and below five (5) being rounded down.

1.4 Priority of agreements, clauses and schedules

1.4.1 This Agreement, and all other agreements and documents forming part of or referred to in this Agreement are to be taken as mutually explanatory and, unless otherwise expressly provided elsewhere in this Agreement, the priority of this Agreement and other documents and agreements forming part hereof or referred to herein shall, in the event of any conflict between them, be in the following order:

- (a) this Agreement; and
- (b) all other agreements and documents forming part hereof or referred to herein;



i.e. the Agreement at (a) above shall prevail over the agreements and documents at (b) above.

1.4.2 Subject to provisions of Clause 1.4.1 in case of ambiguities or discrepancies within this Agreement, the following shall apply:

- (a) between two or more Clauses of this Agreement, the provisions of a specific Clause relevant to the issue under consideration shall prevail over those in other Clauses;
- (b) between the Clauses of this Agreement and the Schedules, the Clauses shall prevail and between Schedules and Annexes, the Schedules shall prevail;
- (c) between any two Schedules, the Schedule relevant to the issue shall prevail;
- (d) between any value written in numerals and that in words, the latter shall prevail.

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ARTICLE 2: SCOPE OF THE PROJECT

2.1 Scope of the Project

The scope of the Project (the "Scope of the Project") shall mean and include, during the term of this Agreement:

- a) Storage Capacity of 1500 MW is contracted from Developer from a Pumped Hydro Storage based Energy Storage System ("PHESS") project constructed, commissioned, operated and maintained by the Developer (the total installed capacity may be more than the contracted capacity) on BOOM basis throughout the 40 years term of this PHESSFA (unless terminated earlier).
- b) The Developer shall make available to the Procurer a contracted capacity of 1500 MW capable of scheduled discharge of 8 hours (with maximum continuous 5 hours) per day.
- c) Survey, Investigate, Obtain Statutory approvals, Designing, constructing, erecting, testing, commissioning and completing the Pumped Hydro Storage based Energy Storage System within the Scheduled Commercial Operation Date (SCOD) and making available the Contracted Capacity (fulfillment of Storage requirement) to the Procurers;
- d) Developing the power evacuation infrastructure from Pumped Hydro Storage based Energy Storage System (PHESS) Ex-bus to the Interconnection Point of STU (Maharashtra) network;
- e) Operation and maintenance of the Pumped Hydro Storage based Energy Storage System (PHESS) in accordance with the provisions of this Agreement; and
- f) Performance and fulfillment of all other obligations of the Developer in accordance with the provisions of this Agreement and matters incidental thereto or necessary for the performance of any or all of the obligations of the Developer under this Agreement.



ARTICLE 3: TERM OF AGREEMENT

3.1 Effective Date

This Agreement shall come into effect from the date of its execution and such date shall be referred to as the Effective Date.

3.2 Term of Agreement

The Term of this Agreement shall commence on the Effective Date and shall continue for a period of 40 years from the Commercial Operation Date and ending on the Expiry Date. However, the Parties may, 180 (one hundred eighty) days prior to the Expiry Date, decide to extend the term of this Agreement on mutually agreed terms and conditions.

3.3 Period of Supply

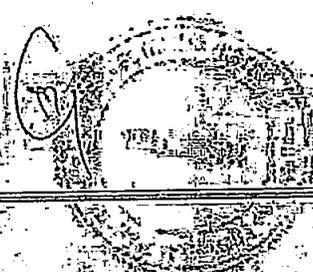
The Developer shall make available, the Contracted Capacity to Procurer for the whole year ("Period of Supply") during the entire term of this Agreement.

3.4 Early Termination

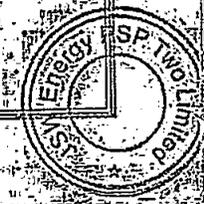
This Agreement shall stand terminated before the Expiry Date if either Procurer or Developer terminates the Agreement, pursuant to Article 16 of this Agreement.

3.5 Survival

The expiry or termination of this Agreement shall not affect any accrued rights, obligations and liabilities of the Parties under this Agreement, including the right to receive penalty as per the terms of this Agreement, nor shall it affect the survival of any continuing obligations for which this Agreement provides, either expressly or by necessary implication, which are to survive after the Expiry Date or termination including those under Article 14 (Force Majeure), Article 16 (Termination), Article 17 (Liability and Indemnification), Article 18 (Governing Law and Dispute Resolution), Article 20 (Miscellaneous Provisions), and other Articles and Schedules of this Agreement which expressly or by their nature survive the Term or termination of this Agreement shall continue and survive any expiry or termination of this Agreement.



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ARTICLE 4: CONDITION SUBSEQUENT

4.1 Conditions Subsequent

Save and except as expressly provided in Article 14 or unless the context otherwise requires, the respective rights and obligations of the Parties under this Agreement shall be subject to the satisfaction in full of the conditions subsequent specified in this Article 4 (the "Conditions Subsequent") by the Developer within 24 (Twenty four) Months from the Effective Date, unless such completion is affected by any Force Majeure event, or if any of the activities is specifically waived in writing by the Procurer.

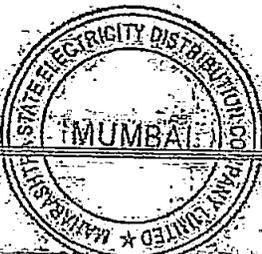
4.2 Conditions Subsequent for the Developer

The Conditions Subsequent required to be satisfied by the Developer shall be deemed to have been fulfilled when the Developer shall have:

- a) achieved Financial Closure for the PHESS and provided a certificate to the Procurer from the lead banker to this effect;
- b) obtained all the consents, permits and Statutory clearances listed in CEA guidelines for formulation of DPR from various designated agencies/authorities/Central Govt/State Govt etc. required for the project to deliver power at Delivery Point;
- c) complied with the Technical Requirements for Pumped Hydro Storage based Energy Storage System (PHESS) as per the applicable Grid Code/ Central Electricity Authority/ Central or State guidelines and also provides the documentary evidence for the same;
- d) submitted the Detailed Project Report (DPR) for the Project duly approved by CEA as per its guidelines for PHSP, indicating Developer's plans to meet the Annual Availability. The Developer shall also demonstrate the technology tie-ups for its major equipment as per the DPR for the Project;
- e) submitted the approval regarding Connectivity granted by Central Transmission Utility (CTU)/ STU (Maharashtra) to the Project after confirming technical feasibility of the said connectivity up to Interconnection/Delivery Point;
- f) Provided documentary evidence for clear title and possession of the land as per the timelines specified in Clause 5.1.1(n);
- g) Provide documentary evidence for Water allocation/availability for required contracted generation of energy.

4.2.1 Developer shall make all reasonable endeavours to satisfy the Conditions Subsequent within the stipulated time.

4.2.2 The Developer shall notify the Procurer in writing at least once a month on the progress made in satisfying the Conditions Subsequent. Developer shall promptly inform the Procurer when any Conditions Subsequent is satisfied by it.



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4.3 Conditions Subsequent for the Procurer

The Conditions Subsequent required to be satisfied by the Procurer shall be deemed to have been fulfilled when the Procurer shall have:

- 4.3.1 obtained an order of the Appropriate Commission for adopting the Tariff under Section 63 of the Electricity Act, 2003;
- 4.3.2 submitted a copy of this Agreement to their respective SERCs in accordance with the requirements of the respective SERC.

4.4 Damages for delay by the Developer

4.4.1 In the event that the Developer does not fulfill any or all of the Conditions Subsequent set forth in Clause 4.2 within the period of 24 (Twenty Four) months from the effective date and the delay has not occurred for any reasons attributable to Procurer or due to Force Majeure, the Developer shall be liable to pay Damages to the Procurer equal to an amount calculated at the rate of 0.2% (zero point two per cent) of the Performance Security for each day's delay until the fulfillment of such Conditions Subsequent, subject to a maximum period of 180 (one hundred and eighty) days. Any delay beyond 180 days shall be construed as the Developer Event of Default and in such case provisions of Article 16 (Termination) shall apply.

4.4.2 The Damages payable by the Developer as per Clause 4.4.1 above, shall be appropriated from the Performance Security in the event the COD is delayed beyond SCOD and shall be in addition to the Damages payable under Clause 5.13.3 of this Agreement.

4.5 Performance Security

4.5.1 For due and punctual performance of its obligations under this Agreement, relating to the Project, the Developer has submitted to the Procurer, an irrevocable and unconditional bank guarantee from a scheduled bank acceptable to the Procurer for an amount of INR 1,50,00,00,000 /- (Indian Rupees One Hundred Fifty Crore only) ("Performance Security"), calculated at 10,00,000 INR (Indian Rupees Ten Lakhs only) per MW of Contracted Capacity.

The Performance Security is furnished to the Procurer in the form of Bank Guarantee, in favour of the Procurer as per the format provided in Schedule 1 and having validity up to twelve months beyond the SCOD. The details of the bank guarantee furnished towards the Performance Security are given below:

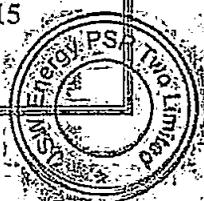
Bank Guarantee No. 2403861BGP00325 dated 07.10.2024 for an amount of INR 1,50,00,00,000 /- (Indian Rupees One Hundred Fifty Crore only) valid up to 31.07.2029.

4.5.2 Appropriation of Performance Security

Upon occurrence of a Developer Default, the Procurer shall, without prejudice to its other rights and remedies hereunder or available in law, be entitled to encash and appropriate the relevant amounts from the Performance Security as Damages for such Developer Default. Upon such encashment and appropriation from the Performance



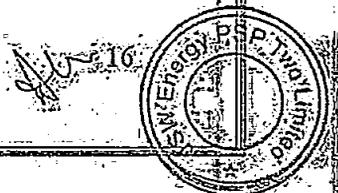
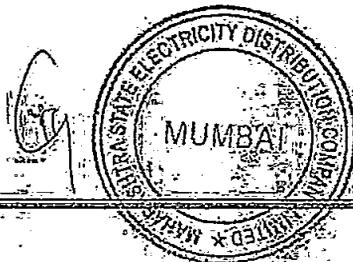
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Security, the Developer shall, within 30 (thirty) days thereof, replenish, in case of partial appropriation, to its original level of the Performance Security, and in case of appropriation of the entire Performance Security, provide a fresh Performance Security, as the case may be, and the Developer shall, within the time so granted, replenish or furnish fresh Performance Security as aforesaid failing which the Procurer shall be entitled to terminate this Agreement in accordance with Article 16.

4.5.3 Release of Performance Security

Subject to other provisions of this Agreement, Procurer shall release the Performance Security after twelve (12) months from the successful Commissioning of the Project after taking into account any liquidated damages / penalties due to delays in commissioning as per provisions stipulated in this Agreement. The release of the Performance Security shall be without prejudice to other rights of Procurer under this Agreement.

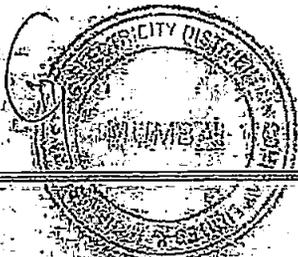


ARTICLE 5: OBLIGATION OF THE DEVELOPER

5.1 Obligations of the Developer

5.1.1 Subject to and on the terms and conditions of this Agreement, the Developer shall at its own cost and expense:--

- a) procure finance for and undertake the designing, constructing, erecting, testing and commissioning of the Pumped Hydro Storage based Energy Storage System (PHESS) in accordance with the Applicable Law(s) & Grid Code and observe, fulfill, comply with and perform all its obligations set out in this Agreement or arising hereunder.
- b) comply with all Applicable Laws and obtain applicable Consents, Clearances and Permits (including renewals as required) including CTU/STU(Maharashtra) connectivity in the performance of its obligations under this Agreement and maintaining all Applicable Permits in full force and effect during the Term of this Agreement and compliance with all applicable guidelines from State/Central Authorities.
- c) obtain requisite InSTS connectivity for evacuation of the Contracted Capacity and maintaining it throughout the term of the Agreement upto Interconnection/Delivery Point.
- d) make available the Contracted Capacity at Delivery point to Procurer not later than the Scheduled Commercial Operations Date (SCOD) and continue providing the Contracted Capacity throughout the term of this Agreement.
- e) connect the Power Project switchyard with the Interconnection Facilities at the Interconnection Point /Delivery Point.
- f) directly coordinate and deal with the corresponding Load Dispatch Centers, and other authorities in all respects in regard to declaration of availability, scheduling and dispatch of power and due compliance with deviation and settlement mechanism and the applicable Grid Code, State & Central Regulations.
- g) Build, Own, Operate and Maintain the Pumped Hydro Storage based Energy Storage System (PHESS) throughout the term of this Agreement and keep it free and clear of all encumbrances.
- h) comply with the equity lock-in conditions set out in Clause 5.2.
- i) be responsible for all payments related to any taxes, cess, duties or levies imposed by the Government Instrumentalities or competent statutory authority on land, equipment, material, water or works of the project to or on the electricity consumed by the Project or by itself or on the income or assets owned by it at the time of BID submission. Any change after BID due date shall be consider under change-in-law.



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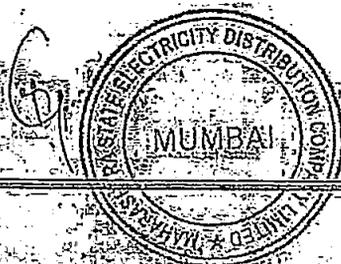


- j) ensure that the PHESS shall have Automatic Generation Control (AGC) functionality, as per IEGC 2022 and Central Electricity Authority (Technical Standards for Connectivity to the Grid), Regulations, as amended time to time.
- k) be responsible for land acquisition and water requirement of Pumped Hydro Storage based Energy Storage System (PHESS).
- l) in generation mode, the PHESS project, at overall plant level, shall have the ability to vary the capacity from 20% to 100% of the rated MW capacity and at individual unit-level, PHESS project shall have the ability to vary the unit-level capacity between 50% to 100% of the rated MW capacity with hydro unit overload capacity as per CEA standards.
- m) be responsible for Joint Inspection of Site for Interconnection Point.
- n) The Developer shall submit documents/ lease agreement to establish possession/right to use: i) required land for powerhouse and associated equipment/facilities to the Procurer up to the scheduled Financial Closure date, and ii) required land for Reservoir (upper and lower) to the Procurer, on or before SCOD.
- o) Wherever leasing of private land is involved, the lease should allow transfer of land lease rights to the lenders or the Procurer, in case of default of the Developer. The Developer shall submit a sworn affidavit from its authorized signatory, listing the details of the land and certifying that total land required for the Project is under clear possession of the Developer.

5.1.2 The Developer shall discharge its obligations in accordance with Good Industry Practices and as a reasonable and prudent person.

5.1.3 The Developer shall, at its own cost and expense, in addition to and not in derogation of its obligations elsewhere set out in this Agreement:

- (a) make, or cause to be made, necessary applications to the relevant government agencies with such particulars and details, as may be required for obtaining Applicable Permits and obtain and keep in force and effect such Applicable Permits in conformity with the Applicable Laws;
- (b) procure, as required, the appropriate proprietary rights, licenses, agreements and permissions for materials, methods, processes and systems used or incorporated into the Power Project;
- (c) make reasonable efforts to maintain harmony and good industrial relations among the personnel employed by it or its Contractors in connection with the performance of its obligations under this Agreement.
- (d) ensure that its Contractors comply with all Applicable Permits and Applicable Laws in the performance by them of any of the Developer's obligations under this Agreement; and



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- (e) not do or omit to do any act, deed or thing which may in any manner be violative of any of the provisions of this Agreement.

5.2 Equity Lock-in Conditions

- a) The shareholding as on the Effective Date is as follows:

Names of Shareholders	No. of Shares (Rs. 10 each)	% of total Shares of the Company
JSW Neo Energy Limited	9,994	100.00
JSW Hydro Energy Limited*	1	00.00
JSW Energy (Barmer) Limited*	1	00.00
JSW Energy (Kutehr) Limited*	1	00.00
JSW Energy (Raigarh) Limited*	1	00.00
JSW Power Trading Company Limited*	1	00.00
JSW Renew Energy Limited*	1	00.00
Total	10,000	100.00

*Nominee of JSW Neo Energy Limited

- b) The Developer, for the sole purpose to exercise its rights and performing its obligations and liabilities under this Agreement, hereby undertakes and agrees to comply with the following lock-in conditions:

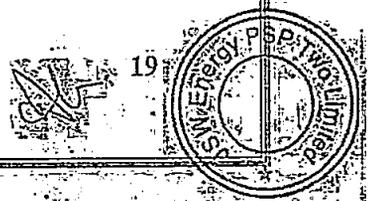
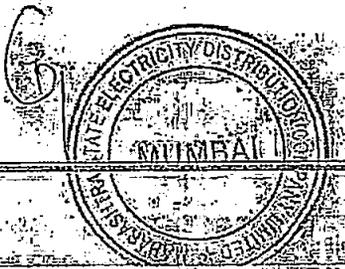
In case the Selected Bidder is a single entity

The Selected Bidder shall hold at least 51% (fifty one percent) of subscribed and paid-up equity share capital of the Developer, until first anniversary of the commercial operations date of the Project. This condition is applicable only in case the single business entity incorporates an SPV to execute the ESFA and implement the Project.

- c) In the event of non-compliance of the above, the same shall constitute an event of default by Developer, and the Procurers shall be entitled to terminate this Agreement in accordance with Article 16.

5.3 Information regarding Interconnection Facilities

The Developer shall be required to obtain all information with regard to the Interconnection Facilities as is reasonably necessary to enable it to design, install and operate all interconnection plant and apparatus on the Developer's side of the Interconnection Point/ Delivery Point to enable delivery of electricity at the Delivery Point.



5.4 Connectivity to the grid

The Developer shall be responsible for power evacuation from the Pumped Hydro Storage based Energy Storage System (PHESS) to the designated nearest Interconnection Point/ Delivery Point/s as per the inter connection approval given by the STU (Maharashtra).

5.5 Procurement of Contracted Capacity

Subject to the terms and conditions of this Agreement, the Developer undertakes to sell to Procurer and subject to Clause 5.6 below, Procurer undertake to procure the entire Contracted Capacity supplied at the Delivery Point for their respective period of supply as defined in clause 3.3 of this agreement.

5.6 Right to Contracted Capacity

Procurer, at any time during the Term of this Agreement, shall not be obliged to procure additional capacity from the Developer apart from the Contracted Capacity.

5.7 Obligations relating to Change in Ownership:

The Developer shall not undertake or permit any change in ownership until First anniversary of the commercial operations date of the Pumped Hydro Storage based Energy Storage System (PHESS). Further any change in Ownership will be with the prior written approval of Procurer.

5.8 Obligations relating to operation of the Power Station:

5.8.1 The Developer shall at all times operate the Pumped Hydro Storage based Energy Storage System (PHESS) in accordance with Applicable Laws and the provisions of the Grid Code and shall comply with such directions as the RLDC/SLDC may give from time to time in accordance with the provisions of the Act.

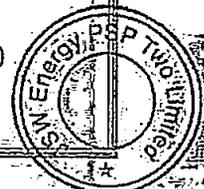
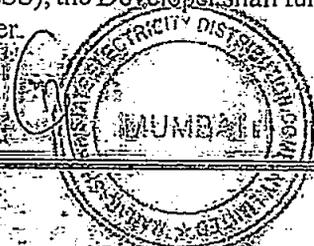
5.8.2 The Developer shall enter into and comply with agreements for interconnection of the Pumped Hydro Storage based Energy Storage System (PHESS) to the grid, sub-stations, licensees or consumers, as the case may be, under and in accordance with Applicable Laws.

5.9 Obligations relating to RLDC/SLDC charges:

The Developer shall be liable for payment of all the charges, due and payable under Applicable Laws by the developer to the RLDC/SLDC in respect of all its supplies to the Procurer.

5.10 Obligations relating to reporting requirements:

All information provided by the Developer to the SLDC / RLDC as a part of its operating and reporting requirements under Applicable Laws, including the Grid Code, shall also be provided by it to the Procurer. Further, during the development/construction phase of the Pumped Hydro Storage based Energy Storage System (PHESS), the Developer shall furnish the monthly progress report of the PHESS to the Procurer.



5.11 Normative Availability (%)

5.11.1 In order to achieve realization of full Annual Fixed Charge (AFC), Developer shall be required to ensure minimum annual availability of 90% for the Contracted Capacity (the "Normative Availability"). On or before commencement of Supply and not later than 45 (forty-five) days prior to the beginning of each Financial Year during the Term of this Agreement, as the case may be, the Developer shall provide to the Procurers its proposed annual program of preventive, urgent and other scheduled maintenance (the "Maintenance Programme") preferably in lean demand period of MSEDCL, to comply with the Maintenance Requirements, Maintenance Manual and Safety Requirements. Any maintenance carried out by the Developer as per the Maintenance Programme under this Clause and as notified to the Procurers under this Clause shall be deemed to be scheduled maintenance (the "Scheduled Maintenance"). For the avoidance of doubt, any closure, suspension, or reduction of Contracted Capacity arising out of Scheduled Maintenance shall be deemed as Non-Availability of Contracted Capacity. The Developer shall plan its maintenance and allied activities and outages during lean demand period of MSEDCL in consultation with the Procurer and SLDC/RLDC.

5.11.2 The cumulative availability (calculated in %) till the end of Nth month during any Financial Year shall be calculated as below:

Cumulative Availability (%) =

$$\frac{\text{Sum of timeblock wise Declared Availability (MW) till Nth month} \times \left[\frac{1 \text{ Hour}}{\text{No. of timeblock in an hour}} \right]}{\text{Contracted Capacity (MW)} \times 24 \times \text{No. of days in N months}}$$

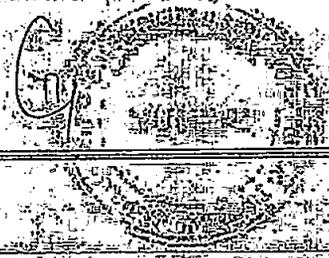
Contracted Capacity (MW) × 24 × No. of days in N months)

"Declared Availability" (MW) is the capability of the Project to operate in discharge mode and will be declared by the Developer at / before 6 AM on day-ahead basis, for each 15-minute time block for the next day. For example, the Declared Machine Availability for all 96 no. 15-minute time blocks of 1st September 2024 will be submitted by 6 AM of 31st Aug 2024.

5.11.3 Procurer/Developer shall be responsible for all scheduling and dispatch activities as per the applicable regulations / requirements / guidelines of CERC / SERC /SLDC / RLDC or any other competent agency and same being recognized by the SLDC/RLDC or any other competent authority / agency as per applicable regulation/ law / direction and maintain compliance to the applicable Codes/ Grid Code requirements and directions, if any, as specified by concerned SLDC/RLDC from time to time.

5.11.4 Provided for any particular / individual time-block, only one instruction may be issued, that is, either charge or discharge (not both within the same time-block).

5.11.5 For avoidance of doubt, it is specifically provided that the Declared Availability will not take into account the State of Charge (as defined below), as the State of charge will vary continuously based on pumping / generation instructions issued by Procurer/SLDC. Procurer/SLDC shall consider State of Charge before issuing the pumping / generation instructions. The Developer shall intimate the State of Charge (expressed in MWh output terms), to the Procurer /SLDC regularly and dynamically.



For illustration purpose, State of Charge and corresponding remaining maximum pumping / generation quantity (MWh) are illustrated below (assuming Contracted Capacity of 2000 MW, 4 hours maximum discharge and Cycle Loss of 25 %):

State of Charge (MWh)	Remaining Maximum Continuous Discharge (Output Energy) (MWh) (Instant MW output capped to Contracted Capacity)	Remaining Maximum Continuous Charge (Input Energy) (Grossed up for Cycle Loss) (MWh) (Instant MW input capped to Contracted Capacity)
8000 (Max)	8000	0
6000	6000	2667
4000	4000	5333
2000	2000	8000
0 (Min)	0	10667

5.11.6 If the continuous-charge / discharge instruction provided by the Procurer/SLDC exceeds the limits as illustrated above, the continuous-charge / continuous-discharge instruction shall be deemed to have been automatically revised downwards to the limits as illustrated above.

5.11.7 Deemed availability shall be considered in case of charging not provided by the Procurer.

5.12 Penalty for under-achievement of Normative Availability

5.12.1 If in a Year, the actual annual availability is lower than 90% (Ninety Five Percent), penalty shall be levied on the Developer, after the end of the Financial Year, as per the following formula:

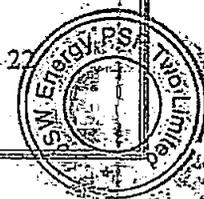
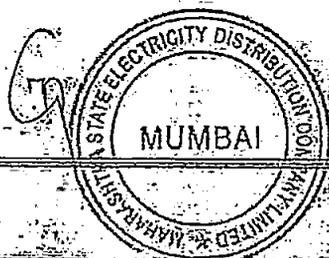
Penalty (Rs Lakh) = (90% – actual annual availability in % achieved for the Contract Year) x (AFC in Rs Lakh per MW per annum) x (Contracted Capacity in MW)

For illustration: If a Developer/s achieves an Annual Availability of 83% during a Contract Year and the AFC quoted by the Developer/s is INR 10 Lakhs/MW/annum for a Contracted Capacity of 1000 MW, then Penalty for achieving annual availability below Normative Availability, computed as per above formula is INR 12.0 Crores for the Year.

5.12.2 The Procurer will share the computation of penalty in accordance with clause 5.12.1 above and share the statement of computation with the Developer. The penalty so computed, shall be mentioned by the Developer in its subsequent Monthly Bill for deduction.

5.12.3 Month on month basis monthly fixed charges (MFC) shall be appropriately calculated and paid based on the cumulative availability as below:

$$MFC_n = \left[\frac{FC_n \times \text{Cumulative Availability (\%)} \text{ achieved upto the end } n \text{ month}}{\text{Normative Annual Availability (\%)}} \right] - FC_{(n-1)}$$



Cumulative Availability (%) achieved upto the n month for calculation of MFCn is limited to 90%.

Where,

$$FCn = \frac{[AFC \times CC] \times L}{[T \times \text{No. of days in the year}]}$$

MFCn = Fixed Charges payable up to the nth month

FCn = Fixed Charges payable upto and including nth month

FC(n-1) = Fixed Charges payable upto and including month 'n-1' but not including month 'n'

AFC = Annual Fixed Charges quoted by the Developer in its Bid in Rupees per MW per Annum

CC = Contracted Capacity in MW

L = Cumulative number of time blocks, corresponding to 8 hours per day, from the 1st day of the financial year upto and including the month 'n'

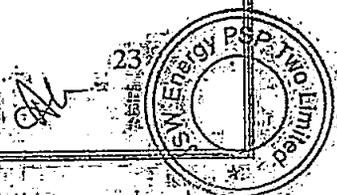
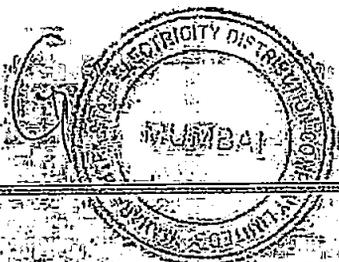
T = No. of time blocks per day corresponding to discharge for 8 hours

5.12.4 The calculation of cumulative availability shall exclude the following time-blocks:

- a) Time-blocks during which the PHESS can charge/discharge power, but the PHESS is unavailable due to temporary transmission unavailability or grid-related constraints after the Interconnection point, for reasons not attributable to the Developer. The duration of grid unavailability shall be intimated by SLDC/RLDC and shall be factored for Annual Availability computations as per above clause.
- b) Based on machine availability by Developer, SLDC shall provide time blocks for charging and discharging, and schedule the injection into grid. Any deviation from the injection/drawal schedule shall be addressed as per MERC Deviation Settlement Mechanism Regulations as applicable and all corresponding deviation charges will be borne by developer.

5.12.5 The Developer shall have the below Response time

- a) Maximum Ramp-up/Ramp-down Response time in operating conditions: 25% of Contract Capacity per minute.
- b) Maximum response time to reach Contract Capacity in case of charging and discharging: 5 minutes.



5.13 Commissioning of Pumped Hydro Storage Plant

5.13.1 Commissioning

- (a) The Date of Commissioning of PHESS (the "Scheduled COD") shall be 36 months for at least 50% capacity and full COD in 48 months from the Effective date of ESFA.
- (b) The Developer shall be permitted for full commissioning as well as part commissioning of the Project even prior to the SCOD subject to clause 5.13.4.
- (c) The maximum period allowed for commissioning of the full Project Capacity with applicable liquidated damages shall be limited to the date as on 6 months from the SCOD or upto the extended SCOD (if applicable).
- (d) In case the Developer fails to achieve the commissioning of Project upto SCOD, the Procurer shall be entitled to invoke, encash and appropriate the Performance Security in accordance with Clause 5.15.

The Procurer will share the computation of penalty in accordance with clause (d) above and share the statement of computation with the Developer.

5.13.2 Part Commissioning

Part commissioning of the Project shall be accepted by the Procurer subject to the following:

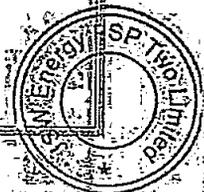
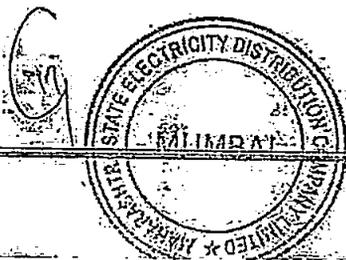
- (a) The minimum capacity for acceptance of first part commissioning is 50MW and subsequent part(s) shall be 50MW, without prejudice to the imposition of penalty, in terms of this Agreement on the part which is not commissioned.
- (b) However, SCOD will not get altered due to part-commissioning. Irrespective of dates of part commissioning, this Agreement will remain in force for a period of 40 years from the date of full commissioning of the project (the "Project COD").

5.13.3 Delay in Commissioning

- (a) In case of delay in commissioning of the Project beyond SCOD until the date as indicated in Clause 5.13.1(c) above, as part of the liquidated damages, the Performance Security submitted by the Developer/s shall be computed on per-day-basis and proportionate to the balance capacity not commissioned.

For example, in case of 190 MW Contracted Capacity, commissioning of 100 MW capacity is delayed by 18 days beyond the SCOD, then the liquidated damages shall be:

$$\begin{aligned} L.D. &= \text{Performance Security Amount} \times (100/190) \times (18/180). \\ &= (\text{Rs. } 12.00 \text{ Lakh} \times 190\text{MW}) \times (100/190) \times (18/180) \\ &= \text{Rs. } 1.20 \text{ Crs.} \end{aligned}$$



- (b) In case the Commissioning of the Project is delayed beyond the date as indicated in 5.13.1 (c), the Contracted Capacity shall stand reduced/ amended to the Part Capacity commissioned till date. Procurement of the balance capacity shall be at the sole discretion of the Procurer and the AFC for the same shall be lower of (a) the rates discovered in the latest competitive bid in the country for providing storage services from any technology, or (b) 75% of the AFC quoted by the Developer.
- (c) In case of delay in commissioning of the PHESS due to Force Majeure or due to reasons beyond the reasonable control of the Developer, Procurer may extend the Scheduled COD after examining the issue on a case-to-case basis, subject to extension of requisite performance security by the developer. Any decision of the Procurer shall be binding on the Developer.
- (d) Procurer will share the computation of penalty in accordance with clause 5.13.3 (a) above and share the statement of computation with the Developer.

5.13.4 Early Commissioning

- (a) The Developer shall be permitted for full as well as part commissioning of the Project even prior to the SCOD.
- (b) In case of part commissioning before the SCOD, the Procurer shall procure the capacity at 75% (seventy-five per cent) of the AFC pro-rated for the capacity made available for the duration between date of part commissioning and SCOD.
- (c) Provided that, for any capacity made available by the Developer before SCOD, Procurer shall have the right but not the obligation to procure such capacity.
- (d) In case of early full commissioning of contracted capacity, before the SCOD the Procurer procures the capacity at 100% (hundred per cent) of the AFC for the duration between date of early full commissioning and Scheduled COD.

Provided that, for any capacity made available by the Developer before SCOD, Procurer shall have the right but not the obligation to procure such capacity.

- (e) In case of early part-commissioning or commissioning of entire capacity prior to the SCOD, and in case the Procurer agrees to procure the early commissioned capacity, the input energy for charging shall be provided by the Procurer upto Delivery Point with due consideration of the declared Cycle Loss.
- (f) Any energy imported by the PHESS during the construction phase i.e., before synchronization shall be on account of Developer.
- (g) In cases of early full commissioning, till Scheduled Commissioning Date, procurer may utilize the storage facility at 100% (hundred per cent) of the ESFA rate payable to the developer. Procurer shall procure the capacity at 75% of AFC on pro-rata basis for the part capacity made available for the duration between date of part commissioning and SCOD. However, in case procurer is not willing to avail PHESS facility for the period of part commissioning, then developer will be allowed to sell power in exchange or through bilateral contacts with



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permission of procurer. In this case Procurer will not provide Input Energy to Developer and the Developer should share the profit of part commissioned capacity in the proportion of 50:50 (Procurer: Developer).

- (h) In case of early part or full commissioning before the SCOD, if Procurer 'doesn't avail the PHESS facility, Procurer will not provide any Input Energy to Developer and will not be liable to pay any Fixed Charges for this period. In this case Developer can sell power to a third party and should share the profit in the proportion of 80:20 (Developer: Procurer).

5.14 Extensions of Time

5.14.1 In the event that the Developer is prevented from achieving the progress in fulfilling the Conditions Subsequent within the time stipulated in the ESFA, except for reasons mentioned below, the Procurer may grant extension of time, not more than 120 Days (One hundred Twenty Days) from the expiry of timeline for achieving Conditions Subsequent as per Clause 4.2. Such extension of time by MSEDCL shall not affect the Commissioning of the Project within the Scheduled Commissioning Date.

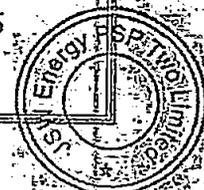
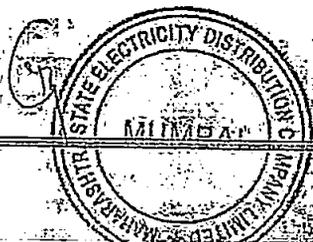
In the event that the Developer is prevented from commissioning of the PHESS within the time stipulated in the ESFA due to:

- a) any default by Procurer's Event of Default; or
- b) Force Majeure Events; or
- c) Delay in commissioning/fulfilment of Condition Subsequent on account of delay in STU (Maharashtra)/CTU connectivity operationalization provided:
 - i. the Developer has complied with the complete application formalities with STU (Maharashtra)/ CTU.
 - ii. the Developer has adhered to the applicable procedures in this regard as notified by the CERC/CEA/CTU/MERC/STU, and
 - iii. the delay in grant of connectivity by the CTU/STU and/or delay in readiness of the ISTS/InSTS substation at the Delivery Point, including readiness of the power evacuation and transmission infrastructure of the ISTS /InSTS network, is a factor attributable to the CTU/STU and is beyond the control of the Developer;

The above shall be treated as delays beyond the control of the Developer and SCOD for such PHESS may be revised. Decision on requisite extension on account of the above factor is discretion of the Procurer.

The Developer shall commission the PHESS and seek approval from the Procurer for condoning the delay in commissioning the PHESS urging any of the grounds mentioned in (a), (b) and (c) above.

5.14.2 After hearing the Parties and considering the merits of the grounds urged, Procurer may condone the delay in commissioning of PHESS on any of the grounds stated by the Developer.



5.14.3 In case Procurer condones the delay, the scheduled commissioning date and the expiry date shall be deemed to be extended by the period for which the delay is condoned.

5.14.4 In the event that the Developer is prevented from achieving the progress in fulfilling the Condition Subsequent or commissioning the Project for the reasons specified in the Clauses 5.14.1 (a), (b) and (c) and if such events continue, Procurer shall have the right to terminate the agreement as per the provisions of Article 16.

5.15 Liquidated Damages for delay in COD

5.15.1 The Pumped Hydro Storage based Energy Storage System (PHESS) shall be completely Commissioned within a period of 48 months (Forty Eight months) ("Scheduled Commercial Operations Date" or "SCOD") from the date of signing of ESFA. If the Developer is unable to make Contracted Capacity available by the SCOD other than for the reasons specified in Clause 5.14.1, the Developer is liable for Liquidated Damages for the delay in making available the full Contracted Capacity by the Scheduled Commissioning Date. In such a case, the liquidated damages shall be computed on per-day-basis over 180 days from SCOD and proportionate to the balance Contracted Capacity not commissioned and accordingly Performance Bank Guarantee shall be encashed.

For example, in case of 190 MW Contracted Capacity, commissioning of 100 MW capacity is delayed by 18 days beyond the SCOD, then the liquidated damages shall be:

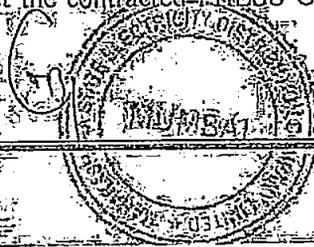
$$\begin{aligned}
 L.D. &= \text{Performance Security Amount} \times (100/190) \times (18/180). \\
 &= (\text{Rs.}12.00 \text{ Lakh} \times 190\text{MW}) \times (100/190) \times (18/180) \\
 &= \text{Rs. } 1.20 \text{ Crs.}
 \end{aligned}$$

5.15.2 In case the Commissioning of the PHESS is delayed beyond the date as indicated in 5.15.1, (that is 180 days from SCOD) the Contracted Capacity shall stand reduced/amended to the Capacity Commissioned and the ESFA for the balance capacity will stand terminated and shall be reduced from the selected Contracted Capacity.

5.15.3 The maximum time period allowed for achievement of Commercial Operation Date with payment of Liquidated Damages shall be limited to 6 months from the SCOD (For example, if the signing of ESFA is 1st April 2024, then SCOD shall be 31st March 2028, irrespective of holidays.). In case, the achievement of COD is delayed beyond 6 months from the SCOD, it shall be considered as a Developer Event of Default and provisions of Article 16 shall apply.

5.15.4 Alternate Source of Supply: In the event the Developer agrees and undertakes to supply from an alternate PHESS, and the Procurer agrees to accept supply from such alternate source, the whole or part of the entitlement of the Procurer from electricity that would have been produced from Contracted Capacity during the period between the Scheduled Completion Date and COD, and on the terms specified in this Agreement, the Damages payable under this clause 5.15 shall be reduced in the same proportion that such supply shall bear to the Contracted Capacity.

Any additional transmission charges or losses on account of such change in source of supply as against the contracted PHESS Capacity shall be borne by the Developer.



Provided further that, any savings in transmission charges or losses on account of such change in source of supply shall accrue to the Procurer.

5.16 Acceptance Test

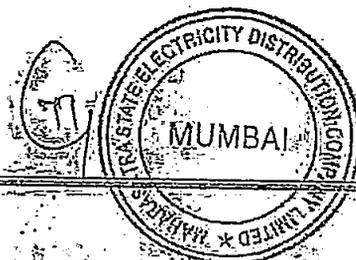
Prior to synchronization of the PHESS, the Developer shall be required to get the PHESS certified for the requisite acceptance/performance test as may be laid down by Central Electricity Authority or Chief Electrical Inspectorate of respective state government, to carry out testing and certification for the Pumped Hydro Storage based Energy Storage System (PHESS).

5.17 Third Party Verification

5.17.1 The Developer shall be further required to provide entry to the site of the Pumped Hydro Storage based Energy Storage System (PHESS) free of all encumbrances at all times during the term of the agreement to the Procurer, its authorized representatives including representatives from Procurer and a third party nominated by any Governmental Instrumentality for inspection and verification of the works being carried out by the Developer at the site of the project. The Developer shall provide full support to Procurers and/or the Third Party in this regard.

5.17.2 The third party may verify the construction works/operation of the PHESS being carried out by the developer and if it is found that the construction works/operation of the PHESS is not as per the CEA standards / prudent utility practices, it may seek clarifications from Developer or require the works to be stopped or to comply with the instructions of such third party.

5.17.3 The third party may carry out checks for testing the cycle loss of the PHESS. During a contract Year, if the cycle loss of the project is found to be higher than the declared cycle loss, the developer shall be liable for penalty on non-fulfillment of its obligation in accordance with the provisions of ESFA.



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ARTICLE 6: OBLIGATIONS OF THE PROCURER

6.1 Obligations of Procurer

6.1.1 Procurer shall, at its own cost and expense undertakes, comply with and perform all its obligations set out in this Agreement or arising hereunder.

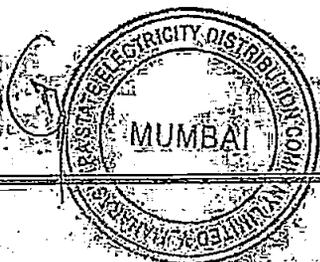
6.1.2 Procurer shall make timely payments of AFC to the Developer as per the procedure set out in Article 13 and maintain the payment security mechanism as prescribed in Clause 13.6.

6.1.3 Procurer agrees to provide support to the Developer and undertake to observe, comply with and perform, subject to and in accordance with the provisions of this Agreement and the Applicable Laws, the following:

- a) upon written request from the Developer, and subject to the Developer complying with Applicable Laws, provide reasonable support and assistance to the Developer in procuring Applicable Permits required from Indian government agencies for implementation and operation of the Project (PHESS);
- b) not do or omit to do any act, deed or thing which may in any manner be violative of any of the provisions of this Agreement;
- c) act reasonably, while exercising its discretionary power under this Agreement; and
- d) support, cooperate with the Developer in the implementation and operation of the Project in accordance with the provisions of this Agreement;

6.1.4 Procurer shall ensure that the energy required for charging is supplied to Developer at the Delivery Point. However, the deviation charges for charging and discharging shall be borne by Developer, if any, will be dealt as per applicable regulation.

6.1.5 Minimum charging power in a 15 min time block will be provided to Developer by the Procurer, equivalent to rated capacity of turbine unit size.



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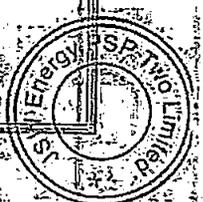
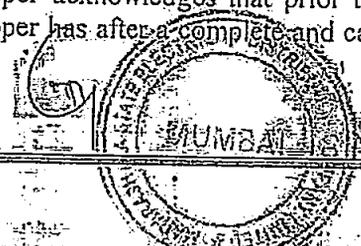


ARTICLE 7: REPRESENTATIONS AND WARRANTIES

7.1 Representations and warranties of the Developer

In addition to any other representations and warranties contained in the Agreement, Developer represents and warrants that:

- a) it is duly organized, validly existing and in good standing under the laws of India;
- b) it has full power and authority to execute, deliver and perform its obligations under this Agreement and to carry out the transactions contemplated hereby;
- c) it has taken all necessary corporate and other action under Applicable Laws and its constitutional documents to authorize the execution, delivery and performance of this Agreement;
- d) it has the financial standing and capacity to undertake the Project (PHESS);
- e) this Agreement constitutes its legal, valid and binding obligation enforceable against it in accordance with the terms hereof;
- f) the execution, delivery and performance of this Agreement will not conflict with, result in the breach of, constitute a default under or accelerate performance required by any of the terms of the Developer's Memorandum and Articles of Association or any Applicable Laws or any covenant, agreement, understanding, decree or order to which it is a party or by which it or any of its properties or assets are bound or affected;
- g) there are no actions, suits, proceedings or investigations pending or to the Developer's knowledge threatened against it at law or in equity before any court or before any other judicial, quasi-judicial or other authority, the outcome of which may constitute Developer Event of Default or which individually or in the aggregate may result in Material Adverse Effect;
- h) it has no knowledge of any violation or default with respect to any order, writ, injunction or any decree of any court or any legally binding order of any Government Agency which may result in Material Adverse Effect;
- i) it has complied with all Applicable Laws and has not been subject to any fines, penalties, injunctive relief or any other civil or criminal liabilities which in the aggregate have or may have Material Adverse Effect;
- j) no representation or warranty by the Developer contained herein or in any other document furnished by it to Procurer or to any Government Agency in relation to Applicable Permits contains or will contain any untrue statement of material fact or omits or will omit to state a material fact necessary to make such representation or warranty not misleading; and
- k) Without prejudice to any express provision contained in this Agreement, the Developer acknowledges that prior to the execution of this Agreement, the Developer has after a complete and careful examination made an independent



evaluation of the Project, and the information provided in the Tender Documents, and has determined to its satisfaction the nature and extent of risks and hazards as are likely to arise or may be faced by the Developer in the course of performance of its obligations hereunder.

- l) The Developer also acknowledges and hereby accepts the risk of inadequacy, mistake or error in or relating to any of the matters set forth above and hereby confirms that Procurers shall not be liable for the same in any manner whatsoever to the Developer.

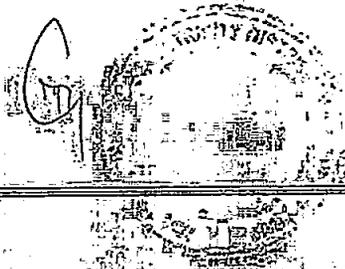
7.2 Representations and Warranties of Procurers

Procurers represents and warrants that:

- a) Procurers has full power and authority to enter into this Agreement and has taken all necessary action to authorize the execution, delivery and performance of this Agreement; and
- b) This Agreement constitutes Procurer's legal, valid and binding obligation enforceable against it in accordance with the terms hereof.

7.3 Obligation to Notify Change

In the event that any of the representations or warranties made/given by a Party ceases to be true or stands changed, the Party who had made such representation or given such warranty shall promptly notify the other of the same.



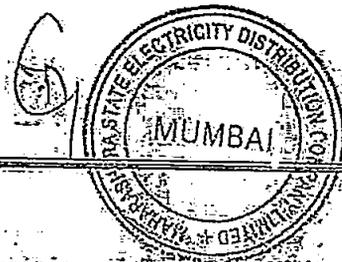
ARTICLE 8: SYNCHRONIZATION AND COMMERCIAL OPERATION

8.1 Synchronization notice

The Developer shall provide at least thirty (30) days written notice to Procurer of the date on which it intends to synchronize the Power Project (PHESS) to the Grid System.

8.2 Conditions for Grid connection

- 8.2.1 Subject to Clause 8.1, the Project (PHESS) shall be synchronized by the Developer with the Grid when it meets all the connection conditions prescribed in applicable Grid Code then in effect and meets all Indian legal/Regulatory/Technical or any other requirements essential for synchronization with the Grid.
- 8.2.2 The synchronization equipment shall be installed by the Developer at its generation facility of the Power Project at its own cost. The Developer shall synchronize its system with the Grid only after the approval of synchronization scheme is granted by the head of the concerned ISTS/InSTS Sub-station/ Grid System and checking/verification is made by the concerned authorities of the Grid.
- 8.2.3 The Developer shall immediately after each synchronization/ tripping of machine/'s, inform the sub-station of the Grid System to which the Power Project is electrically connected and to SLDC/RLDC in accordance with applicable Grid Code.



ARTICLE 9: DISPATCH

9.1 Dispatch

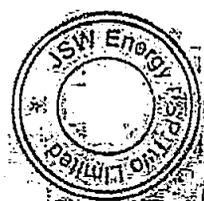
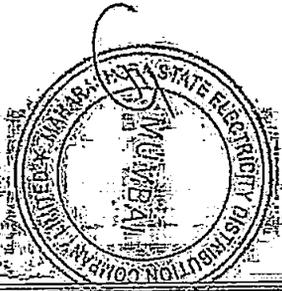
9.1.1 The Power Project (PHESS) shall be required to maintain compliance to the applicable Grid Code/ Central Electricity Authority/ Central or State guidelines requirements and directions, if any, as specified by concerned SLDC/RLDC from time to time.

9.1.2 SCADA system shall be installed and commissioned by the Developer. The Developer shall integrate the SCADA system with the relevant SLDC/RLDC and shall make the SCADA system ready to accept commands from relevant SLDC/RLDC and provide necessary feedback/data to relevant SLDC/RLDC.

9.2 Discharge of the Pumped Hydro Storage based Energy Storage System (PHESS)

9.2.1 The Project (PHESS) shall be designed and constructed so as to operate in generation mode (discharge mode) as well as load mode (charging / pumping).

- a) The Developer shall be responsible for discharge of maximum 8 hours (with maximum continuous 5 hours) on daily basis, as per the schedule provided by respective SLDC/Procurer. Further, SLDC/Procurer will take dynamic decision depending upon the grid condition and Project (PHESS) State of Charge for the available quantum of power required for charging and discharging, subject to maximum 8 hours discharge (with maximum continuous 5 hours) for the Contracted Capacity.
- b) **Alternate Source of Supply:** During the Operating Period, if the Developer is unable to provide supply of power to the Procurer(s) up to the Aggregate Contracted Capacity from the Power Station except due to a Force Majeure Event or due to Supplier Event of Default, the developer is free to supply power up to the Aggregated Contracted Capacity from an alternative generation source (only from PHESS project) to meet its obligation under this Agreement. Such power shall be supplied to the Procurer(s) at the same Tariff as per the terms of this Agreement and other incidental charges, including but not limited to application fees for open access, RLDC/SLDC charges, etc., applicable from the alternative source of power supply are higher than the applicable Transmission Charges from the Injection Point to the Delivery Point, the developer would be liable to bear such additional charges.
- c) The developer shall be permitted to supply power to the Procurer from any alternative PHESS source for a maximum continuous duration of six (6) months or a maximum non continuous period of twenty-four (24) months during the Operating Period, excluding any period of supply from alternative generation source that the developer avails prior to the commencement of supply from the generation source named in this Agreement.



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ARTICLE 10: METERING

10.1 Meters

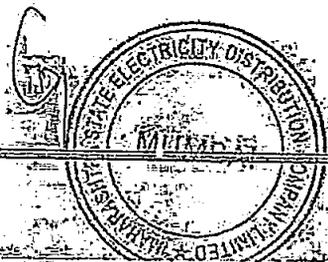
- 10.1.1 For installation of meters, meter testing, meter calibration and meter reading and all matters incidental thereto, the Developer and Procurer shall follow and be bound by the Applicable Laws including Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006, the Grid Code, as amended and revised from time to time.
- 10.1.2 The Developer shall bear all costs pertaining to installation, testing, calibration, maintenance, renewal and repair of meters up to inter-connection point.
- 10.1.3 In addition to ensuring compliance of the applicable codes, the Developer shall install main and check meters at the interconnection point, along with Stand-by meter(s) as per the applicable Central/State regulations

10.2 Measurement of Energy

- 10.2.1 Measurement of electrical energy shall be done at the delivery point. Metering shall be at STU (InSTS) Substation. For commercial settlement, delivery point shall mean the metering point at Substation of STU.
- 10.2.2 All costs, charges and losses up to Delivery Point during discharge mode shall be on account of the Developer.
- 10.2.3 All losses, costs, charges such as wheeling and Transmission as applicable up to the Delivery Point during pumping mode will be on account of the Procurer.

10.3 Reporting of Metered Data and Parameters

- 10.3.1 The Developer will install necessary equipment at Project site for regular monitoring of weather parameters, minimum head level available in the reservoir, conversion cycle loss, auxiliary consumption and simultaneously for monitoring of the electric power generated (generation mode) and electric power consumed (pumping mode) from the Project (PHESS).
- 10.3.2 Online arrangement would have to be made by the Developer for submission of above data regularly for the entire period of this ESFA to RLDC/SLDC and Procurer.
- 10.3.3 Day wise reports on above parameters on monthly basis shall be submitted by the Developer to RLDC/SLDC and Procurer for entire period of this Agreement.
- 10.3.4 The Developer and Procurers shall follow the forecasting and scheduling process as per the prevailing regulations in this regard by MERC /CERC.



ARTICLE 11: INSURANCES

11.1 Insurance

The Developer shall effect and maintain or cause to be affected and maintained, at its own cost and expense, throughout the Term of this Agreement, Insurances against such risks, with such deductibles and with such endorsements and co-insured(s), which the Prudent Utility Practices would ordinarily merit maintenance of and as required under the Financing Agreements.

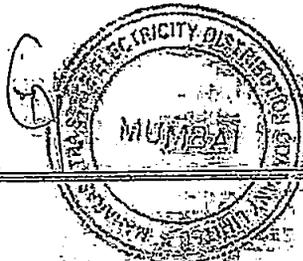
11.2 Application of Insurance Proceeds

11.2.1 Save as expressly provided in this Agreement or the Insurances, the proceeds of any insurance claim made due to loss or damage to the Project or any part of the Project shall be first applied to reinstatement, replacement or renewal of such loss or damage.

11.2.2 If a Force Majeure Event renders the Project (PHESS) no longer economically and technically viable and the insurers under the Insurances make payment on a "total loss" or equivalent basis, Procurer shall have no claim on such proceeds of such Insurance.

11.3 Effect on liability of Procurers

Notwithstanding any liability or obligation that may arise under this Agreement, any loss, damage, liability, payment, obligation or expense which is insured or not or for which the Developer can claim compensation, under any Insurance shall not be charged to or payable by Procurer.



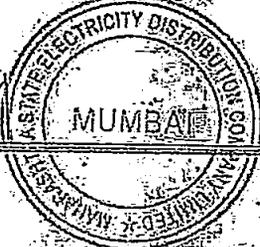
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ARTICLE 12: APPLICABLE TARIFF

12.1 Annual Fixed Charge (AFC)

- 12.1.1 The Procurer shall pay to the Developer, Annual Fixed Charges (AFC) at INR 84,66,129.00 (Indian Rupees Eighty Four Lakhs Sixty Six Thousand One Hundred and Twenty Nine only) per MW per annum (without any escalation) exclusive of GST, payable for availability of the Project (PHESS) to the extent of Normative Availability thereof and shall be computed and paid on monthly basis in accordance with the provisions of this Agreement corresponding to the Period of Supply mentioned in Clause 3.3, during the term of this Agreement.
- 12.1.2 The AFC shall be billed by the Developer and paid by the Procurer on monthly basis, as Monthly Fixed Charge (MFC) and MFC shall be computed in accordance with clause 5.12.3.
- 12.1.3 MFC shall be calculated on month on month basis appropriately based on the cumulative availability.
- 12.1.4 Full AFC upto the current month shall be payable for achievement of Normative Availability. In case of cumulative availability being lower than Normative Availability i.e. 90%, penalty will be applicable in accordance with Clause 5.12.1 of this Agreement.
- 12.1.5 The MFC payable shall be further adjusted on account of variation between actual Cycle Loss and the Declared Cycle Loss as per the Clause 12.2.2.
- 12.1.6 Penalty applicable shall be computed and billed by Developer along with MFC bill at the end of every applicable month in an assessment Contract Year. Any claim towards the penalty shall be adjusted in the same Monthly Bill and the Procurer will have the rights to settle or dispute the claims in this regard as per Clause 13.3 and Clause 13.7.
- 12.1.7 Reactive Energy Billing: The Reactive power charges and charges against power drawn/inject from/to grid as per CERC/SERC Regulations, shall be payable by Developer.
- 12.1.8 In case of tripping/ non availability of PHESS after scheduling of energy for the pumping mode till the schedule is revised to zero, cost of the pumping energy scheduled shall be deducted from MFC at the rate of Average Power Purchase Rate notified/approved/issued for the control period by MERC to MSEDCL. Further, the responsibility of revision of schedule in this case is with the Developer.
- ### 12.2 Energy consumption during pumping mode
- 12.2.1 Cost of supplying pumping energy including cost of power, Transmission charges and losses, Electricity Duty, etc up to Delivery Point shall be borne by Procurer, also factoring the Cycle Loss declared by Developer at 24 %. If for any month, it is found that the Developer has not been able to adhere to the declared Cycle Loss, such shortfall in performance shall be adjusted in the MFC payable to the Developer.
- 12.2.2 The adjusted MFC payable to the Developer on account of higher Cycle Loss than the Declared Cycle Loss shall be as below:



Adjusted MFC

$$= MFC - [(Input\ Energy\ at\ Actual\ Cycle\ Loss - Input\ Energy\ at\ Declared\ Cycle\ Loss) \times Additional\ Input\ Energy\ Charges]$$

Where,

Additional Input Energy Charges will be as below:

Deviation from declared Cycle Loss	Excess Input Energy to be billed at
≤10%	1.5 x Average Power Purchase Rate notified/approved/issued for the applicable year by MERC to MSEDCL
> 10%*	2.00 x Average Power Purchase Rate notified/approved/issued for the applicable year by MERC to MSEDCL

* The overall efficiency of the hydro generating units/plants shall not be less than 75% at any point of time.

Average Power purchase rate (APPR) shall be as notified/approved/issued by the MERC for the applicable year. In case there is no approved rate for the said period, then the last rate approved may be considered and same shall be reconciled after the notification of APPR by MERC for the corresponding year. There is no adjusted AFC (payable on monthly basis) applicable, if the actual Cycle Loss is lower than the Declared Cycle Loss.

Illustration:

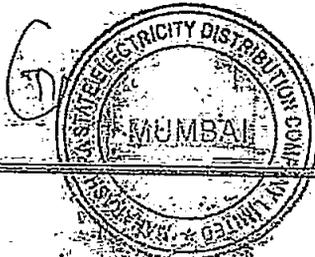
If the Declared Cycle Loss is 25% whereas the Actual Cycle Loss is 27%, then the applicable amount on 2% (i.e., 25%-27%) additional input energy shall be billed and recovered from the Developer at the approved Average Power purchase rate (MERC approved value for the applicable year). Considering quoted AFC ---

Sr.No.	Particulars	Unit	Legends	Amount
1.	Declared Cycle Loss	%	A	25
2.	Monthly Output	MWh	B	2,40,000
3.	Input Energy required @ Declared Cycle Loss	MWh	C = B/(1-A)	3,20,000
4.	Actual Cycle Loss	%	D	27
5.	Actual Input Energy Required	MWh	E = B/(1-D)	3,28,767
6.	Excess Input Energy required	MWh	F = E - C	8767
7.	APPR rate (as approved by MERC)	INR per unit	G	4.40 (illustrative)
8.	Additional input energy	INR per	H = G*1.50	6.6



Sr.No	Particulars	Unit	Legend	Amount
	charges	unit		
	Additional input energy cost Rs.	INR	$I=F*H*1000$	57863013.70
9.	MFC	INR	J	250000000
10.	Adjusted MFC	INR	$H=I-(H*F)$	192136986

- 12.2.3 The Output/Discharge Energy at all times during the contract period shall be equal to the Contracted Capacity.
- 12.2.4 The calculation for Cycle Loss shall be part of the Monthly Bill raised by the Developer and Procurer will have the rights to accept or dispute the claims in this regard as per Clause 13.3 and Clause 13.7
- 12.2.5 Based on machine availability by developers, SLDC/Procurer shall provide time blocks for pumping and generation, and schedule the injection into grid. Any deviation from the schedule shall be addressed as per MERC Deviation Settlement Mechanism Regulations as applicable and applicable deviation charges shall be borne by the Developer.
- 12.2.6 In case of generation of excess power by Developer due to reduction in Round Trip Loss, the Developer will be allowed to sell power in exchange or through bilateral contacts with a profit sharing in proportion of 50:50 (Procurer: Developer). However, MSEDCL will reserve the First Right of Refusal.



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ARTICLE 13: BILLING AND PAYMENT

13.1 General

13.1.1 On achievement of COD and thereon commencement of supply of power, Procurer shall pay to the Developer the MFC, on or before the Due Date, in accordance with Article 13. All payments by Procurer shall be in Indian Rupees.

13.2 Delivery and Content of Monthly Bills/Supplementary Bills

13.2.1 The Developer shall issue to Procurer a signed monthly bill/Supplementary Bill for the immediately preceding Month based on the period of supply of the Procurer, along with all relevant documents.

13.2.2 Each monthly bill shall include all charges as per this Agreement for the Contracted Capacity supplied for the relevant Month based on Energy Accounts issued by RLDC/SLDC or any other competent authority which shall be binding on both the Parties.

13.3 Payment of Monthly Bills

13.3.1 The Procurer shall, within 30 (thirty) days of receipt of a Monthly Invoice/Supplementary Invoice in accordance with Clause 13.2.1, (the "Payment Due Date"), make payment of the amount claimed directly, through electronic transfer, to the nominated bank account of the Supplier, save and except any amounts which it determines as not payable or disputed (the "Disputed Amounts").

13.3.2 The due date of making of payments shall be 30th day (if such day is not a business day, the immediately succeeding business day) after energy bill is received by the MSEDCL through email (ceppmsedcl@gmail.com) upto 12:00 Hrs, after 12:00 Hrs next day shall be considered as bill receipt day. For the purpose of determination of due date, the day 1 shall be the 'X'+1 day, where 'X' is the date of receipt of bill by the Procurer.

13.3.3 All payments required to be made under this Agreement shall also include any deduction or set off for:

- a. deductions required by the Law; and
- b. amounts claimed by Procurer, if any, from the Developer, through an invoice to be payable by the Developer, and not disputed by the Developer within thirty (30) days of receipt of the said Invoice and such deduction or set-off shall be made to the extent of the amounts not disputed. It is clarified that Procurer shall be entitled to claim any set off or deduction under this Article, after expiry of the said thirty (30) Day's period.
- c. The Developer shall open a bank account at Mumbai (the "Developer's Designated Account") for all Payments (including Supplementary Bills) to be made by Procurers to the Developer and notify Procurers of the details of such account at least 90 (ninety) days before the dispatch of the first monthly bill.
- d.



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13.4 Late Payment Surcharge

In the event of delay in payment of a monthly bill by Procurer beyond its Due Date, a late payment surcharge shall be payable to the Developer as per Electricity (Late Payment Surcharge and related matters) Rules, 2022 as amended from time to time or any subsequent re-enactment thereof. The Late Payment Surcharge shall be claimed by the Developer through the Supplementary Bill.

13.5 Rebate

For payment of any Bill on or before Due Date, the following Rebate shall be paid by the Developer to Procurer in the following manner.

- a) A Rebate of 1.5% shall be payable to the Procurer for the payments made on or before the 7th Business Day from the date of receipt of the Invoice.
- b) Any payments made beyond the date as mentioned above in point "a" upto the Due Date shall be allowed a rebate of 1%.
- c) Provided that, any payment made by Procurer on date of presentation of Bill, a Rebate of 2% shall be payable.
- d) For the above purpose, the date of presentation of bill shall be same day in case it is delivered on or before 12:00 noon, else it would be the next Business Day.
- e) No Rebate shall be payable on the Bills raised on account of Change in Law relating to taxes, duties and cess.

13.6 Payment Security Mechanism

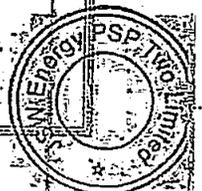
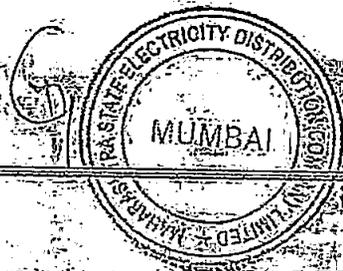
13.6.1 Procurer, not later than 30 (Thirty) days prior to commencement of supply, shall provide to the Developer, in respect of payment of its Monthly Bills corresponding to their respective period of supply, an unconditional, monthly revolving and irrevocable letter of credit ("Letter of Credit"), which may be drawn upon by the Developer in accordance with this Article.

The Letter of Credit, shall be procured by the Procurer from a scheduled bank at Mumbai and shall be made operative from a date prior to the Due Date of its first Monthly Bill under this Agreement. The Letter of Credit shall have a term of six (6) Months respectively.

Provided that the Developer shall not draw upon such Letter of Credit prior to the Due Date of the relevant Monthly Bill and/or Supplementary Bill.

13.6.2 Provided further that if at any time, such Letter of Credit amount falls short of the amount specified in Article 13.6.1 due to any reason whatsoever, Procurer whose Letter of Credit has been invoked shall restore such shortfall within fifteen (15) days.

13.6.3 Procurer shall ensure that the Letter of Credit shall be renewed not later than 30(thirty) days prior to its expiry



13.6.4 All costs relating to opening, maintenance of the Letter of Credit shall be borne by Procurer.

13.6.5 If Procurer fails to pay a Monthly Bill or Supplementary Bill or part thereof within and including the Due Date, then, the Developer may draw upon the Letter of Credit, and accordingly the bank shall pay without any reference to or instructions from Procurer, an amount equal to such Monthly Bill or Supplementary Bill or part thereof, if applicable, by presenting to the scheduled bank issuing the Letter of Credit, the following documents

- a) a copy of the Monthly Bill or Supplementary Bill which has remained unpaid to Developer and;
- b) a certificate from the Developer to the effect that the Monthly Bill or Supplementary Bill at item (a) above, or specified part thereof, is in accordance with the Agreement and has undisputed and remained unpaid beyond the Due Date.

13.7 Performance Guarantee

13.7.1 The Developer shall, for the performance of its obligations hereunder during the Operation Period, be deemed to provide to the Procurer upon occurrence of COD of the last unit, an irrevocable and unconditional guarantee pursuant to the provisions of this Clause 13.7 (the "Performance Guarantee"), for a sum equivalent to the Fixed Charge due and payable by the Procurer to the Developer as on COD for Normative Availability in respect of a period of 15 (fifteen) days in accordance with the provisions of this Agreement. The Performance Guarantee shall constitute the first and exclusive charge on all amounts due and payable by the Procurer to the Developer, and the Procurer shall be entitled to enforce the Performance Guarantee by making a deduction from the amounts due and payable by it to the Developer in accordance with the provisions of Clause 13.8. For the avoidance of doubt, the Parties agree that no amounts shall be earmarked, frozen or withheld for securing payment of any potential Damages that may fall due at a subsequent date, and only the amounts which shall have become due and payable by the Supplier upon occurrence of Supplier Default shall be liable to appropriation.

13.7.2 Notwithstanding anything to the contrary contained in this Agreement, the Procure may encash the Performance Guarantee and appropriate the proceeds thereof as Damages for not meeting the obligations of the Supplier under this Agreement.

13.7.3 Upon occurrence of a Developer Default, the Procurer shall, without prejudice to its other rights and remedies hereunder or in law, be entitled to appropriate the relevant amounts from the Performance Guarantee as Damages for such Developer Default. For the avoidance of doubt, the Parties expressly agree that upon the Performance Guarantee being appropriated, in whole or in part, it shall be deemed to be replenished to the extent of such appropriation within 7 days.



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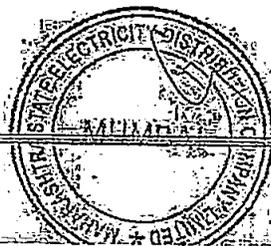
13.8 Disputed Bill

- 13.8.1 If the Procurer does not dispute a Monthly Bill or a Supplementary Bill raised by the Developer by the Due Date, such Bill shall be taken as conclusive subject to reconciliation as per Clause 13.9.
- 13.8.2 If the Procurer disputes the amount payable under a Monthly Bill or a Supplementary Bill, as the case may be, it shall pay 50% of the disputed amount and it shall within Thirty (30) days of receiving such Bill, issue a notice (the "Bill Dispute Notice") to the invoicing Party setting out:
- (a) the details of the disputed amount;
 - (b) its estimate of what the correct amount should be;
 - (c) and all written material in support of its claim.
- 13.8.3 If the Developer agrees to the claim raised in the Bill Dispute Notice issued pursuant to Clause 13.7.2 the Developer shall revise such Bill and present along with the next Monthly Bill. In such a case excess amount shall be refunded along with interest at the same rate as Late Payment Surcharge, which shall be applied from the date on which such excess payment was made by the disputing Party to the invoicing Party and up to and including the date on which such payment has been received as refund.
- 13.8.4 If the Developer does not agree to the claim raised in the Bill Dispute Notice issued pursuant to Clause 13.7.2, it shall, within fifteen (15) days of receiving the Bill Dispute Notice, furnish a notice (the "Bill Disagreement Notice") to the Procurer providing:
- (a) reasons for its disagreement;
 - (b) its estimate of what the correct amount should be;
 - (c) and all written material in support of its counter-claim.
- 13.8.5 Upon receipt of the Bill Disagreement Notice by the Procurer under Clause 13.7.4, the Parties shall meet and make best endeavors to amicably resolve such dispute within fifteen (15) days of receipt of the Bill Disagreement Notice.
- 13.8.6 If the Parties do not amicably resolve the Dispute within fifteen (15) days of receipt of Bill Disagreement Notice pursuant to Clause 13.7.4, the matter shall be referred to Dispute resolution in accordance with Article 18.
- 13.8.7 For the avoidance of doubt, it is clarified that despite a Dispute regarding an Invoice, Procurer shall, without prejudice to its right to Dispute, be under an obligation to make payment of 50% of the Disputed Amount in the Monthly Bill.

13.9 Payment of Supplementary Bill

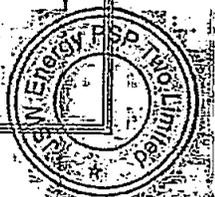
13.9.1 Developer may raise Supplementary Bill for payment on account of:

- a) Adjustments required by the Monthly Energy Accounts (if applicable); or



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b) Change in Law as provided in Article 15

13.9.2 Procurer shall remit all amounts due under a Supplementary Bill raised by the Developer to the Developer's Designated Account by the Due Date. For such payments by Procurer, Rebate as applicable to Monthly Bills pursuant to Clause 13.5 shall equally apply.

13.9.3 In the event of delay in payment of a Supplementary Bill by either Party beyond its Due Date, a Late Payment Surcharge shall be payable at the same terms applicable to the Monthly Bill in Clause 13.4

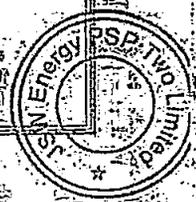
13.10 Annual Reconciliation

13.10.1 The Parties acknowledge that all payments made against Monthly Bills and Supplementary Bills shall be subject to annual reconciliation at the end of each Financial Year within 30 days of issuance of final energy accounts by competent authority to take into account the Energy Accounts, AFC adjustments, rebates, Late Payment Surcharge, penalty for deviation from Normative Availability, penalty for deviation from Declared Cycle Loss or any other reasonable circumstance provided under this Agreement.

13.10.2 Late Payment Surcharge/ interest shall be payable in such a case from the date on which such payment had been made to the invoicing Party or the date on which any payment was originally due, as may be applicable. Any Dispute with regard to the above reconciliation shall be dealt with in accordance with the provisions of Article 18.

13.10.3 The Parties, therefore, agree that as soon as all such data in respect to a full Financial Year has been finally verified, adjusted and the final energy account has been issued by competent authority, the Developer and Procurer shall jointly sign such reconciliation statement.

13.10.4 Upon reconciliation, if any amount is payable by either party to the other party the invoice shall be raised within seven (7) days of signing of a reconciliation statement, and requisite payments to be made within fifteen (15) Days of issuance of such invoice.



ARTICLE 14: FORCE MAJEURE

14.1 Definitions

14.1.1 In this Article, the following terms shall have the following meanings:

14.2 Affected Party

14.2.1 An Affected Party means Procurer or the Developer whose performance has been affected by an event of Force Majeure.

14.3 Force Majeure

A 'Force Majeure' means any event or circumstance or combination of events those stated below which wholly or partly prevents or unavoidably delays an Affected Party in the performance of its obligations under this Agreement, but only if and to the extent that such events or circumstances are not within the reasonable control, directly or indirectly, of the Affected Party and the Affected Party could not have prevented or overcome by exercise of due diligence and following Good Industry Practice and has Material Adverse Effect on the Affected Party:

- a) act of God, epidemic, extremely adverse weather conditions, lightning, earthquake above 6.5 on Modified Richter scale, landslide, drought, cyclone, flood exceeding 1 in 10,000 frequency, volcanic eruption, chemical or radioactive contamination or ionizing radiation, fire or explosion (to the extent of contamination or radiation or fire or explosion originating from a source external to the Site) if and only if it is declared/ notified by the competent state / central authority / agency (as applicable) or verified to the satisfaction of Procurer;
- b) an act of war (whether declared or undeclared), invasion, armed conflict or act of foreign enemy, blockade, embargo, riot, insurrection, terrorist or military action, civil commotion or politically motivated sabotage;
- c) compulsory acquisition in national interest or expropriation of any Project Assets or rights of the Developer or of the Contractor;
- d) any political or economic upheaval, disturbance, movement, struggle or similar occurrence which could not have been anticipated or foreseen by a prudent person and which causes the construction or operation of the Project to be financially unviable or otherwise not feasible;
- e) industry-wide or State-wide strikes or industrial action for a continuous period of 24 (twenty four) hours and exceeding an aggregate period of 7 (seven) days in an Accounting Year;
- f) any judgment or order of any court of competent jurisdiction or statutory authority made against the Developer in any proceedings for reasons other than (i) failure of the Developer to comply with any Applicable Law or Applicable Permit, or (ii) on account of breach of any Applicable Law or Applicable Permit or of any contract, or (iii) enforcement of this Agreement, or (iv) exercise of any of its rights under this Agreement or



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- g) unlawful or unauthorized or without jurisdiction revocation of, or refusal to renew or grant without valid cause, any clearance, license, permit, authorization, no objection certificate, consent, approval or exemption required by the Developer or any of the Contractors to perform their respective obligations under this Agreement; provided that such delay, modification, denial, refusal or revocation did not result from the Developer's or any Contractor's inability or failure to comply with any condition relating to grant, maintenance or renewal of such clearance, license, authorization, no objection certificate, exemption, consent, approval or permit.
- h) The discovery of geological conditions, toxic contamination or archaeological remains on the Project site or PHESS Site that could not reasonably have been expected to be discovered through an inspection of the Project Site; or any event or circumstances of a nature analogous to any of the foregoing.
- i) Any delay in Government/Sponsor Agency/Government agency Decision making or decision taken by the Government/Sponsor Agency/Government agency which is inimical to the development of the Project as envisaged in this Agreement.
- j) An event of force majeure affecting the concerned STU/CTU, as the case be, thereby affecting the evacuation of power.

14.4 Force Majeure Exclusions

Force Majeure shall not include (i) any event or circumstance which is within the reasonable control of the Parties and (ii) the following conditions, except to the extent that they are consequences of an event of Force Majeure:

- a) Unavailability, late delivery, or changes in cost of the plant, machinery, equipment, materials, spare parts or consumables for the Power Project;
- b) Delay in the performance of any Contractor, sub-Contractor or their agents ;
- c) Non-performance resulting from normal wear and tear typically experienced in power generation materials and equipment;
- d) Strikes at the facilities of the Affected Party;
- e) Insufficiency of finances or funds or the agreement becoming onerous to perform; and
- f) Non-performance caused by, or connected with, the Affected Party's:
 - i. Negligent or intentional acts, errors or omissions;
 - ii. Failure to comply with an Indian Law; or
 - iii. Breach of, or default under this Agreement.
- g) Non-availability of Water other than drought



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14.5 Notification of Force Majeure Event

14.5.1 The Affected Party shall give notice to the other Party of any event of Force Majeure as soon as reasonably practicable, but not later than seven (7) days after the date on which such Party knew or should reasonably have known of the commencement of the event of Force Majeure. If an event of Force Majeure results in a breakdown of communications rendering it unreasonable to give notice within the applicable time limit specified herein, then the Party claiming Force Majeure shall give such notice as soon as reasonably practicable after reinstatement of communications, but not later than one (1) day after such reinstatement.

14.5.2 Provided that such notice shall be a pre-condition to the Affected Party's entitlement to claim relief under this Agreement. Such notice shall include full particulars of the event of Force Majeure, its effects on the Party claiming relief and the remedial measures proposed.

14.5.3 The Affected Party shall give the other Party regular (and not less than monthly) reports on the progress of those remedial measures and such other information as the other Party may reasonably request about the Force Majeure Event.

14.5.4 The Affected Party shall give notice to the other Party of (i) the cessation of the relevant event of Force Majeure; and (ii) the cessation of the effects of such event of Force Majeure on the performance of its rights or obligations under this Agreement, as soon as practicable after becoming aware of each of these cessations.

14.6 Duty to Perform and Duty to Mitigate

To the extent not prevented by a Force Majeure Event pursuant to Clause 14.3, the Affected Party shall continue to perform its obligations pursuant to this Agreement. The Affected Party shall use its reasonable efforts to mitigate the effect of any Force Majeure Event as soon as practicable.

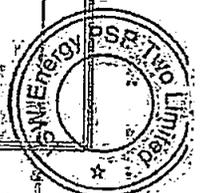
14.7 Available Relief for a Force Majeure Event

Subject to this Article 14:

- a) No Party shall be in breach of its obligations pursuant to this Agreement except to the extent that the performance of its obligations was prevented, hindered or delayed due to a Force Majeure Event;
- b) Every Party shall be entitled to claim relief in relation to a Force Majeure Event in regard to its obligations, including but not limited to those specified under Article 5 & 6;
- c) For avoidance of doubt, neither Party's obligation to make payments of money due and payable prior to occurrence of Force Majeure events under this Agreement shall be suspended or excused due to the occurrence of a Force Majeure Event in respect of such Party.
- d) Provided that no payments including any cost query shall be made by either Party affected by a Force Majeure Event.



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14.8 Performance Excused

- a) The Affected Party, to the extent rendered unable to perform its obligations or part of the obligation thereof under this Agreement as a consequence of the Force Majeure Event, shall be excused from performance of the obligations, to the extent it is unable to perform on account of such Force Majeure Event, for a period equal in length to the duration for which such Force Majeure Event subsist, provided that such period shall not exceed 180 (one hundred and eighty) days from the date of issuance of the Force Majeure Notice, or any extended period as mutually agreed. The Parties may mutually agree to extend the period for which performance is excused due to a Force Majeure Event. However, in case of the Force Majeure Event continuing upto a period of 180 days or any extended period as mutually agreed, either Party has the right to terminate the Agreement.
- b) For the time period, as mutually agreed by the Parties, during which the performance shall be excused, the Procurer shall be entitled for a day-to-day extension of the period provided for Financial Closure or Scheduled Commissioning Period or the Agreement period, as the case may be. The term of this Agreement will be suitably extended as per the above extension.
- c) Provided always that a Party shall be excused from performance only to the extent reasonably warranted by the Force Majeure Event.
- d) Provided further that, nothing shall absolve the Affected Party from any payment obligations accrued prior to the occurrence of the underlying Force Majeure Event.

14.9 Termination Due to Force Majeure Event

In the event a Force Majeure Event subsists for a period of more than 9 months during the Term of this Agreement, either Party shall be entitled to terminate this Agreement by issuing a termination notice to the other Party.

14.10 No Liability for Other Losses

Save as otherwise provided in these Guidelines, no Party shall be liable in any manner, whatsoever, to the other Parties in respect of any Loss relating to or arising out of the occurrence or existence of any Force Majeure Event.



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ARTICLE 15: CHANGE IN LAW

Definitions:

In this Article 15, the following terms shall have the following meanings:

“Change in Law” means the occurrence of any of the following events after the date of bid submission, i.e. July 29, 2024 resulting in any additional recurring/ non-recurring expenditure by the Developer or any income to the Developer:

- a. the enactment, coming into effect, adoption, promulgation, amendment, modification or repeal (without re-enactment or consolidation) in India, of any Applicable Law, including rules and regulations framed pursuant to such Law;
- b. change in the interpretation or application of any Applicable Law by any Governmental Instrumentality having the legal power to interpret or apply such Law, or any Competent Court of Law;
- c. any change in taxes and duties or introduction of any taxes and duties made applicable for setting up of the Project for supply of power by the Developer as per the terms of this Agreement. The Developer shall consider all the prevailing taxes and duties applicable on the date of submission of Bid while submitting the Bid for the Project(s). If any such above prevailing taxes and duties are not considered or omitted or ignored, then it shall be accepted that the Developer has considered all such taxes and duties in its Bid. Any change in law pertaining to taxes and duties after the date of submission of Technical Bid shall be to the account of Procurers and appropriate change in tariff, either increase or decrease in proportionate, due to the change in taxes and duties shall be as per clause 15.2 (Relief for Change in Law) of this Agreement;

But shall not include (i) any change in any withholding tax on income or dividends distributed to the shareholders of the Developer, or (ii) any change on account of regulatory measures by the Appropriate Commission, or (iii) any change

in the Appropriate Commission's approved Tariff as compared to the approved tariff exist as on the Bid Due Date.

15.1 Relief for Change in Law

15.1.1 The aggrieved Party shall be eligible for such compensation so as to restore it to the original position as if the Change in Law had not occurred and shall be required to approach the Appropriate Commission for seeking approval of Change in Law.

15.1.2 The decision of the Appropriate Commission to acknowledge a Change in Law and the date from which it will become effective, provide relief for the same, shall be final and governing on both the Parties.



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ARTICLE 16: TERMINATION

16.1 Termination for Developer Event of Default

Save as otherwise provided in this Agreement, in the event that any of the defaults specified below shall have occurred, and the Developer fails to cure the default within the Cure Period set forth below, or where no Cure Period is specified, then within a Cure Period of 60 (sixty) days, the Developer shall be deemed to be in default of this Agreement (the "Developer Event of Default"), unless the default has occurred solely as a result of any breach of this Agreement by Procurer or due to Force Majeure. The defaults referred to herein shall include the following:

- a) The Developer has failed to achieve the COD within the period as specified in Clause 5.13.1 for any reason whatsoever;
- b) After COD of the PHESS, the Developer fails to achieve availability of 80% (eighty percent) for a period of 6 (six) consecutive months or for a cumulative period of 6 (six) months within any continuous period of 18 (eighteen) months;
- c) After COD of the PHESS, the Developer fails to maintain cycle loss upto and below 24% (twenty-four percent) for a period of 6 (six) consecutive months or for a cumulative period of 6 (six) months within any continuous period of 18 (eighteen) months;
- d) The condition relating to equity lock-in period specified in Clause 5.2 of this Agreement is not complied.
- e) the Performance Security has been encashed and appropriated in accordance with Clause 4.5.2 and the Developer fails to replenish or provide fresh Performance Security within a Cure Period of 30 (thirty) days;
- f) The Developer has unlawfully repudiated this Agreement or has otherwise expressed an intention not to be bound by this Agreement;
- g) The Developer is in material breach of any of its obligations pursuant to this Agreement, including failure to fulfill Condition Subsequent, and such material breach is not rectified by the Developer within thirty (30) days of receipt of first notice in this regard given by Procurer.
- h) Any representation made or warranty given by the Developer under this Agreement is found to be false or misleading;
- i) A resolution has been passed by the shareholders of the Developer for voluntary winding up of the Developer;
- j) Any petition for winding up of the Developer has been admitted and liquidator or provisional liquidator has been appointed or the Developer has been ordered to be wound up by Court of competent jurisdiction, except for the purpose of amalgamation or reconstruction with the prior consent of Procurer, provided that as part of such amalgamation or reconstruction and the amalgamated or



reconstructed entity has unconditionally assumed all surviving obligations of the Developer under this Agreement;

- k) A default has occurred under any of the Financing Documents and any of the lenders to the Project has recalled its financial assistance and demanded payment of the amounts outstanding under the Financing Documents or any of them as applicable; and
- l) The Developer has suffered an attachment levied on any of its assets which has caused or is likely to cause a Material Adverse Effect on the Project and such attachment has continued for a period exceeding 120 days.
- m) the Developer is in breach of the Maintenance Requirements or the Safety Requirements, as the case may be;
- n) the Developer is adjudged bankrupt or insolvent, or if a trustee or receiver is appointed for the Developer or for the whole or material part of its assets that has a material bearing on the Project
- o) the Developer has been, or is in the process of being liquidated, dissolved, wound-up, amalgamated or reconstituted in a manner that would cause, in the reasonable opinion of the Procurer, a Material Adverse Effect
- p) the Developer submits to the Procurer any statement, notice or other document, in written or electronic form, which has a material effect on the Procurer's rights, obligations or interests and which is false in material particulars;
- q) the Developer issues a Termination Notice in violation of the provisions of this Agreement; or
- r) The Developer commits a default in complying with any other provision of this Agreement if such default causes or may cause a Material Adverse Effect on the Procurer.

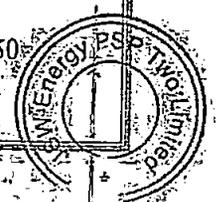
16.2 Termination for Procurer Event of Default

Save as otherwise provided in this Agreement, in the event that any of the defaults specified below shall have occurred, and Procurer fails to cure the default within the Cure Period set forth below, or where no Cure Period is specified, then within a Cure Period of 60 (Sixty) days, Procurer shall be deemed to be in default of this Agreement (a "Procurer Event of Default"), unless the default has occurred solely as a result of any breach of this Agreement by Developer or due to Force Majeure. The defaults referred to herein shall include the following:

- a) Procurer has unreasonably withheld or delayed grant of any approval or permission which the Developer is obliged to seek under this Agreement, and thereby caused or likely to cause Material Adverse Effect;
- b) Procurer is in material breach of any of its obligations, under this Agreement and has failed to cure such breach within 60 (Sixty) days of receipt of notice



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thereof issued by the Developer and which has led to the Project forfeiting the benefits accruing under Applicable Law;

- c) Procurer has unlawfully repudiated this Agreement or otherwise expressed its intention not to be bound by this Agreement;
- d) Any representation made or warranty given by Procurer under this Agreement has been found to be false or misleading.

16.3 Procedure for cases of Developer/Procurer Event of Default

16.3.1 Upon the occurrence and continuation of any Developer Event of Default under Article 16, Procurer shall be entitled to terminate this Agreement by issuing a notice stating its intention to terminate this Agreement (Procurers Preliminary Default Notice), which shall specify in reasonable detail, the circumstances giving rise to the issue of such notice.

16.3.2 Following the issue of a Procurers Preliminary Default Notice, the Consultation Period of sixty (60) days or such longer period as the Parties may agree, shall apply and it shall be the responsibility of the Parties to discuss as to what steps shall be taken with a view to mitigate the consequences of the relevant Event of Default having regard to all the circumstances.

16.3.3 During the Consultation Period, the Parties shall continue to perform their respective obligations under this Agreement.

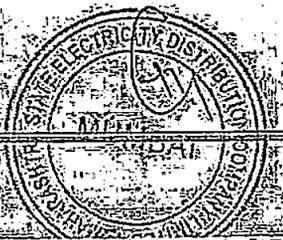
16.3.4 Within a period of seven (7) days following the expiry of the Consultation Period unless the Parties shall have otherwise agreed to the contrary or the Developer Event of Default giving rise to the Consultation Period shall have ceased to exist or shall have been remedied, Procurer shall be entitled to terminate this Agreement by giving a written Termination Notice of thirty (30) days to the Developer.

16.3.5 Upon occurrence and continuation of any Procurer Default specified in Clause 16.2, the Developer shall have the right to deliver to Procurer, a Developer Preliminary Default Notice, which notice shall specify in reasonable detail the circumstances giving rise to its issue.

16.3.6 Following the issue of a Developer Preliminary Default Notice, the Consultation Period of sixty (60) days or such longer period as the Parties may agree, shall apply and it shall be the responsibility of the Parties to discuss as to what steps shall be taken with a view to mitigate the consequences of the relevant Event of Default having regard to all the circumstances.

16.3.7 During the Consultation Period, the Parties shall continue to perform their respective obligations under this Agreement.

16.3.8 After a period of seven (7) days following the expiry of the Consultation Period and unless the Parties shall have otherwise agreed to the contrary or Procurer Event of Default giving rise to the Consultation Period shall have ceased to exist or shall have been remedied, the Developer shall be entitled to sell the Contracted Capacity to any third party of the Developers choice and the Developer shall be entitled to terminate



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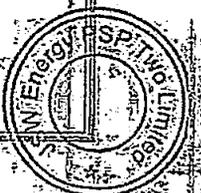
this Agreement by giving a written Termination Notice of thirty (30) days to the Procurer.

16.4 Termination Payment

- 16.4.1 Upon Termination on account of a Developer Default, the Developer shall pay to the Procurer, by way of Termination Payment, an amount equal to the AFC that would have been due and payable for Normative Availability for a period of 24 (twenty-four) months as if the PHESS had operated for such 24 (twenty-four) months from the date of Termination
- 16.4.2 - Upon Termination on account of a Procurer Default, the Procurer shall pay to the Developer, by way of Termination Payment, an amount equal to the AFC that would have been due and payable for Normative Availability for a period of 24 (twenty-four) months as if the PHESS had operated for such 24 (twenty-four) months from the date of Termination.
- 16.4.3 Termination Payment shall be due and payable within 15 (fifteen) days of a demand being made with the necessary particulars, and in the event of any delay, the defaulting Party shall pay interest at a rate equal to 3% (three per cent) above the Bank Rate on the amount of Termination Payment remaining unpaid; provided that such delay shall not exceed 90 (ninety) days. For the avoidance of doubt, it is expressly agreed that Termination Payment shall constitute full discharge by the Procurer of its payment obligations in respect thereof hereunder.
- 16.4.4 The Developer expressly agrees that Termination Payment under this Article 16.4 shall constitute a full and final settlement of all claims of the Developer on account of Termination of this Agreement for any reason whatsoever and that the Developer or any shareholder thereof shall not have any further right or claim under any law, treaty, convention, and contractor otherwise.



[Handwritten signature]



ARTICLE 17: LIABILITY AND INDEMNIFICATION

17.1 Indemnity

17.1.1 The Developer shall indemnify, defend and hold Procurer harmless against:

- a) any and all third-party claims against Procurer for any loss of or damage to property of such third party, or death or injury to such third party, arising out of a breach by the Developer of any of its obligations under this Agreement; and
- b) any and all losses, damages, costs and expenses including legal costs, fines, penalties and interest actually suffered or incurred by Procurer from third party claims arising by reason of a breach by the Developer of any of its obligations under this Agreement, (provided that this Article 17 shall not apply to such breaches by the Developer, for which specific remedies have been provided for under this Agreement)

17.1.2 Procurer shall indemnify, defend and hold the Developer harmless against:

- a) any and all third-party claims against the Developer, for any loss of or damage to property of such third party, or death or injury to such third party, arising out of a breach by Procurer of any of their obligations under this Agreement; and
- b) any and all losses, damages, costs and expenses including legal costs, fines, penalties and interest ('Indemnifiable Losses') actually suffered or incurred by the Developer from third party claims arising by reason of a breach by Procurer of any of its obligations.

17.2 Procedure for claiming Indemnity

17.2.1 Third party claims

- a) Where the indemnified party is entitled to indemnification from the indemnifying party pursuant to exceptions under Article 17, the Indemnified Party shall promptly notify the Indemnifying Party in respect of which it is entitled to be indemnified. Such notice shall be given as soon as reasonably practicable after the Indemnified Party becomes aware of such claim. The indemnifying party shall be liable to settle the indemnification claim within thirty (30) days of receipt of the above notice. Provided however that, if:
 - i. the Parties choose to refer the contest the claim of third party; and
 - ii. the claim amount is not required to be paid/ deposited to such third party pending the resolution of the third-party claim, the Indemnifying Party shall become liable to pay the claim amount to the Indemnified Party or to the third party, as the case may be, promptly following the resolution of the third-party claim, if such claim is settled in favor of the third party.
- b) The Indemnified Party may contest the claim of the third party for which it is entitled to be indemnified and the indemnified party shall reimburse to the



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Indemnified Party all reasonable costs and expenses incurred by the Indemnified party. However, such Indemnified Party shall not settle or compromise such claim without first getting the consent of the indemnifying party, which consent shall not be unreasonably withheld or delayed.

An indemnifying party may, at its own expense, assume control of the defense of any proceedings brought against the Indemnified Party if it acknowledges its obligation to indemnify such Indemnified Party, gives such Indemnified Party prompt notice of its intention to assume control of the defense, and employs an independent legal counsel at its own cost that is reasonably satisfactory to the Indemnified Party.

17.3 Indemnifiable Losses

Where an Indemnified Party is entitled to Indemnifiable Losses from the indemnifying party pursuant to Article 17, the Indemnified Party shall promptly notify the indemnifying party of the Indemnifiable Losses actually incurred by the Indemnified Party. The Indemnifiable Losses shall be reimbursed by the Indemnifying Party within thirty (30) days of receipt of the notice seeking Indemnifiable Losses by the Indemnified Party. In case of non-payment of such losses after a valid notice under this Article 17, such event shall constitute a payment default under Article 16.

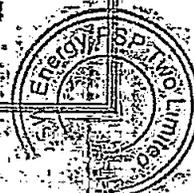
17.4 Limitation on Liability

Except as expressly provided in this Agreement, neither the Developer nor Procurer nor its/ their respective officers, directors, agents, employees or affiliates (or their officers, directors, agents or employees), shall be liable or responsible to the other Party or its Affiliates, officers, directors, agents, employees, successors or permitted assigns or their respective insurers for incidental, indirect or consequential damages, connected with or resulting from performance or non-performance of this Agreement, or anything done in connection herewith, including claims in the nature of lost revenues, income or profits (other than payments expressly required and properly due under this Agreement), any increased expense of, reduction in or loss of power generation or equipment used therefore, irrespective of whether such claims are based upon breach of warranty, tort (including negligence, whether of Procurer, the Developer or others), strict liability, contract, breach of statutory duty, operation of law or otherwise.

Procurer shall have no recourse against any officer, director or shareholder of the Developer or any Affiliate of the Developer or any of its officers, directors or shareholders for such claims excluded under this Article. The Developer shall have no recourse against any officer, director or shareholder of Procurer, or any affiliate of Procurer or any of its officers, directors or shareholders for such claims excluded under this Article.

17.5 Duty to Mitigate

The Parties shall endeavor to take all reasonable steps so as mitigate any loss or damage which has occurred under this Article 17.



ARTICLE 18: GOVERNING LAW AND DISPUTE RESOLUTION

18.1 Governing Law

This Agreement shall be governed by and construed in accordance with the Laws of India. Any legal proceedings in respect of any matters, claims or disputes under this Agreement shall be under the exclusive jurisdiction of appropriate courts in Mumbai, Maharashtra.

18.2 Amicable Settlement and Dispute Resolution

- i. Either Party is entitled to raise any claim, dispute or difference of whatever nature arising under, out of or in connection with this Agreement ("Dispute") by giving a written notice (Dispute Notice) to the other Party, which shall contain:
 - a. a description of the Dispute;
 - b. the grounds for such Dispute; and
 - c. all written material in support of its claim.
- ii. The other Party shall, within thirty (30) days of issue of Dispute Notice issued under Clause 18.2 (i), furnish:
 - a. counter-claim and defenses, if any, regarding the Dispute; and
 - b. all written material in support of its defenses and counter-claim.
- iii. Within thirty (30) days of issue of Dispute Notice by any Party pursuant to Clause 18.2 (i) if the other Party does not furnish any counter claim or defense under Clause 18.2 (ii) or thirty (30) days from the date of furnishing counter claims or defense by the other Party, both the Parties to the Dispute shall meet to settle such Dispute amicably. If the Parties fail to resolve the Dispute amicably within thirty (30) days from the later of the dates mentioned in this Clause 18.2 (iii), the Dispute shall be referred for dispute resolution in accordance with Clause 18.3.

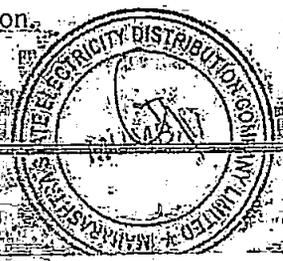
18.3 Dispute Resolution

Dispute Resolution by Appropriate Commission

- a. If any dispute is not settled amicably under Clause 18.2, the same shall be referred by any of the Parties to Appropriate Commission for dispute resolution in accordance with the provisions of the Electricity Act 2003.

18.4 Performance during Dispute

Pending the submission of and/or decision on a Dispute by Appropriate Jurisdiction, the Parties shall continue to perform their respective obligations under this Agreement, subject to any interim order that may be passed by Appropriate Jurisdiction, without prejudice to a final adjustment in accordance with such decision by Appropriate Jurisdiction.



ARTICLE 19: ASSIGNMENT AND CHARGES

19.1 Assignments

19.1.1 This Agreement shall be binding upon, and inure to the benefit of the Parties and their respective successors and permitted assigns. This Agreement shall not be assigned by any Party other than by mutual consent between the Parties to be evidenced in writing.

19.1.2 Provided that, Procurer shall permit assignment of any of Developer's rights and obligations under this agreement in favor of the lenders to the Developer, if required under the financing agreements.

19.1.3 Provided further that any successor(s) or permitted assign(s) identified after mutual agreement between the Parties may be required to execute a new agreement on the same terms and conditions as are included in this Agreement.



ARTICLE 20: MISCELLANEOUS

20.1 Interest and Right of Set Off

Any sum which becomes payable under any of the provisions of this Agreement by one Party to the other Party and which is not covered in LPS rule shall, if the same be not paid within the time allowed for payment thereof, shall be deemed to be a debt owed by the Party responsible for payment thereof to the Party entitled to receive the same. Such sum shall until payment thereof carry interest at prevailing medium term prime lending rate of State Bank of India per annum from the due date for payment thereof until the same is paid to or otherwise authorized by the Party entitled to the same. Without prejudice to any other right or remedy that may be available under this Agreement or otherwise under law, the Party entitled to receive such amount shall also have the right of set off.

Provided the stipulation regarding interest for delayed payments contained in this Article 20 shall neither be deemed nor construed authorize any delay in payment of any amount due by a Party nor be deemed or construed to be a waiver of the underlying breach of payment obligations.

20.2 Confidentiality

The Parties undertake to hold in confidence this Agreement and not to disclose the terms and conditions of the transaction contemplated hereby to third parties, except:

- a. to their professional advisors; or
- b. to their officers, Contractors, employees, agents or representatives, financiers, who need to have access to such information for the proper performance of their activities; or
- c. disclosures required under Law;
- d. without the prior written consent of the other Party.

20.3 Waiver of immunity

Each Party unconditionally and irrevocably:

- a) agrees that the execution, delivery and performance by it of this Agreement constitute commercial acts done and performed for commercial purpose;
- b) agrees that, should any proceedings be brought against it or its assets, property or revenues in any jurisdiction in relation to this Agreement or any transaction contemplated by this Agreement, no immunity (whether by reason of sovereignty or otherwise) from such proceedings shall be claimed by or on behalf of the Party with respect to its assets;
- c) waives any right of immunity which it or its assets, property or revenues now has, may acquire in the future or which may be attributed to it in any jurisdiction; and



- d) consents generally in respect of the enforcement of any judgment or award against it in any such proceedings to the giving of any relief or the issue of any process in any jurisdiction in connection with such proceedings (including the making, enforcement or execution against it or in respect of any assets, property or revenues whatsoever irrespective of their use or intended use of any order or judgment that may be made or given in connection therewith).

20.4 Waiver

20.4.1 Waiver, including partial or conditional waiver, by either Party of any default by the other Party in the observance and performance of any provision of or obligations under this Agreement:

- a) shall not operate or be construed as a waiver of any other or subsequent default hereof or of other provisions of or obligations under this Agreement;
- b) shall not be effective unless it is in writing and executed by a duly authorized representative of the Party; and
- c) shall not affect the validity or enforceability of this Agreement in any manner.

20.4.2 Neither the failure by either Party to insist on any occasion upon the performance of the terms, conditions and provisions of this Agreement or any obligation thereunder nor time or other indulgence granted by a Party to the other Party shall be treated or deemed as waiver of such breach or acceptance of any variation or the relinquishment of any such right hereunder.

20.5 Depreciation

For the purposes of depreciation under Applicable Laws, the property representing the capital investment made by the Supplier in the Project Assets shall be deemed to be acquired and owned by the Supplier. For the avoidance of doubt, the Procurer shall not in any manner be liable in respect of any claims for depreciation to be made by the Supplier under Applicable Laws

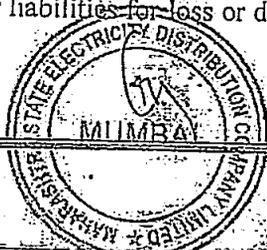
20.6 Exclusion of implied warranties etc.

This Agreement expressly excludes any warranty, condition or other undertaking implied at law or by custom or otherwise arising out of any other agreement between the Parties or any representation by either Party not contained in a binding legal agreement executed by both Parties.

20.7 Survival

Termination shall;

- a) not relieve the Developer or Procurer, as the case may be, of any obligations hereunder which expressly or by implication survive Termination hereof; and
- b) except as otherwise provided in any provision of this Agreement expressly limiting the liability of either Party, not relieve either Party of any obligations or liabilities for loss or damage to the other Party arising out of, or caused



acts or omissions of such Party prior to the effectiveness of such Termination or arising out of such Termination.

All obligations surviving Termination shall only survive for a period of 3 (three) years following the date of such Termination.

20.8 Entire Agreement

This Agreement and the Schedules together constitute a complete and exclusive statement of the terms of the agreement between the Parties on the subject hereof, and no amendment or modification hereto shall be valid and effective unless such modification or amendment is agreed to in writing by the Parties and duly executed by persons especially empowered in this behalf by the respective Parties. All prior written or oral understandings, offers or other communications of every kind pertaining to this Agreement are abrogated and withdrawn. For the avoidance of doubt, the Parties hereto agree that any obligations of the Developer arising from the Request for Proposal shall be deemed to form part of this Agreement and treated as such.

20.9 Severability

If for any reason whatever, any provision of this Agreement is or becomes invalid, illegal or unenforceable or is declared by any court of competent jurisdiction or any other instrumentality to be invalid, illegal or unenforceable, the validity, legality or enforceability of the remaining provisions shall not be affected in any manner, and the Parties will negotiate in good faith with a view to agreeing to one or more provisions which may be substituted for such invalid, unenforceable or illegal provisions, as nearly as is practicable to such invalid, illegal or unenforceable provision. Failure to agree upon any such provisions shall not be subject to the Dispute Resolution Procedure set forth under this Agreement or otherwise.

20.10 No partnership

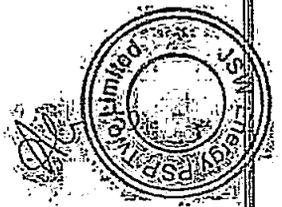
This Agreement shall not be interpreted or construed to create an association, joint venture or partnership between the Parties, or to impose any partnership obligation or liability upon either Party, and neither Party shall have any right, power or authority to enter into any agreement or undertaking for, or act on behalf of, or to act as or be an agent or representative of, or to otherwise bind, the other Party.

20.11 Third Parties

This Agreement is intended solely for the benefit of the Parties and their respective successors and permitted assigns, and nothing in this Agreement shall be construed to create any duty to, standard of care with reference to, or any liability to, any person not a Party to this Agreement.

20.12 Successors and assigns

This Agreement shall be binding upon, and inure to the benefit of the Parties and their respective successors and permitted assigns.



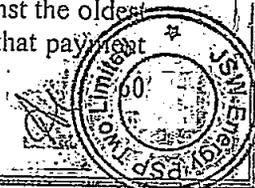
20.13 Notices

Any notice or other communication to be given by any Party to the other Party under or in connection with the matters contemplated by this Agreement shall be in writing and shall:

- a) in the case of the Developer, be given by facsimile or e-mail and by letter delivered by hand to the address given and marked for attention of the person set out below or to such other person as the Developer may from time to time designate by notice to Procurer; provided that notices or other communications to be given may, if they are subsequently confirmed by sending a copy thereof by registered acknowledgement due, air mail or by courier, be sent by facsimile or e-mail to the number as the Developer may from time to time designate by notice to Procurer;
- b) in the case of Procurer, be given by facsimile or e-mail and by letter delivered by hand and be addressed to the Chief Engineer (Power Purchase), Power Purchase Section, Prakashgad, Plot G 9, Prof. Anant Kanekar Marg, Bandra (East), Mumbai 400 051 with a copy delivered to Procurer Representative or such other person as Procurer may from time to time designate by notice to the Developer; provided that if the Developer does not have an office in [insert location of concerned Procurer] it may send such notice by facsimile or e-mail and by registered acknowledgement due, air mail or by courier; and
- c) any notice or communication by a Party to the other Party, given in accordance herewith, shall be deemed to have been delivered when in the normal course of post it ought to have been delivered and in all other cases, it shall be deemed to have been delivered on the actual date and time of delivery, provided that in the case of facsimile or e-mail, it shall be deemed to have been delivered on the working day following the date of its delivery.

20.14 Delayed payments

- a) The Parties hereto acknowledge and agree that the Electricity (Late Payment Surcharge and related Matters) Rules 2022 ("LPS Rules") shall be applicable. In the event of payment by the Procurer beyond the Due Date, a Late Payment Surcharge (LPS) shall be payable by the Utility to Supplier on the outstanding payment beyond the Due Date. The rate of Late Payment Surcharge for first month of default as well as for successive months of default will be as per the terms of the LPS Rules. If the period of default lies in two or more financial years, the base rate of Late Payment Surcharge shall be calculated separately for the periods falling in different years.
- b) Late Payment Surcharge shall be claimed by the Supplier through Supplementary Bill. All payments by the Procurer to the Supplier for power procured from it shall be first adjusted towards Late Payment Surcharge and thereafter, towards monthly charges, starting from the longest overdue bill. All the bills payable by the Procurer to Supplier for the energy procured from it, shall be time tagged with respect to the date and time of submission of the bill and the payment made by the Procurer shall be adjusted first against the oldest bill and then to the second oldest bill and so on, so as to ensure that payment



against a bill is not adjusted unless and until all bills older than it have been paid for.

20.15 No partnership

This Agreement shall not be interpreted or construed to create an association, joint venture or partnership between the Parties, or to impose any partnership obligation or liability upon either Party, and neither Party shall have any right, power or authority to enter into any agreement or undertaking for, or act on behalf of, or to act as or be an agent or representative of, or to otherwise bind, the other Party.

20.16 Third parties

This Agreement is intended solely for the benefit of the Parties, and their respective successors and permitted assigns, and nothing in this Agreement shall be construed to create any duty to, standard of care with reference to, or any liability to, any person not a Party to this Agreement.

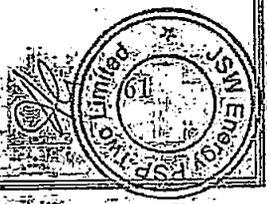
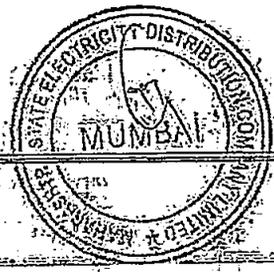
20.17 Successors and assigns

This Agreement shall be binding upon, and inure to the benefit of the Parties and their respective successors and permitted assigns.

All notices required to be given by one Party to the other Party and all other communications, Documentation and proceedings which are in any way relevant to this Agreement shall be in writing and in English language only.

20.18 Counterparts

This Agreement may be executed in two counterparts, each of which, when executed and delivered, shall constitute an original of this Agreement.



ARTICLE 21: DEFINITIONS

21.1 Definitions

In this Agreement, the following words and expressions shall, unless repugnant to the context or meaning thereof, have the meaning hereinafter respectively assigned to them"

"Accounting Year" means the financial year commencing from the first day of April of any calendar year and ending on the thirty-first day of March of the next calendar year.

"Act" or "Electricity Act, 2003" shall mean the Electricity Act, 2003 and include any modifications, amendments and substitution from time to time"

"Actual COD" shall mean the Date of full commissioning of the PHESS.

"Affected Party" shall have the meaning set forth in Clause 14.2."

"Affiliate" shall mean a Company that, directly or indirectly,

- i. controls, or
- ii. is controlled by,
- iii. is under the common control with the Bidder or is a Member in a Bidding Consortium developing the Project.

The expression 'control' shall mean the ownership, directly or indirectly, of 51% (fifty one percent) or more of the voting shares of such company or right to appoint majority directors.

"Agreement" "or "Energy Storage Facility Agreement" "or" "ESFA" shall mean this Energy Storage Facility Agreement including its recitals and Schedules, amended or modified from time to time in accordance with the terms hereof"

"Annual Fixed Charge (AFC)" shall mean Annual fixed cost of storage payable annually to the Developer/s at the Delivery Point for a period of 40 years. The Annual Fixed Charge payable to the Developer/s shall be expressed in INR/MW/Annum and shall be exclusive of GST.

"Appropriate Commission" shall mean the Central Electricity Regulatory Commission referred to in sub- section (1) of section 76 or the State Electricity Regulatory Commission referred to in sub- section (1) of section 82 of the Electricity Act 2003 as the case may be.

"Applicable Laws" means all laws, brought into force and effect by GOI or the State Government including rules, regulations and notifications made thereunder, and judgments, decrees, injunctions, writs and orders of any court of record, applicable to this Agreement and the exercise, performance and discharge of the respective rights and obligations of the Parties hereunder, as may be in force and effect during the subsistence of this Agreement"



“Applicable Permits” means all clearances, licenses, permits, authorizations, no objection certificates, consents, approvals and exemptions required to be obtained or maintained under Applicable Laws in connection with the construction, operation and maintenance of the Project Facilities during the subsistence of this Agreement”

“Bidder” or “Bidding Company” shall mean a Company, public sector enterprise or undertaking, foreign company, AIF, Foreign Investment Fund or a Bidding Consortium submitting the Bid. Any reference to the Bidder includes Bidding Company / Bidding Consortium/ Member in a Bidding Consortium including its successors, executors and permitted assigns and Lead Member of the Bidding Consortium jointly and severally, as the context may require.;

“Bidding Consortium” or “Consortium” shall refer to a group of companies that has collectively submitted the response in accordance with the provisions of RfS no. CEPP/PHSP/T-01 dated 09/03/2024;

“Bidding Document/Tender”: This RfS, Pumped Hydro Energy Storage Facility Agreement (PHESS), including annexures, amendments / corrigenda thereof.

“Bill Dispute Notice” shall mean the notice issued by a Party raising a Dispute regarding a Monthly Bill or a Supplementary Bill issued by the other Party;

“Business Day” shall mean with respect to Developer and Procurer, a day other than Sunday or a statutory holiday, on which the banks remain open for business in Mumbai, Maharashtra;

“Change in Law” shall have the meaning ascribed thereto in Article 15 of this Agreement.

“CERC” shall mean the Central Electricity Regulatory Commission of India, constituted under sub – section (1) of Section 76 of the Electricity Act, 2003, or its successors.

“Commercial Operation Date” or “COD” shall mean the date on which the commissioning certificate is issued upon successful commissioning of the full Contracted Capacity or the last part capacity of the PHESS (where upon the developer starts injecting power from the PHESS to the Delivery point) as the case maybe.

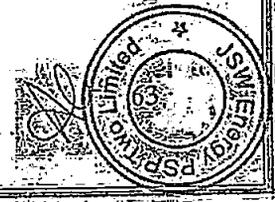
“Competent Court of Law” shall mean any court or tribunal or any similar judicial or quasi- judicial body in Mumbai, Maharashtra that has jurisdiction to adjudicate upon issues relating to this Agreement.

“Company” means the Company acting as the Developer under this Agreement;

Conversion Efficiency: Conversion Efficiency measured at the Delivery Point, and in reference to a complete cycle (full charge and full discharge) is ratio of output energy delivered at Delivery Point to input supplied energy at Delivery Point.

“Conversion Loss/ Cycle Loss”: $Cycle Loss = 100\% - Conversion Efficiency$

“Conditions Subsequent” shall have the meaning set forth in Article 4.



"Consents, Clearances and Permits" shall mean all authorizations, licenses, approvals, registrations, permits, waivers, privileges, acknowledgements, agreements, or concessions required to be obtained from or provided by any concerned authority for the purpose of setting up of the generation facilities and/ or supply of power.

"Consultation Period" shall mean the period of sixty (60) days or such other longer period as the Parties may agree, commencing from the date of issuance of a Developer Preliminary Default Notice or Procurer Preliminary Default Notice as provided in Article 16 of this Agreement, for consultation between the Parties to mitigate the consequence of the relevant event having regard to all the circumstances.

"Construction Works" means all works and things necessary to complete the Project Facilities in accordance with this Agreement

"Contracted Capacity" shall mean 1500 MW of pumped hydro storage contracted with Procurer for discharge by the Developer to Procurer at the Delivery Point. The pumped hydro storage should be capable of delivering 8 hours of discharge in a 24 hour period 00:00 hrs to 24:00 hrs. with maximum 5 hours' continuous discharge. Capacity of the Pumped hydro storage system (Excluding auxiliary consumption) in MW contracted with Procurer for supply by the Bidder at the Delivery Point from the PHESS.

"Contract Year" shall mean the period beginning from the SCOD and ending on the immediately succeeding March 31 and thereafter each period of 12 months beginning on April 1 and ending on March 31 provided that (i) in the financial year in which the actual Commissioning Date would occur, the Contract Year shall end on the date immediately before the actual Commissioning Date and a new Contract Year shall commence once again from the actual Commissioning Date and end on the immediately succeeding March 31, and thereafter each period of twelve (12) months commencing on April 1 and ending on March 31, and (ii) Provided further that the last Contract Year of this Agreement shall end on the last day of the Term of this Agreement.

"Contractor" means the person or persons excluding Other Developer, as the case may be, with whom the Developer has entered into any of the EPC Contract, the O&M Contract, or any other agreement or a material contract for construction, operation and/or maintenance of the Project or matters incidental thereto, but does not include a person who has entered into an agreement for providing financial assistance to the Developer"

"Cure Period" means the period specified in this Agreement for curing any breach or default of any provision of this Agreement by the Party responsible for such breach or default and shall:

- a. commence from the date on which a notice is delivered by one Party to the other Party asking the latter to cure the breach or default specified in such notice; and
- b. not relieve any Party from liability to pay Damages or compensation under the provisions of this Agreement.

Provided that if the cure of any breach by the Developer requires any reasonable action by the Developer that must be approved by Procurer or its Independent



Engineer hereunder authorized representative of Procurer, the applicable Cure Period shall be extended by the period taken by Procurer or the Independent Engineer hereunder authorized representative of Procurer to accord their approval;

“CTU” shall mean the Central Transmission Utility as defined in sub-section (10) of section 2 of the Electricity Act 2003

“Declared Cycle Loss” shall mean Cycle Loss declared by the Developer in the bid submission;

“Delivery Point” shall be the point at STU/MSETCL periphery, where the power from the Project is injected into the identified STU Substation.

Declared Availability: “Declared Availability” (MW) is the capability of the Project to operate in only discharge mode and will be declared by the Developer at / before 6 AM on day-ahead basis, for each 15-minute time block for the next day. For example, the Declared Machine Availability for all 96 no. 15-minute time blocks of 1st September 2024 will be submitted by 6 AM of 31st Aug 2024

“Developer Event of Default” shall have the meaning set forth in Article 16.1 of this Agreement.

“Dispute” shall have the meaning set forth in Article 18.2 of this Agreement.

“Dispute Resolution Procedure” means the procedure for resolution of Disputes set forth in Article 18

“Document” or “Documentation” means documentation in printed or written form, or in tapes, discs, drawings, computer programs, writings, reports, photographs, films, cassettes, or expressed in any other written, electronic, audio or visual form;

“Due Date” shall have the same meaning ascribed thereto in Article 13 of this Agreement.

“Effective Date” shall mean date as defined in Clause 3.1;

“Electricity Laws” shall mean the Electricity Act, 2003 and the rules and regulations made there under from time to time along with amendments thereto and replacements thereof and any other Law pertaining to electricity including regulations framed by the Appropriate Commission.

“Emergency” means a condition or situation that is likely to endanger the security of the individuals on or about the Project Facilities, including Users thereof, or which poses an immediate threat of material damage to any of the Project Assets”

“Encumbrances” means any encumbrance such as mortgage, charge, pledge, lien, hypothecation , security interest, assignment, privilege or priority of any kind having the effect of security or other such obligations and shall include without limitation any designation of loss payees or beneficiaries or any similar arrangement under any insurance policy pertaining to the Project, physical encumbrances, claims



amounts due on account of taxes, cesses, electricity, water and other utility charges and encroachments on the Project Site / Project Facilities.

“Energy Accounts” shall mean the regional energy accounts/state energy accounts as specified in the Grid Code issued by the appropriate agency for each Month (as per their prescribed methodology), including the revisions and amendments thereof.

“ESFA” shall mean the Energy Storage Facility Agreement.

“Events of Default” shall mean the events as defined in Article 16 of this Agreement.

“Expiry Date” Shall mean the date occurring Forty (40) years from the actual Commissioning Date or Actual COD unless extended by the Parties as per this Agreement.

“Financial Closure” shall mean the execution of all the Financing Agreements required for the Power Project/PHESS and fulfillment of Condition Subsequent and waiver, if any, of any of the Condition Subsequent for the initial draw down of funds there under.

“Financing Agreement” shall mean the agreements pursuant to which the Developer has sought financing for the Power Project including the loan agreements, security documents, notes, indentures, security agreements, letters of credit and other documents, as may be amended, modified, or replaced from time to time, but without in anyway increasing the liabilities of Procurer.

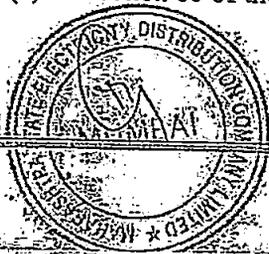
“Force Majeure” “or “Force Majeure Event” shall have the meaning ascribed to it in Article 14“

“GoI” means Government of India”

“Good Industry Practices” means the practices, methods, techniques, designs, standards, skills, diligence, efficiency, reliability and prudence which are generally and reasonably expected from a reasonably skilled and experienced operator engaged in the same type of undertaking as envisaged under this Agreement and which would be expected to result in the performance of its obligations by the Developer in accordance with this Agreement, Applicable Laws and Applicable Permits in reliable, safe, economical and efficient manner;

“Government Instrumentality” means any department, division or sub-division of Government of India or the State Government and includes any commission board, authority, agency or municipal and other local authority or statutory body including Panchayat under the control of Government of India or the State Government, as the case may be, and having jurisdiction over all or any part of the Project Facilities or the performance of all or any of the services or obligations of the Developer under or pursuant to this Agreement;

“Grid Code” shall mean the Grid Code specified by the Central Commission under Clause (h) of Sub-Section (1) of Section 79 of the Electricity Act and/or the State Grid Code as specified by the concerned State Commission, referred under Clause (h) of Sub-section (1) of Section 86 of the Electricity Act 2003, as applicable.



“Grid” means the high voltage backbone system of inter-connected transmission lines and sub-stations;

“Installed Capacity” shall mean {the name plate capacity of all the units of the PHSP Project reckoned at Generator Terminals or the AC Rating of the Project at Delivery Point}.

“Insurances” shall mean the insurance cover to be obtained and maintained by the Developer in accordance with Article 11 of this Agreement.

“Interconnection Facilities” shall mean the facilities on Developer’s side of the Delivery Point for sending and metering the electrical output in accordance with this Agreement and which shall include, without limitation, all other transmission lines and associated equipment, transformers, relay and switching equipment and protective devices, safety equipment and, subject to Article 10, the Metering System required for supply of power as per the terms of this Agreement.

“Inter-Connection Point/ Metering Point” shall mean the point at 220 kV and above where the power from the Project is injected into the nearest ISTS/InSTS Substation as the case may be. Metering shall be done at this interconnection point where the power is injected into Grid. For interconnection with grid and metering, the Bidder/s shall abide by the relevant CERC/SERC Regulations, Grid Code and Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006 and Amendment Regulation, 2010 and Technical Standard for Connectivity of the Grid (Amendment) Regulation, 2013, the Grid Code as amended and revised from time to time. The total cost of metering, recording & transferring /communicating the data from its pooling stations to 765/400/220 kV Grid Substation (GSS) of CTU/STU would be borne by the Developer/s.

ISTS: ISTS means “Inter-State Transmission System”.

InSTS: InSTS means “Intra-State Transmission System”/ Maharashtra State Electricity Transmission Company Limited (MSETCL) or STU.

“Invoice” or “Bill” shall mean either a Monthly Bill / Supplementary Bill or a Monthly Invoice/ Supplementary Invoice raised by any of the Parties.

“Late Payment Surcharge” shall have the meaning ascribed thereto in Clause 13.4 of this Agreement.

“Law” shall mean in relation to this Agreement, all laws including Electricity Laws in force in India and any statute, ordinance, regulation, notification or code, rule, or any interpretation of any of them by an Indian Governmental Instrumentality and having force of law and shall further include without limitation all applicable rules, regulations, orders, notifications by an Indian Governmental Instrumentality pursuant to or under any of them and shall include without limitation all rules, regulations, decisions and orders of the Appropriate Commission.

“Letter of Award” or “LoA” shall mean the letter issued by MSEDCL to the Selected Bidder for award of the Contracted Capacity.



“Letter of Credit” or “LC” shall have the meaning ascribed thereto in Clause 13.6 of this Agreement.

“Lenders’ Representative” means the person duly authorized by the Senior Lenders to act for and on behalf of the Senior Lenders with regard to matters arising out of or in relation to this Agreement, and includes his successors, assigns and substitutes.

“Material Adverse Effect” means a material adverse effect of any act or event on the ability of either Party to perform any of its obligations under and in accordance with the provisions of this Agreement and which act or event causes a material financial burden or loss to either Party.

“Month” shall mean a month in a calendar year as per Gregorian calendar.

“O&M” means the operation and maintenance of the Project Facilities and includes all matters connected with or incidental to such operation and maintenance, provision of services and facilities in accordance with the provisions of this Agreement;

“Other Developer” shall mean all the bidders other than the Single Business Entity/Consortium, declared as Selected Bidder under the RFS and the SPV, if any formed by such Selected Bidders, with whom the Storage Procurement Agreements are executed in accordance with the provisions of the RFS to undertake any Project(s) thereunder.

“Parent” shall mean a Company, which holds not less than 51% equity either directly or indirectly in the Project Company or a Member in a Consortium providing Contracted Capacity.

“Paid-up share capital” shall mean Paid-up share capital as defined in Section-2 of the Companies Act, 2013.

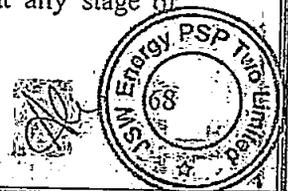
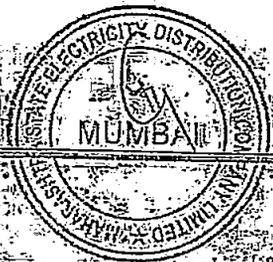
“Payment Security Mechanism” shall have the meaning ascribed thereto in Clause 13.6 of this Agreement.

“Performance Security” shall have the meaning set forth in Clause 4.5.

“Procurer Default” shall have the meaning set forth in Article 16 of this Agreement.

“Project” or “Pumped Hydro Energy Storage System (PHESS)” or Pumped Hydro Storage Project/s” shall mean the Pumped Hydro Storage Plants (PHSP)/ Pumped hydro storage system, comprising all the various components for charging (pumping) and discharging (generation), having single point of injection into the grid at Interconnection/ Delivery/ Metering Point, and having requisite control systems and separate metering system for each interconnection points with ISTS/InSTS.

The Project shall include all Pumped hydro generation units, auxiliaries and associated facilities, bay(s) for transmission system in the their switchyard, dedicated transmission line up to the injection point and all the other assets, buildings/structures, equipment, plant and machinery, facilities and related assets required for the efficient and economic operation of the power generation facility, whether completed or at any stage of



development and construction or intended to be developed and constructed for the purpose of supply of power to Procurer/s under this Agreement.

The Project shall also , includes all components of the storage facility such as Upper Reservoir, Lower Reservoir, penstocks, head and tail works, main and regulating reservoirs dams and other hydraulic works, intake water conductor system, tail water conductor system, surge well, power Station and generating/pumping Units.

“Preliminary Default Notice” shall have the meaning ascribed thereto in Article 16 of this Agreement.

“Prudent Utility Practices” shall mean the practices, methods and standards that are generally accepted internationally from time to time by electric utilities for the purpose of ensuring the safe, efficient and economic design, construction, commissioning, operation and maintenance of power generation equipment and which practices, methods and standards shall be adjusted as necessary, to take account of:

- a) Operation and maintenance guidelines recommended by the manufacturers of the plant and equipment to be incorporated in the Power Project;
- b) The requirements of Indian Law; and the physical conditions at the site of the Power Project.

“RBI” shall mean the Reserve Bank of India.

“Rebate” shall have the same meaning as ascribed thereto in Clause 13.5 of this Agreement.

“RLDC” shall mean the relevant Regional Load Dispatch Centre established under Sub-section (1) of Section 27 of the Electricity Act, 2003.

“Rupees”, “INR” shall mean Indian rupees, means the lawful currency of the Republic of India.

“Scope of the Project” shall have the meaning set forth in Clause 2.1.

“Scheduled Commercial Operations Date (SCOD)” shall mean a maximum period of 4 (four) years or 48 (Forty Eight) months from effective date.

“Senior Lenders” means the financial institutions, banks, multilateral lending agencies, trusts, funds and agents or trustees of debenture holders, including their successors and assignees, who have agreed to guarantee or provide finance to the Developer under any of the Financing Agreements for meeting all or any part of the Total Project Cost and who hold parri passu charge on the assets, rights, title and interests of the Developer.

“SLDC” shall mean the Load Despatch Centre established under Sub-section (1) of Section 31 of the Electricity Act 2003, relevant for the State(s) where the Delivery Point is located.

“SLDC Charges” shall mean the charges levied by the SLDC of the state where the Delivery Point is located.



“State” means the State of Maharashtra and “State Government” means the government of that State.

“State of Charge” (expressed in MWh output terms) means the level of water available at any given point of time and determines the remaining maximum pumping / generation quantity (MWh).

“State Transmission Utility” or “STU” shall mean Maharashtra State Electricity Transmission Company Limited under Sub-section (1) of Section 39 of the Electricity Act 2003.

“Tariff” shall have the same meaning as provided for in Article 12 of this Agreement.

“Tariff Payment” shall mean the payments to be made under Monthly Bills as referred to in Article 13 and the relevant Supplementary Bills.

“Tax” means and includes all taxes, fees, cesses, duties (including stamp duties), levies that may be payable by the Developer for execution of the agreement and during the term of this Agreement under Applicable Law; but excluding any interest, penalties and other sums in relation thereto imposed on any account whatsoever. For the avoidance of doubt, Taxes shall not include taxes on corporate income.

“Termination” means the expiry or termination of this Agreement and the Rights hereunder.

“Termination Notice” means the communication issued in accordance with this Agreement by one Party to the other Party terminating this Agreement.

“Term of Agreement” shall have the meaning ascribed thereto in Article 3 of this Agreement.

“Tests” means the tests to be carried out in accordance with the Specifications and Standards or the Maintenance Requirements and as finalized by the Developer in consultation with Procurer/Independent Engineer authorized representatives of Procurer.

“Total Project Cost” means the cost incurred by the Developer for development and construction of the Project Facilities, as determined by an independent firm of chartered accountants mutually agreed upon and appointed by the Parties.

“Week” shall mean a calendar week commencing from 00:00 hours of Monday, and ending at 24:00 hours of the following Sunday.



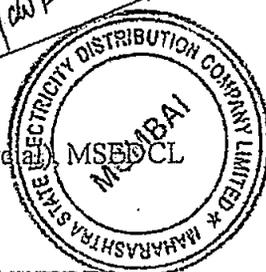
IN WITNESS WHEREOF THE PARTIES HAVE EXECUTED AND DELIVERED THIS AGREEMENT AS OF THE DAY, MONTH AND YEAR FIRST ABOVE WRITTEN.

SIGNED, SEALED AND DELIVERED

For and on behalf of Procurer by

Signature 

Name: Yogesh Gadkari

Designation: Director (Commercial) 

SIGNED, SEALED AND DELIVERED

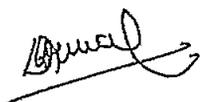
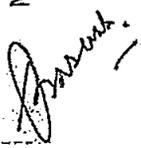
For and on behalf of Developer by

Signature 

Name: Abhay Yagnik 

Designation: Senior Vice President -BD

In presence of:

- 1. Dinesh Agrawal 
- 2. Prasun Kumar 



SCHEDULE -1

PERFORMANCE GUARANTEE

The,

Maharashtra State Electricity Distribution Company Limited

WHEREAS:

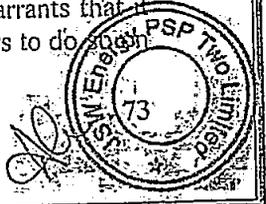
- (A)(the "Supplier") and [the Maharashtra State Electricity Distribution Company Limited] represented by and having its principal offices at Prakashgad, Plot G-9, Bandra (East), Mumbai, Maharashtra 400051 ("Utility") have entered into a Power Supply Agreement dated ... (the "Agreement") whereby the Utility has agreed to the Supplier undertaking the construction and operation of the Power Station with a generating capacity of 1600 MW in the State of _____ on build, own, operate and maintain (the "BOOM") basis, subject to and in accordance with the provisions of the Agreement.
- (B) The Agreement requires the Supplier to furnish a Performance Security to the Utility in a sum of [an amount equivalent to MFC payable for fifteen days] (the "Guarantee Amount") as security for due and faithful performance of its obligations, under and in accordance with the Agreement, during the Construction Period (as defined in the Agreement).
- (C) We, ... through our Branch at(the "Bank") have agreed to furnish this Bank Guarantee by way of Performance Security.

NOW, THEREFORE, the Bank hereby, unconditionally and irrevocably, guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably guarantees and undertakes to pay to the Utility upon occurrence of any failure or default in due and faithful performance of all or any of the Supplier's obligations, under and in accordance with the provisions of the Agreement, on its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Supplier, such sum or sums upto an aggregate sum of the Guarantee Amount as the Utility shall claim, without the Utility being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.
2. A letter from the Utility, under the hand of an Officer not below the rank of a Superintending Engineer or equivalent, that the Supplier has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Utility shall be the sole judge as to whether the Supplier is in default in due and faithful performance of its obligations during the Contract Period under the Agreement and its decision that the Supplier is in default shall be final, and binding on the Bank, notwithstanding any differences between the Utility and the Supplier, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Supplier for any reason whatsoever.



3. In order to give effect to this Guarantee, the Utility shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Supplier and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.
4. It shall not be necessary, and the Bank hereby waives any necessity, for the Utility to proceed against the Supplier before presenting to the Bank its demand under this Guarantee.
5. The Utility shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Agreement or to extend the time or period for the compliance with, fulfillment and/or performance of all or any of the obligations of the Supplier contained in the Agreement or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Utility against the Supplier, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Utility, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Utility of the liberty with reference to the matters aforesaid or by reason of time being given to the Supplier or any other forbearance, indulgence, act or omission on the part of the Utility or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.
6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Utility in respect of or relating to the Agreement or for the fulfillment, compliance and/or performance of all or any of the obligations of the Supplier under the Agreement.
7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Utility on the Bank under this Guarantee, no later than 6 (six) months from the date of expiry of this Guarantee, all rights of the Utility under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.
8. The Performance Guarantee shall cease to be in force and effect when the Supplier shall have provided another Performance Security in substitution of this Performance Guarantee and such substitution shall be repeated until the Performance Guarantee has been released in accordance with the Clause 13.4 of EFSA, and provided the Supplier is not in breach of this Agreement. Upon request made by the Supplier for release of the Performance Security along with the particulars required hereunder, duly certified by a statutory auditor of the Supplier, the Procurer shall release the Performance Guarantee forthwith.
9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Procurer in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do such behalf of the Bank.



<p>मुख्य अभियंता, जलविज्ञान व धरण सुरक्षितता सीडीओ बिल्डींगच्या मागे, दिंडोरी रोड, नाशिक - ४२२००४ दूरध्वनी : ०२५३-२५३०२२७</p>	 <p>महाराष्ट्र शासन जलसंपदा विभाग</p>	 <p>स्वातंत्र्याचा अमृत महोत्सव</p>	<p>Chief Engineer, Hydrology & Dam Safety Behind C.D.O. Building, Dindori Road, Nashik - ४२२००४ Ph.No. : ०२५३-२५३०२२७</p>
<p>Web: www.mahaahp.gov.in Email: cehpswnasik@gmail.com / cehp.nashikwrtd@maharashtra.gov.in</p>			
<p>फक्त ई-मेलद्वारे</p>			

जा.क्र.मुअ/जवधसु/तांशा-६/(१४/२०२२)/२३६७/सन २०२२
प्रति,

दिनांक:- २१/११/२०२२

मुख्य अभियंता,
जलसंपदा विभाग, कोंकण प्रदेश,
मुंबई-४००००१.

विषय :- Request for allocation of water to Proposed Bhavali Pumped Storage Project (1500 MW) of JSW Energy limited.

- संदर्भ :- १) शासन पत्र संकिर्ण-२००८/१६०४/(४६४/२००८)/जसंअ, दि. २७/०५/२००९.
२) शासन पत्र क्र. जविप्र २०२१/ (प्र.क्र.७४/२१)/जवि, दिनांक - ०४/१०/२०२१.
३) मुख्य अभियंता, जलसंपदा विभाग, कोंकण प्रदेश, मुंबई या कार्यालयाचे पत्र जा.क्र.मुअ/जसंविप्र/पाऊप्र/तां-५/२७०१, दिनांक - ०६/०७/२०२२.
४) या कार्यालयाचे मा. सचिव (जसंव्य व लाक्षेवि), जलसंपदा विभाग मंत्रालय यांना उद्देशून पत्र जा.क्र.मुअ/जवधसु/तांशा-६/(१४/२०२२)/१८५०/सन २०२२, दि. २३/०८/२०२२.
५) शासन पत्र संकिर्ण-२००८/(४६४/२००८)/जसंअ, दि. १४/१०/२०२२.
६) शासन पत्र जा.क्र. जविप्र २०२१/(प्र.क्र. ७४/२१) जवि, दि. २१.१०.२०२२.

उपरोक्त संदर्भ पत्र क्र. २ अन्वये आपले कार्यालयाने विषयांकित प्रकल्पास पाणी उपलब्धता प्रमाणपत्र मिळणेबाबतचा प्रस्ताव शिफारशी सह सादर केलेला आहे.

संदर्भिय शासन पत्र क्र. १ नुसार खाजगी संस्थांना पाणी उपलब्धतेचे निष्कर्ष निर्गमित करण्यापूर्वी त्या अभ्यासांना शासनाची मान्यता घेण्यात यावी असे निर्देश होते. या अनुषंगाने विषयांकित प्रकल्पाची संकल्पन टिप्पणी शासन मान्यतेसाठी या कार्यालयाचे संदर्भिय पत्र क्र. ४ अन्वये सादर करण्यात आलेली होती. तथापि दि. १४.१०.२०२२ रोजीच्या संदर्भिय शासन पत्र क्र. ५ अन्वये मुद्दा क्र. ३ मध्ये "अनुज्ञेय शिल्लक पाण्यापैकी किती पाणी/प्रस्तावित पाणी प्रत्यक्षात प्रस्तावित प्रकल्पाच्या ठिकाणी उपलब्ध आहे किंवा कसे याबाबत पाणी उपलब्धता प्रमाणपत्र मुख्य अभियंता, जलविज्ञान व धरण सुरक्षितता, नाशिक यांनी जलशास्त्रीय अभ्यास करून त्याआधारे देणे अपेक्षित आहे. मुख्य अभियंता, जलविज्ञान व धरण सुरक्षितता, नाशिक हे जलशास्त्रीय अभ्यासासाठी सक्षम कार्यालय असून व त्यासाठी शासनाने प्राधिकृत केलेले असल्याने परत या अभ्यासास शासनाची मान्यता घेण्याची आवश्यकता नाही" असे नमूद आहे.

त्यानुसार संदर्भिय शासन पत्र क्र. ६ अन्वये शासनाने खाजगी संस्थांकडून पाणी उपलब्धता मागणी प्रस्तावाबाबत करावयाच्या कार्यावाही संदर्भात जलसंपदा विभाग, जसंअ कार्यासनाने दिनांक १४/१०/२०२२

रोजीच्या पत्रान्वये (संदर्भ पत्र क्र. ५) अभिप्राय दिले असून, सदर अभिप्रायास अनुसरून पुढील उचित कार्यवाही आपल्या स्तरावर त्वरीत करण्यात यावी असे कळविले आहे.

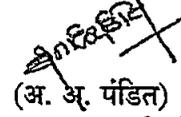
या अनुषंगाने या कार्यालयाने पाणी उपलब्धता प्रमाणपत्र क्र. WFR/Ulhas/894, Dated- 21/11/2022 अन्वये विषयांकित प्रकल्पास ०.९९१ द.ल.घ.मी. चे प्रमाणपत्र जा. क्र. CE/H&DS/TS-6/(14/2022)/2350 /2022, दि. 21/11/2022 प्रदान केलेले आहे. सोबत सदर प्रमाणपत्र व संकल्पन टिपणी जोडण्यात आलेली आहे.

प्रस्तावित प्रकल्पाचा समावेश राज्य एकात्मिक जल आराखड्यात (ISWP) करण्याची जबाबदारी क्षेत्रिय मुख्य अभियंता यांची राहिल.

हे आपले माहिती व आवश्यक कार्यवाहीसाठी सस्नेह अग्रेषीत.

सोबत - वरीलप्रमाणे

स्थळ प्रत मा. मु.अ. यांनी मान्य केली आहे.


(अ. अ. पंडित)

सहायक मुख्य अभियंता
जलविज्ञान व धरण सुरक्षितता
नाशिक.

प्रत:-मा. सचिव (जसंव्य व लाक्षेवि), जलसंपदा विभाग, मंत्रालय, मुंबई यांना माहितीस्तव सविनय सादर.

(लक्षवेध- न.गौ. बसेर, उपसचिव (जवि), जलसंपदा विभाग, मंत्रालय, मुंबई)

प्रत:-मा. कार्यकारी संचालक, कॉकण पाटबंधारे विकास महामंडळ, ठाणे यांना माहितीस्तव सादर.

प्रत:-अधीक्षक अभियंता, आधार सामग्री पृथःकरण मंडळ, नाशिक यांना माहितीसाठी.

सोबत: वरीलप्रमाणे.

प्रत:- JSW Neo Energy Ltd, JSW Centre, Bandra Kurla Complex, Mumbai-४०००५१.

D.A.-Design Note.

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For office use only



सत्यमेव जयते

GOVERNMENT OF MAHARASHTRA
WATER RESOURCES DEPARTMENT

HYDROLOGY & DAM SAFETY

DESIGN NOTE

WATER AVAILABILITY STUDY FOR
Bhavali Pumped Storage Project (1500MW) of JSW Neo Energy
Limited (Lower Dam), Tal.-Shahapur Dist.- Thane.

CERTIFICATE No. WFR/Ulhas River Sub Basin
/894

DATED: -21/11/2022

CHIEF ENGINEER
HYDROLOGY & DAM SAFETY
JALVIDNYAN BHAWAN, DINDORI ROAD
NASHIK 422 004

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Government of Maharashtra
Water Resources Department
Hydrology and Dam Safety
Water Availability Certificate
TO BE READ WITH DESIGN NOTE

Certificate No. WRR/Ulhas/894 Date: 21/11/2022

- Reference: 1) GoM, WRD's marathi Circular no. KTW-1000(43/2000)/WRP, Mantralaya, Mumbai. dt. 23.03.2000.
2) GoM, WRD's marathi Circular no. Misc-2002/ (17/2002)/WRI, Mantralaya, Mumbai. dt. 24.12.2003.
3) GoM WRD's marathi circular no. WAC-2006/(332/2006) WRI, Mantralaya, Mumbai, dt.6.12.2006.
4) GoM WRD's marathi circular no. 2018/(300/18)/WRI Mantralaya , Mumbai -32 dt.01.12.2018
5) Government of Maharashtra, Water Resources Department, Mumbai, Letter No. HEP2021/C.R. No. 74/21/HP, Dated-04/10/2021.
6) Chief Engineer, Water Resources Department, Konkan Region, Mumbai's letter No. CE/WRDKR/WAC/TS-5/2701, Dt.06/07/2022.
7) Government of Maharashtra, Water Resources Department, Mumbai Letter No. Misc-2008/(464/2008)/ WRI, Dated-14/10/2022.
8) Government of Maharashtra, Water Resources Department, Mumbai Letter No. HEP 2021/C.R. No. 74/21/HP, Dated-21/10/2022.

- Name of Project: - Bhavali Pumped Storage Project (1500 MW) of JSW Neo Energy Limited (Lower Dam).
- Location:-Tal.-Shahapur, Dist – Thane.
(Latitude – 19° 34' 56.38" N, Longitude - 73° 35' 10" E)
- Catchment Area of Project: - 7.32 Sq. km.
- Basin: - West Flowing River Basin, Sub Basin:-Ulhas river Sub Basin, River / Nalla: - Bhatsa River.
- Water availability certificate demanded by: - Chief Engineer, Water Resources Department, Konkan Region, Mumbai.
- Data supplied by:- Chief Engineer, Water Resources Department, Konkan Region, Mumbai.

In exercise of powers vested with the Chief Engineer, Hydrology and Dam Safety, Nashik vide Govt. circular referred at reference -4 above, this is to certify that 0.991 Mcum of water is available at 90% dependability (With one time filling requirement of 17.84 Mcum) for Lower Dam of Bhavali Pumped Storage Project (1500 MW) of JSW Neo Energy Limited, Tal- Shahapur, Dist- Thane In Ulhas River Sub Basin of West Flowing River basin.

This certificate is valid till the date of Administrative Approval or cancellation of the project proposal for specific reason as per GoM's circular under reference no-3. This certificate is non-transferable from State sector to Local sector and vice versa.

(S. S. Pagar)
Chief Engineer
Hydrology and Dam safety
Nashik

No. CE/H&DS/TS-6/(14/2022)/2350/2022
Chief Engineer,
Hydrology and Dam Safety, Nashik
Dated: - 21/11/2022.

To,

- 1) Copy to the Chief Engineer, WRD, Konkan Region, Mumbai for information please.
D.A.: Design Note.

(P.T.O)



Government of Maharashtra
Water Resources Department
Hydrology and Dam Safety
Water Availability Certificate
TO BE READ WITH DESIGN NOTE

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- 2) Copy to the Superintending Engineer, Data Analysis Circle, Nashik
D.A.: Design Note and file of the project.
- 3) Copy to JSW Neo Energy Limited, JSW Energy Centre, Bandra Kurla Complex, Bandra (East),
Mumbai-400051.
D.A.: Design Note.

Accompaniment to WAC No. WFR/ Ulhas River Basin/894

Hydrology and Dam Safety, Nashik (Maharashtra)
Design Note
Water Availability Studies For Bhavali Pumped Storage Project (1500 MW)
of JSW Energy Limited (Lower Dam) Tal-Shahapur, Dist-Thane in Ulhas
sub-basin of WFR basin

- Ref:
- 1) Government of Maharashtra, Water Resources Department, Mumbai letter No. HEP 2021/C.R.No.74/21/HP, Dated - 04/10/2021.
 - 2) Chief Engineer, Hydrology and Dam Safety, Nashik office letter no. CE/H&DS/TS-2/(169/2015)/2123/2021, Dated - 17/11/2021.
 - 3) Chief Engineer, Water Resource Department, Konkan Region, Mumbai office letter No. CE/WRDKR/WAC/TS-5/4702, Dated - 30/12/2021.
 - 4) JSW Neo Energy Limited, JSW Centre, Bandra Kurla Complex, Bandra (East), Mumbai-51, letter no. JSWNEI/BHAVALI/2021-2022/016, Dated - 15/03/2022.
 - 5) Government of Maharashtra, Water Resources Department, Mumbai letter No. HEP 2021/C.R.No.74/21/HP, Dated - 13/04/2022.
 - 6) Chief Engineer, Water Resource Department, Konkan Region, Mumbai office letter No. CE/WRDKR/WAC/TS-5/2701, Dated - 06/07/2022.
 - 7) Chief Engineer, Hydrology and Dam Safety, Nashik office letter no. CE /H&DS / TS-6/(14/2022)/1850/2022, Dated - 23/08/2022.
 - 8) Government of Maharashtra, Water Resources Department, Mumbai letter No. Mis-2008/(464/2008)/WRI, Dated - 14/10/2022.
 - 9) Government of Maharashtra, Water Resources Department, Mumbai letter No. HEP 2021/C.R.No.74/21/HP, Dated - 21/10/2022.

1.0 Proposal:

The proposal for water availability certification is received vide letter under reference No. 6.

The details of proposal are as below:

- 1) Name of the Project with location : Bhavali Pumped Storage Project (1500 MW) of JSW Neo Energy Limited (Lower Dam) Tal-Shahapur, Dist-Thane
- 2) Type of Project : Pumped Storage Hydro Electric Project
- 3) River : Bhatsa
- 4) Basin : West Flowing River Basin
- 5) Sub-Basin : Ulhas River Sub Basin
- 6) Latitude : 19° 34' 56.38" N
- 7) Longitude : 73° 35' 10.00" E
- 8) Catchment Area of the Project : 7.32 Sq. Km
- 9) Utilization proposed : 17.84 Mcum (for One time filling)
0.991 Mcum (for every year requirement)
- 10) Whether proposed project is in the catchment of major/medium/minor projects, if yes, name of the projects : Yes.
The proposed Lower Dam of Bhavali Pumped Storage Project is in the catchment area of existing Bhatsa Project.
- 11) Whether proposed project lies in Drought prone Area? (if yes, give reference) : No.

- 12) Recommendations of Regional Chief Engineer / Executive Director : Proposal recommended by Chief Engineer, Water Resource Department, Konkan Region, Mumbai vide letter under Ref. No. 3, Dated 30/12/2021 Ref.No. 6, dated 06/07/2022.

2.0 Yield Study by Hydrology Project:

2.1 Data used:

- 1) Monsoon Rainfall-Runoff equations developed at Bhatsa Dam site on Bhatsa River for Ulhas sub basin by CE, Hydrology & Dam Safety, Nashik is given below.

$$\text{For Monsoon : } R = 0.789 P - 128.0288$$

where R and P are in mm.

- 2) Rainfall data & period : Rainfall - Kothale rain gauge station data
Period - 1973 to 2019.
- 3) Evaporation data & period : Evaporation data of Padali & Bhatsanagar
FCS station period - 2002 to 2021.

2.2 Yield at Project site:

Using above Monsoon Rainfall-Runoff correlation developed at Bhatsa Dam site on Bhatsa River for Ulhas sub basin and Rainfall data of Kothale rain gauge station for the period from 1973 to 2019, the yield at proposed Lower Dam of Bhavali Pumped Storage Project site is calculated as below. (Map showing location of project is enclosed in Annexure- 4))

50 % dependable yield :- 15.778 Mcum

75 % dependable yield :- 12.508 Mcum

90 % dependable yield :- 4.387 Mcum

(Yield from free catchment) (Annexure - 1(b))

Evaporation and other losses:

Using evaporation data of Padali & Bhatsanagar Full Climatic Station (FCS) for the period from 2002 to 2021 the evaporation of both dams are calculated as below.

Evaporation from Upper Dam :- 0.44 Mcum

Evaporation from Lower Dam :- 0.189 Mcum

Total Evaporation :- 0.629 Mcum (Annexure - 2(e))

Other operational losses :- 0.362 Mcum

Total losses :- 0.991 Mcum

2.3 Water availability in basin /sub basin as per tribunal/interstate agreement/ master plan / GOM guidelines:

- 1) Yield available at 75% dependability in Ulhas sub basin as per ISWP Volume I, Main report, page no. 262, Annexure 10-1(a), Sr. No.7, Column No. 8.) : 6650.000 Mcum
- 2) As per Govt. letter No. Misc/2002/(17/02)/WRI, dated 20/10/2004 sanctioned water utilization in Ulhas sub basin. : 3059.000 Mcum

The name of Bhavali Pumped Storage Project is not included in Integrated State Water Plan (ISWP) of WRD Maharashtra. The field Chief Engineer should take necessary steps to include the name of this Project in ISWP of Ulhas Sub Basin.

2.4 Yield in Ulhas Sub basin:	:	6650.000 Mcum
1) Yield available in Ulhas sub basin.	:	3059.000 Mcum
2) Sanctioned water utilization	:	1004.887 Mcum
3) Utilization of projects as per certificates issued by CE, HP, Nashik in Ulhas sub basin from 24/12/2003 to 03/01/2012.	:	
4) Utilization of projects as per certificates issued by CE, WRD, Konkan Pradesh, Mumbai in Ulhas sub basin from 19/07/2013 to 30/11/2018.	:	6.113 Mcum
5) Utilization of projects as per certificates issued by CE, Hydrology & Dam Safety, Nashik in Ulhas sub basin from 01/12/2018 to till date.	:	44.189 Mcum
6) Total utilization (2+3+4+5)	:	4114.189 Mcum
7) Balance in Ulhas Sub Basin (1-6)	:	2535.811 Mcum

2.5 Effect of proposed project on downstream project:

Bhatsa Project is an existing project on downstream of proposed Lower Dam of Bhavali Pumped Storage Project. The 17.84 Mcum of water required for one time filling & 0.991 Mcum of water required for every year will be stored in lower reservoir during that period of monsoon whenever there are spillway releases from Bhatsa dam. So the surplus quantity of water available at Bhatsa dam will be used for this project, hence there will be no effect of this lower dam on Bhatsa project.

2.6 Guidelines to be followed during operation of PSP:

- 1) **Regarding one time filling:** As per reference letter no. 5 to allocate 17.84 Mcum of water for one time filling of reservoir, it is presumed that in a good water year whenever there are spillway releases in monsoon from Bhatsa dam, water need to be stored in lower dam of PSP for One time filling. However GoM WRD will not guarantee that the required water will be available in three consecutive years as per the construction program of 36 months.
- 2) **Regarding water required for every year:** If in case it happens not to be a good year, water equivalent to the evaporation & other losses should be released from the proposed lower reservoir of the PSP to the Bhatsa reservoir in order not to affect any water planning of the Bhatsa dam as agreed by the promoter in letter under reference no. 3.
- 3) **Information to be submitted during monsoon:** During rainy season from 7th June to 31st October, promoter will be required to submit daily information to the Chief Engineer, WRD, Kokan Region, Mumbai regarding the water level of the lower dam, water storage and water pumped back from lower to the upper dam.
- 4) **Regarding yield at upper dam:** As per direction of the Hon'ble High Court through order dated 23/09/2016 in PIL No. 173/2013 new irrigation projects cannot be taken upstream of Jayakwadi dam, there are constraints to store water coming from catchment of upper dam region. So promoter should not store any water coming from catchment of upper dam region, and it should be released to downstream Bhavali project. The water to be used for PSP should be strictly pumped from lower dam only.
- 5) **Water Charges :** It will be the responsibility of the field authority to collect the water charges used for one time filling of the dam and water required for every year to compensate the loss due to evaporation.

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2.7 Government Guidelines to issue Water Availability Certificate to Private

Agencies:

As per letter no. Mis-2008/1604/(464/2008)/WRI, Dated - 27/05/2009 Government of Maharashtra, Water Resources Department has instructed to take sanction for Water Availability Study from Government before issuing the results to the concerned agency.

So as per this letter the Water Availability Study of Bhavali Pumped Storage Project (1500 MW) of JSW Neo Energy Limited (Lower Dam), Tal-Shahapur, Dist-Thane was submitted to Government of Maharashtra, Water Resources Department by letter no. CE/H&DS/TS-6/(14/2022)/1850/2022, Dated - 23/08/2022.

Now to issue Water Availability Certificate for Private Agencies Government of Maharashtra, Water Resources Department has informed by letter under reference no. 9 to follow the procedure laid down in letter under reference no. 8.

As per this letter the proposal should fulfill following two requirements.

1) After receiving proposal from Private Agency for Water availability Certificate the concerned Irrigation Development Corporation should check the sanctioned water use, balance water & planning of balance water at proposed project location. If excess water beyond planned utilization is available at proposed project location then consent/sanction should be given for water use of the project.

2) The Chief Engineer, Hydrology & Dam Safety should carry out the yield study at proposed project location and ascertain the available yield. After checking the available yield, sanctioned water utilization at project location and downstream effect, Water Availability Certificate should be issued to the concerned agency.

The Bhavali Pumped Storage Project (1500 MW) of JSW Neo Energy Limited (Lower Dam) Tal-Shahapur, Dist-Thane has fulfilled above both requirements.

Both the requirements are fulfilled hence Water Availability Certificate is being issued.

3.0 Conclusion

The study concludes the following:

- 1) Water balance in Ulhas sub basin as per present planning in ISWP -WFR Basin is 2535.811 Mcum.
- 2) Yield available at proposed Lower Dam of Bhavali Pumped Storage Project site at 90% dependability is 4.387 Mcum as against the demand of 0.991 Mcum.
- 3) Water requirement of 17.84 Mcum for one time filling in of reservoir will be made available whenever there are spillway releases in monsoon from Bhatsa dam.
- 4) There will be no effect on Bhatsa Project due to construction of proposed Lower Dam of Bhavali Pumped Storage Project. As the water required for one time filling & for every year will be stored during that period of monsoon whenever there are spillway releases from Bhatsa dam, so there will be no effect of this lower dam on Bhatsa project.
- 5) It is presumed that, the project is planned in accordance with the provision in the State Water Policy and provisions in approved ISWP of WFR basin implementation strategy. Inclusion of this project in ISWP will be done in due course by field Chief Engineer.

6) The observance of the restrictions laid down by the dispute Tribunals/ Honorable Court/ Commissions/ Committee is left to the concerned Chief Engineer or the authority.

So the Water Availability Certificate for 0.991 Mcum at 90% dependability (with one time filling requirement of 17.84 Mcum) is issued to the proposed Lower Dam of Bhavali Pumped Storage Project, Tal-Shahapur, Dist-Thane in Ulhas sub basin of West Flowing River Basin.

(C. H. Dhum)
Executive Engineer
Water Planning Division
Nashik

(M. S. Amale)
Superintending Engineer
Data Analysis Circle
Nashik

(S. S. Pagar)
Chief Engineer,
Hydrology & Dam Safety
Nashik.

JSW Neo Energy Limited
Bhavali Pumped Storage Project (6 X 250 MW)

Monsoon Rainfall Data of Kothale Raingauge Station in mm

Year	June	July	Aug	Sept	Oct	Monsoon rainfall
1973	478.9	1257.3	891.6	889.1	34.7	3551.6
1974	281.9	793.4	846.7	367.8	138.6	2428.4
1975	631.2	922.0	1045.1	619.0	62.9	3280.2
1976	914.4	2148.7	912.9	3071.1	0.5	7047.6
1977	798.9	1205.4	744.0	528.0	104.6	3380.9
1978	630.4	771.6	709.6	295.5	77.7	2484.8
1979	418.8	965.7	1085.6	238.9	93.5	2802.5
1980	901.7	1083.0	1214.8	310.6	37.4	3547.5
1981	404.0	1478.1	698.7	602.4	64.7	3247.9
1982	271.3	702.9	1113.6	226.4	13.8	2328.0
1983	468.8	1086.0	1117.2	540.6	177.4	3390.0
1984	402.8	1152.2	742.0	254.0	198.2	2749.2
1985	533.6	858.8	761.4	218.6	110.8	2483.2
1986	472.1	865.0	805.4	75.2	30.6	2248.3
1987	121.8	754.1	931.0	109.0	39.4	1955.3
1988	349.0	1330.6	981.6	732.2	122.0	3515.4
1989	159.0	725.8	582.2	299.2	132.6	1898.8
1990	437.5	862.5	1005.0	332.7	98.8	2736.5
1991	36.3	1309.5	670.1	270.3	0.0	2286.2
1992	445.2	812.9	1016.5	392.9	36.3	2703.8
1993	459.4	1455.8	647.4	592.2	144.0	3298.8
1994	759.3	1181.3	1028.0	568.8	37.4	3574.8
1995	199.8	971.6	298.1	530.7	126.6	2126.8
1996	312.4	988.0	122.5	1003.5	133.7	2560.1
1997	347.4	1231.2	1399.4	286.0	52.2	3316.2
1998	335.2	920.4	771.5	1003.6	207.0	3237.7
1999	584.2	820.6	547.6	680.7	269.0	2902.1
2000	278.5	995.8	731.1	229.2	212.0	2446.6
2001	830.4	1158.1	691.1	356.4	165.0	3201.0
2002	971.6	366.0	949.6	293.2	0.0	2580.4
2003	605.6	1200.8	876.2	806.6	17.2	3506.4
2004	612.2	875.6	1796.6	422.6	142.6	3849.6
2005	1644.4	1419.4	825.6	880.0	147.6	4917.0
2006	597.3	1787.4	1579.6	610.9	143.9	4719.1
2007	681.6	989.5	1035.0	537.0	0.0	3243.1
2008	758.8	786.2	994.4	931.8	66.8	3538.0
2009	82.8	1037.9	308.8	326.8	102.2	1858.5
2010	461.6	821.0	796.6	384.9	169.0	2633.1
2011	336.4	757.6	1258.2	471.8	70.2	2894.2
2012	341.4	1053.2	750.0	631.0	194.0	2969.6
2013	591.0	1451.0	1604.0	2052.0	2086.0	7784.0
2014	104.6	878.6	1537.0	1953.0	1983.0	6456.2
2015	135.0	176.0	65.0	72.0	24.0	472.0
2016	50.0	236.0	199.0	73.0	10.0	568.0
2017	202.0	268.0	178.0	73.0	20.0	741.0
2018	113.0	245.0	89.0	18.0	6.0	471.0
2019	97.0	410.0	245.0	192.0	23.0	967.0

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JSW Neo Energy Limited
Bhavali Pumped Storage Project (6 X 250 MW)

Yield Calculation of Lower Dam, Tal - Shahapur, Dist -Thane under Bhavali Pumped Storage Project

Sr. No.	Year	Monsoon Rainfall at Kothale Rain Gauge station (mm)	Monsoon Yield in mm by equation of Bhatsa Dam (R=0.7890*P-128.0288)	Catchment area (Km ²)	Monsoon Yield (Mcum)
1	1973	3551.6	2674.2	7.32	19.575
2	1974	2428.4	1788.0	7.32	13.088
3	1975	3280.2	2460.0	7.32	18.008
4	1976	7047.6	5432.5	7.32	39.766
5	1977	3380.9	2539.5	7.32	18.589
6	1978	2484.8	1832.5	7.32	13.414
7	1979	2802.5	2083.1	7.32	15.249
8	1980	3547.5	2670.9	7.32	19.551
9	1981	3247.9	2434.6	7.32	17.821
10	1982	2328.0	1708.8	7.32	12.508
11	1983	3390.0	2546.7	7.32	18.642
12	1984	2749.2	2041.1	7.32	14.941
13	1985	2483.2	1831.2	7.32	13.405
14	1986	2248.3	1645.9	7.32	12.048
15	1987	1955.3	1414.7	7.32	10.356
16	1988	3515.4	2645.6	7.32	19.366
17	1989	1898.8	1370.1	7.32	10.029
18	1990	2736.5	2031.1	7.32	14.867
19	1991	2286.2	1675.8	7.32	12.267
20	1992	2703.8	2005.3	7.32	14.679
21	1993	3298.8	2474.7	7.32	18.115
22	1994	3574.8	2692.5	7.32	19.709
23	1995	2126.8	1550.0	7.32	11.346
24	1996	2560.1	1891.9	7.32	13.849
25	1997	3316.2	2488.5	7.32	18.215
26	1998	3237.7	2426.5	7.32	17.762
27	1999	2902.1	2161.7	7.32	15.824
28	2000	2446.6	1802.3	7.32	13.193
29	2001	3201.0	2397.6	7.32	17.550
30	2002	2580.4	1907.9	7.32	13.966
31	2003	3506.4	2638.5	7.32	19.314
32	2004	3849.6	2909.3	7.32	21.296
33	2005	4917.0	3751.5	7.32	27.461
34	2006	4719.1	3595.3	7.32	26.318
35	2007	3243.1	2430.8	7.32	17.793
36	2008	3538.0	2663.5	7.32	19.496
37	2009	1858.5	1338.3	7.32	9.797
38	2010	2633.1	1949.5	7.32	14.270
39	2011	2894.2	2155.5	7.32	15.778
40	2012	2969.6	2215.0	7.32	16.214
41	2013	7784.0	6013.5	7.32	44.019
42	2014	6456.2	4965.9	7.32	36.350
43	2015	472.0	244.4	7.32	1.789
44	2016	568.0	320.1	7.32	2.343
45	2017	741.0	456.6	7.32	3.342
46	2018	471.0	243.6	7.32	1.783
47	2019	967.0	634.9	7.32	4.648

Yield arranged in Descending order			
Sr. No.	Year	Annual Yield (Mcum)	Remarks
1	2013	44.019	
2	1976	39.766	
3	2014	36.350	
4	2005	27.461	
5	2006	26.318	
6	2004	21.296	
7	1994	19.709	
8	1973	19.575	
9	1980	19.551	
10	2008	19.496	
11	1988	19.366	
12	2003	19.314	
13	1983	18.642	
14	1977	18.589	
15	1997	18.215	
16	1993	18.115	
17	1975	18.008	
18	1981	17.821	
19	2007	17.793	
20	1998	17.762	
21	2001	17.550	
22	2012	16.214	
23	1999	15.824	
24	2011	15.778	50% Dependable Yield 15.778 Mcum
25	1979	15.249	
26	1984	14.941	
27	1990	14.867	
28	1992	14.679	
29	2010	14.270	
30	2002	13.966	
31	1996	13.849	
32	1978	13.414	
33	1985	13.405	
34	2000	13.193	
35	1974	13.088	
36	1982	12.508	75% Dependable Yield 12.508 Mcum
37	1991	12.267	
38	1986	12.048	
39	1995	11.346	
40	1987	10.356	
41	1989	10.029	
42	2009	9.797	
43	2019	4.648	90% Dependable Yield 4.387 Mcum
44	2017	3.342	
45	2016	2.343	
46	2015	1.789	
47	2018	1.783	

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JSW Neo Energy Limited
Bhavali Pumped Storage Project (6 X 250 MW)

Evaporation loss calculation of Upper & Lower Dam

1) Upper Reservoir

Full Supply Level (FRL) of Reservoir	: 745.0 m
Minimum Draw Down Level (MDDL) of Reservoir	: 728.0 m
Surface area of reservoir at FRL	: 0.699 Sq km
Surface area of reservoir at MDDL	: 0.356 Sq km
Average Surface area of reservoir	: 0.528 Sq km
Capacity of reservoir at FRL	: 16.424 Mcum (0.58 TMC)
Capacity of reservoir at MDDL	: 6.513 Mcum (0.23 TMC)

2) Lower Reservoir

Full Supply Level (FRL) of Reservoir	: 300.0 m
Minimum Draw Down Level (MDDL) of Reservoir	: 270.0 m
Surface area of reservoir at FRL	: 0.524 Sq km
Surface area of reservoir at MDDL	: 0.107 Sq km
Average Surface area of reservoir	: 0.316 Sq km
Capacity of reservoir at FRL	: 11.327 Mcum (0.40 TMC)
Capacity of reservoir at MDDL	: 1.416 Mcum (0.05 TMC)

Bhavali Pumped Storage Project (6 X 250 MW), Tal - Igatpuri, Dist - Nashik

Monthly Evaporation of Padali (Mukane)

Sr. No.	Year/Month	January	February	March	April	May	June	July	August	September	October	November	December
1	2002				320.4	248.8	144.5	154.0	133.2	161.9	274.4	281.1	288.0
2	2003	288.0	298.0	350.0	301.6	328.4	166.5	100.6	103.4	89.3	116.4	133.6	148.9
3	2004	205.0	198.9	193.7	303.0	306.1	177.5	82.4	93.1	98.2	174.5	197.3	207.5
4	2005	185.0	193.0	286.5	276.0	308.0	182.8	120.8	90.8	106.1	180.1	230.0	275.5
5	2006	274.0	255.5	291.0	291.0	301.0	162.8	132.9	116.8	129.3	190.3	216.2	216.0
6	2007	235.0	236.0	281.0	282.0	324.0	189.8	106.2	106.2	104.3	187.0	159.9	260.0
7	2008	260.0	249.6	287.0	301.0	339.0	151.4	113.6	130.4	128.2	189.1	226.0	242.0
8	2009	224.0	203.0	260.4	274.0	294.5	223.0	106.6	108.9	160.8	197.2	99.5	102.5
9	2010	98.7	95.3	121.2	164.4	187.0	129.7	86.4	90.8	87.4	106.0	96.9	105.4
10	2011	108.6	107.9	142.3	169.6	182.2	123.7	93.6	82.8	86.4	97.1	95.5	97.8
11	2012	101.9	86.8	160.5	223.1	263.0	208.5	83.7	80.3	80.9	166.1	184.4	169.6
12	2013	124.7	156.4	216.5	245.1	279.1	112.8	82.8	81.8	75.6	101.6	195.9	215.2
13	2014	206.9	157.7	168.3	239.2	265.3	202.3	150.5	108.7	128.9	135.7	137.4	125.7
14	2015	130.1	149.4	168.0	220.3	302.4	171.2	129.6	120.6	128.0	141.0	126.6	127.1
15	2016	128.4	163.7	209.8	246.2	269.4	166.5	106.6	113.0	119.0	125.6	121.6	121.6
16	2017	116.5	142.6	183.9	219.8	248.4	170.6	104.1	111.6	122.6	130.6	115.8	107.0
17	2018	117.4	137.2	197.0	221.8	249.8	167.7	100.4	98.2	134.0	189.0	161.4	114.1
18	2019	114.4	140.5	215.0	244.8	256.6	186.2	131.8	125.8	118.8	131.2	116.2	109.2
19	2020	119.6	140.8	181.0	229.4	268.8	169.6	141.8	118.3	122.6	123.0	105.0	97.4
20	2021	118.2	113.0	172.8	202.6	182.2	145.4	133.8	119.6	107.0	115.6	99.4	81.1
	Monthly Average	166.1	169.7	215.0	248.8	270.2	167.6	113.1	106.7	114.5	153.6	155.0	160.6

Bhavali Pumped Storage Project (6 X 250 MW), Tal - Igatpuri, Dist - Nashik

Monthly Evaporation of Bhatsanagar

Sr. No.	Year/Month	January	February	March	April	May	June	July	August	September	October	November	December
1	2002	145.4	193.3	218.1	254.3	258.7	80.5	62.1	35.2	59.5	151.3	149.8	145.9
2	2003	145.6	154.3	256.8	241.6	241.5	132.9	35.4	52.5	44.1	111.8	114.2	129.7
3	2004	120.0	103.2	166.5	157.2	158.7	43.5	24.9	15.3	48.8	116.1	120.9	120.1
4	2005	135.3	151.8	230.9	255.1	240.5	122.5	17.2	16.0	24.8	90.5	130.8	109.1
5	2006	128.0	162.4	183.5	232.1	217.5	13.5	2.1	5.8	40.1	98.7	113.5	124.1
6	2007	136.1	129.0	213.2	243.2	246.9	126.7	76.0	51.2	31.7	133.3	130.0	146.0
7	2008	135.2	160.8	244.9	242.2	234.6	86.1	55.4	55.7	68.3	118.1	131.0	125.7
8	2009	145.8	184.4	253.9	266.3	242.6	175.1	30.7	54.9	56.9	96.4	86.8	92.7
9	2010	113.0	107.3	141.6	178.1	158.7	42.8	1.0	12.5	22.7	62.8	91.3	109.3
10	2011	164.3	168.7	211.1	224.3	225.3	26.5	2.0	10.9	10.5	84.6	148.5	182.1
11	2012	174.8	171.9	195.4	215.9	185.7	50.8	9.1	4.7	27.7	79.9	126.7	123.7
12	2013	133.5	146.2	173.9	172.5	265.1	27.2	0.0	10.9	14.8	120.7	132.6	149.8
13	2014	150.0	148.2	162.0	184.5	185.6	103.3	9.1	10.9	73.0	114.6	177.5	109.4
14	2015	148.8	150.8	202.3	218.0	276.0	56.7	9.1	0.0	7.4	93.3	51.8	162.0
15	2016	196.4	217.1	255.8	275.5	253.5	78.5	0.0	0.0	0.0	143.7	177.7	187.8
16	2017	188.2	183.0	204.4	218.2	229.3	6.0	0.0	16.5	50.5	133.8	139.4	113.5
17	2018	142.4	162.2	177.0	181.0	192.2	23.2	0.0	0.0	19.2	119.7	138.8	151.1
18	2019	147.8	138.0	151.6	150.8	179.3	58.2	0.0	0.0	10.9	58.9	110.2	173.5
19	2020	174.0	187.5	199.5	194.8	186.8	14.0	0.0	0.0	0.0	72.6	125.2	132.9
20	2021	138.1	140.4	178.6	179.7	132.7	65.4	79.0	85.0	77.0	163.8	158.3	172.9
	Monthly Average	148.1	158.0	201.0	214.3	215.6	66.7	20.7	21.9	34.4	108.2	127.7	138.1

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JSW Neo Energy Limited
Bhavali Pumped Storage Project (6 X 250 MW)

Upper Dam Evaporation Loss

Month	Average monthly evaporation of Padali station (mm)	Mesh correction factor	Seasonal coefficients	Avg. corrected monthly evaporation of Padali station (mm)	Avg. Surface Area of Upper Reservoir (Sq. Km)	Evaporation loss from Upper Reservoir (Mcum)
January	166.1	1.144	0.6	114.0	0.528	0.030
February	169.7	1.144	0.8	155.4	0.528	0.041
March	215.0	1.144	0.8	196.8	0.528	0.052
April	248.8	1.144	0.8	227.7	0.528	0.060
May	270.2	1.144	0.8	247.3	0.528	0.065
June	167.6	1.144	0.7	134.2	0.528	0.035
July	113.1	1.144	0.7	90.6	0.528	0.024
August	106.7	1.144	0.7	85.5	0.528	0.023
September	114.5	1.144	0.7	91.7	0.528	0.024
October	153.6	1.144	0.6	105.4	0.528	0.028
November	155.0	1.144	0.6	106.4	0.528	0.028
December	160.6	1.144	0.6	110.2	0.528	0.029
					Total	0.44

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Executive Engineer
 Water Planning Division (yield)
 Nashik-4

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Bhawali Pumped Storage Project (6 X 250 MW)

Lower Dam Evaporation Loss

Month	Average monthly evaporation of Bhatsanagar station (mm)	Mesh correction factor	Seasonal coefficients	Avg. corrected monthly evaporation of Bhatsanagar station (mm)	Avg. Surface Area of Lower Reservoir (Sq. Km)	Evaporation loss from Lower Reservoir (Mcum)
January	148.1	1.144	0.6	101.7	0.316	0.016
February	158.0	1.144	0.8	144.6	0.316	0.023
March	201.0	1.144	0.8	184.0	0.316	0.029
April	214.3	1.144	0.8	196.1	0.316	0.031
May	215.6	1.144	0.8	197.3	0.316	0.031
June	66.7	1.144	0.7	53.4	0.316	0.008
July	20.7	1.144	0.7	16.5	0.316	0.003
August	21.9	1.144	0.7	17.5	0.316	0.003
September	34.4	1.144	0.7	27.5	0.316	0.004
October	108.2	1.144	0.6	74.3	0.316	0.012
November	127.7	1.144	0.6	87.7	0.316	0.014
December	138.1	1.144	0.6	94.8	0.316	0.015
				Total	Total	0.189

Evaporation loss from Upper Dam :	0.440	Mcum
Evaporation loss from Lower Dam :	0.189	Mcum
Total :	0.628	Mcum


Executive Engineer
 Water Planning Division (yield)
 Nashik-4

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A) Water Account of Ulhas Sub basin

Sr. No.	Project Status	Major	Medium	Minor	Total	Remarks
1	Completed					Sanction Utilization As per Govt. Letter No. Misc/2002/(17/02)/WRI, Dated 20/10/2004.
2	Ongoing					
3	New A.A. approved					
4	New unapproved projects but water availability certified	-	-	1055.19	1055.19	
5	Total of Sr. No. 1 to 4				3059.00	
					4114.19	

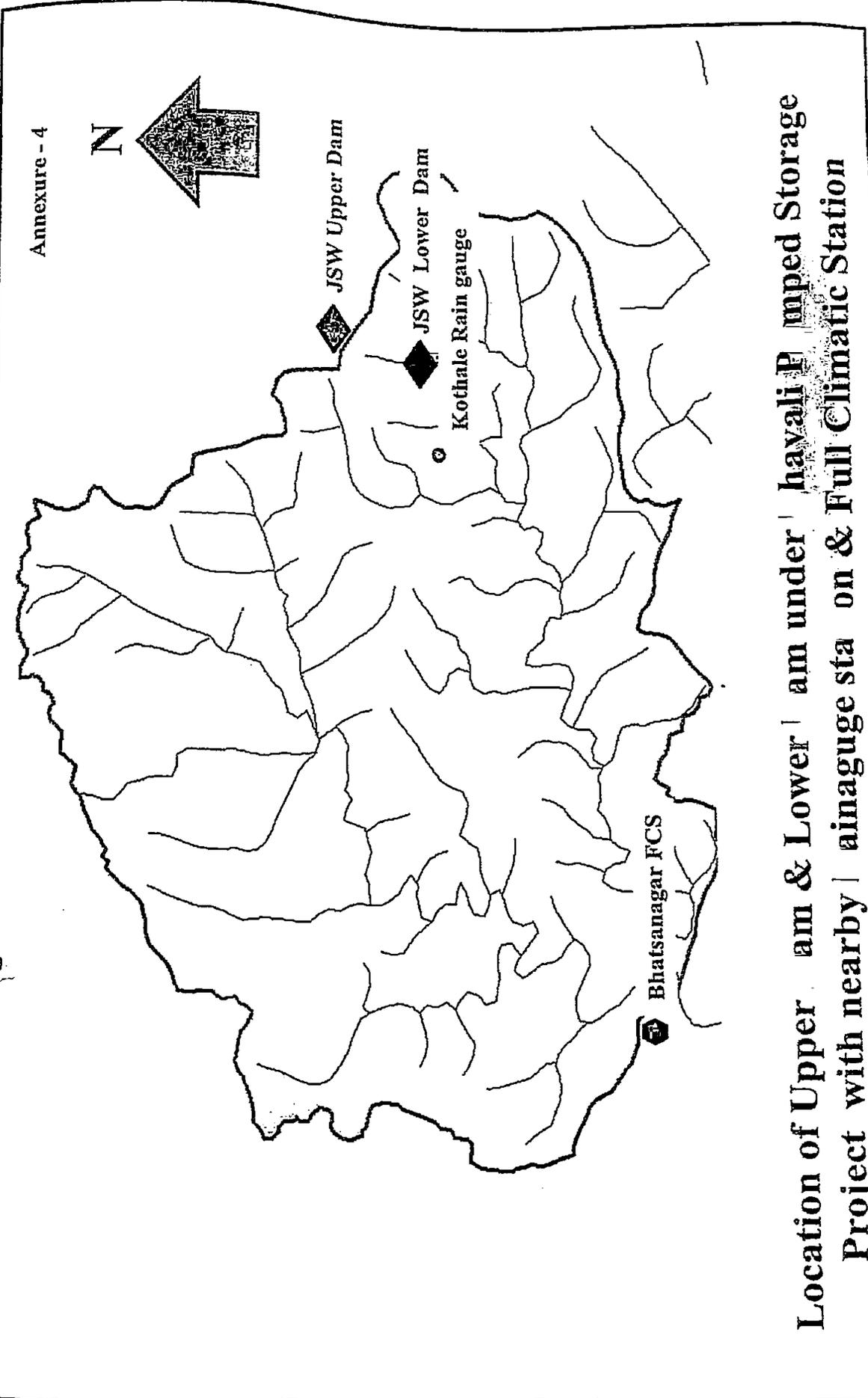
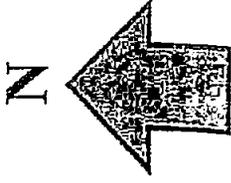
B) Water Account at Bhavali PSP Lower Dam

Sr. No.	Project Status	Major	Medium	Minor	Total	Remarks
1	Completed					As per information supplied by field officers in the proposal.
2	Ongoing		Nil		Nil	
3	New A.A. approved					
4	New unapproved projects but water availability certified		Nil		Nil	
5	Total of Sr. No. 1 to 4				Nil	

C) Water Account of downstream project

A) Bhatsn Irrigation Project

Sr. No.	Project Status	Major	Medium	Minor	Total	Remarks
1	Completed	692.68	-	1.946	694.626	As per list of project attached in ISWP
2	Ongoing	-	-	0.542	0.542	
3	New A.A. approved	-	-	1.934	1.934	
4	New unapproved projects but water availability certified	-	-	25.5	25.5	
5	Total of Sr. No. 1 to 4				722.602	



Location of Upper Dam & Lower Dam under Mahavali Project Storage Project with nearby Rain gauge station & Full Climatic Station