7: General Description of the JALOND Project Site

1. Environment conditions	(1) Upper reservoir			The submerged area involves 178 ha of forest including 88 ha of reserved forest
	(2) Lower reservoir			The submerged area involves 50 ha of non-reserved forest and 5 ha of agricultural land
2. River basin conditions	(1) Upper reservoir	(1) River basin		The rivers in the upper reaches of this river basin branch off into a number of small streams and form a steep mountainous topography with abrupt exposed cliffs. About a third of the area in the lower reaches of the basin presents the topography of a tableland plain which has a number of hamlets dotted here and there.
		(2) Submerged dwellings		On the evidence of the 1/50,000 scale topographical map it appears that there is no submerged dwelling. As the topographical map is rather old, it is conceivable that some dwellings may exist in the reservoir area.
		(3) River bed condition		The rivers in the upper reaches of the basin are generally narrow mountain streams so that they may have few rock debris deposits in the them because of their rapid flow. The tableland type relief of the upper reaches presents an alluvial fan-shaped topography and it is seen as likely that deposits of rock debris have accumulated there. In the tableland plant rock debris is washed down from the upper reaches to form deposits of considerable thickness.
		(4) Circum-reservoir terrain		The reservoir is located somewhere in the middle of the tableland plain and the area surrounding it consists of a tableland type plain extending over a broad range so that there is every reason to suppose that the rock debris talus in the vicinity of the reservoir might fall down or slide into the reservoir as a result of changes in reservoir water level.
	(2) Lower reservoir	(1) River basin		In the most upstream end of the basin, there is a watershed peak consisting of an exposed cliff wall approximately 1,000m high. The terrain then gradually dips at an increasingly more gentle gradient to the dam site. The parts surrounding the reservoir present an alluvial fan-shaped relief, and the rivers too have a gentler gradient.
		(2) Submerged dwellings		As the reservoir area is located in the most upstream end of the alluvial fan-shaped terrain, there is no submerged dwelling in the basin.
		(3) River bed condition		The topography of the surrounds of the upper reaches of the basin is marked by the presence of ravines and valleys with exposed fresh bed rock. The terrain around the middle reaches presents a weathered surface, with talus of rock debris having settled on the river bed. At the reservoir, the topography has an alluvial fan-shaped appearance. It is estimated that the deposits of washed-down rock debris are of somewhat deep.
		(4) Circum-reservoir terrain		The terrain around the reservoir presents a fairly gentle gradient, with progressive weathering of the surface. There is reason to fear that the rock debris deposits may slightly collapse or slide as a result of variation in the reservoir water level.
	(3) Changes in river basin			At an elevation of approximately 1,000m, the relief consists of a watershed peak in the form of a precipitous cliff wall extending to a southward direction. This peak divides the upper and lower reservoirs, with the upper reservoir reaches on the northern side at a gently dipped terrain and the lower reservoir on the south side.
3. Location and condition of structures	(1) Upper reservoir dam	(1) Dam site status		Situated in a flat tableland, the river bed is flanked by cliffs on either side. On both banks, the mountainous cliffs bordering the river give way to a flat hinterland it may be assumed that there are whethered layers on the surface near the abutment on both banks.
		(2) Dam		The narrow river bed is flanked by mountainous cliffs on both sides. This suggests that the rock bed is exposed. The mountainous cliffs on either side of the river consist of eroded fresh rock with somewhat whethered depth, and while much will depend on the survey to establish the extent to which the rock bed has weathered, it is certainly fair to comment that it would be difficult to increase the dam height any further.
	(2) Lower reservoir dam	(1) Dam site status		The dam site has a relatively large width and its deposits is supposed to be rock debris. However, it is unlikely that this deposits is of significant depth. On both banks, the relief is dipped at a steep gradient, and observation suggests that the weathered layer is not deep.
		(2) Dam		The dam site presents the shortcoming that the river bed in this position is relatively wide, but otherwise there are no factors that might become a problems.
	(3) Waterway route	(1) Geographical profile		The stretch from the upper reservoir to the watershed peak consisting of the overhanging cliff is a plain so that the headrace has shallow overburden which needs deepening. To deepen it, it is necessary to construct a inclined tunnel from the intake. In terms of the layout of the waterway system, it can also be seen that the topography presents a gentle slope once the precipitous cliff is passed.
		(2) Layout		The route of the waterway system needs to be selected by taking into account the topographical features. The layout of the waterway is determined in such a manner as to locate the powerhouse as close as possible to the lower reservoir.
	(4) Intake and outlet			Inclined structure is adopted for the intake considering the headrace overburden. Certain consideration must be given, however, to the shallowness of the water depth when the design for this structure is prepared. For the outlet, however, ordinary horizontal structure can be used.
	(5) Surge tank			Since the waterway from the powerhouse to the intake has a length in the order of 2,000m, arrangements are made to have surge tank on as the downstream side as possible of the waterway system to control water pressure taking into consideration of the topographical conditionse. On the outlet side, however, no surge tanks is required because of the short length of the tailrace.
	(6) Powerhouse			The powerhouse is situated as close as possible to the lower reservoir and needs to be constructed in a position deep underground so as to ensure stability for the cavity structure that constructs the powerhouse and the transformer room.
4. Access road and tunnel	(1) Upper and lower reservoirs			A new road of approximately 15km length should be construct to run to the upper reservoir from the existing road which goes to Valhivre village. For access to the lower reservoir, it is necessary to construct a new road of some 25km length branching from Panhinai village.
	(2) Access tunnel to powerhouse			Facing the powerhouse from the right bank of the lower reservoir, the construction of an approximately 1,000m long access tunnel is planned.
	(3) Cable tunnel			The plan is to construct a inclined type cable tunnel to connect the powerhouse with the adjoining transformer room. The switchyard is to be positioned in the relatively flat location on the right bank of the lower reservoir.
5. Power transmission lines				To construct the 400kV double circuits (including return way), double conductors, 1km from Jalond PPS connected to Bableshwar-Kalwa transmission line.
6. General evaluation				In view of the large reservoir capacity and the short length of the waterway of only 3.3km, this site offers favorable economic effectiveness for the siting of this project. Yet, it is quite essential to execute the detailed topographical survey for ensuring the reservoir capacity and the submerged area of the upper reservoir because the river basin and the river banks consist of the flat plateau and the steep cliff respectively.

Sheet rock

Open mixed jungle

Devrān Ohol

Kumshet

Open scrub

880

904

Open

Mula R

R E S E R V E D F O R E S T

Omda Dongar

Open mixed jungle

Potajchiwadi

Bahiroba Na

Ghodishep

1028

1149

Bayroba Don

Mahālondi Dara

Open scrub

Umbar Dara

Sheet rock

Open mixed

Dadar Dongar

1206

Napta Dongar

Bandeshetwadi

Raksha Ohol

634 Bahiroba Matha

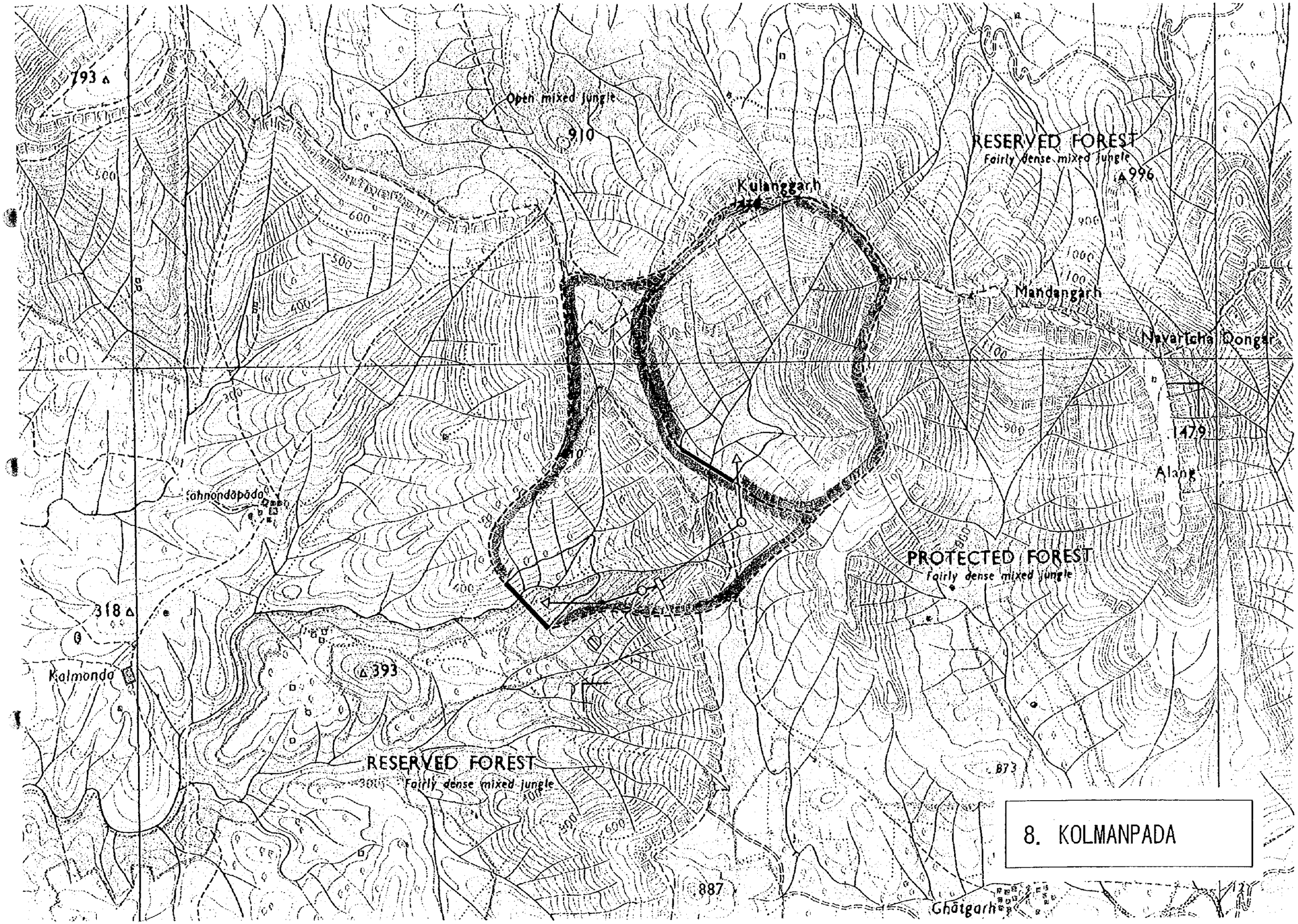
Navalwadi

224

7. JALOND

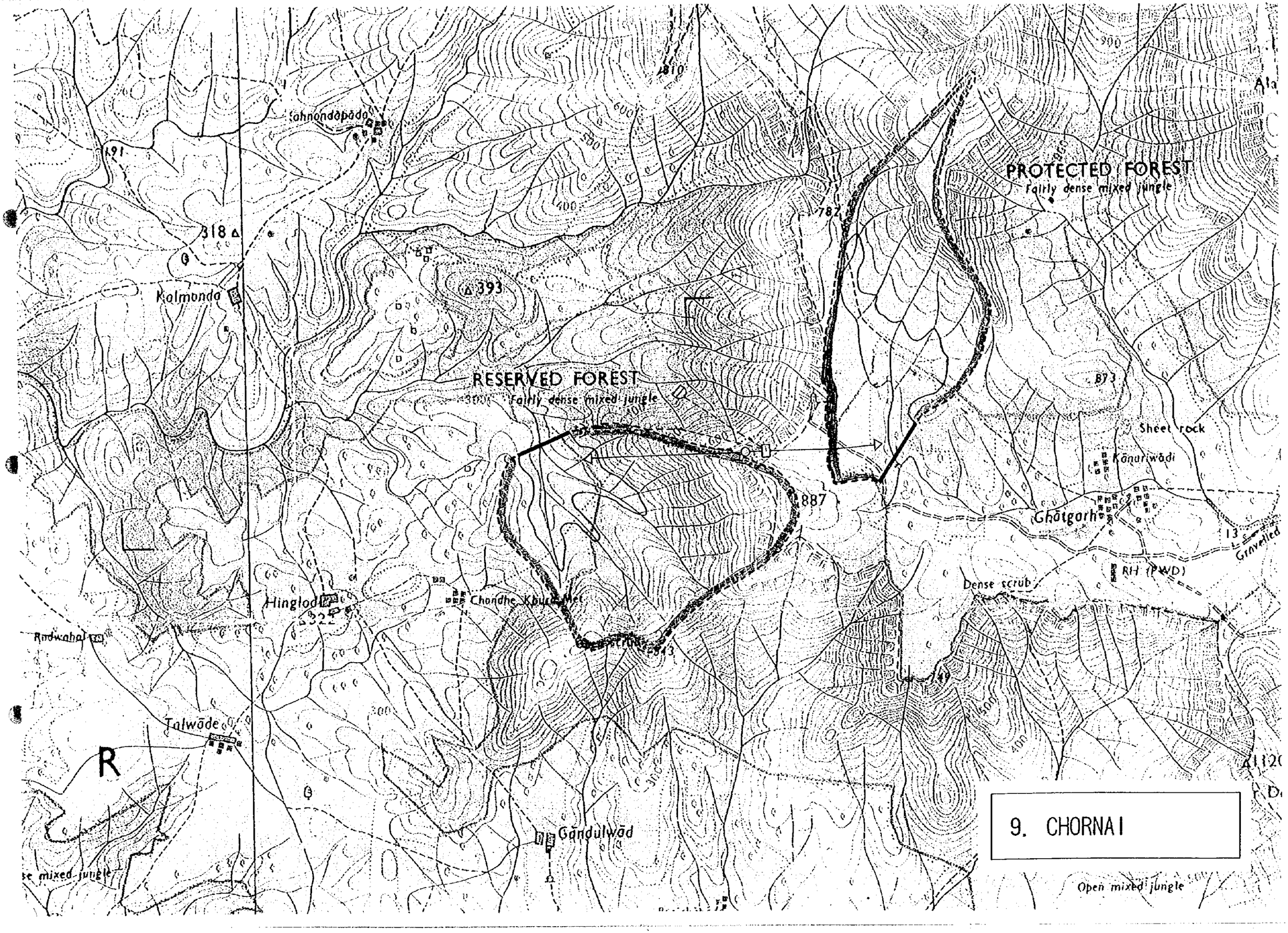
8: General Description of the KOLMANPADA Project Site

1. Environment conditions	(1) Upper reservoir			The submerged area involves 35 ha of reserved forest
	(2) Lower reservoir			The submerged area involves 7 ha of reserved forest and 10 ha of agricultural land
2. River basin conditions	(1) Upper reservoir	(1) River basin		In the vicinity of the most upstream end of this river basin, the topography is characterized by sharp cliffs and steep slopes. Precipitous cliffs are also present in the middle reaches of the basin. Farther down from these cliffs to the lower reaches, the river dips at a relatively gentle gradient. In the vicinity of the reservoir the topography becomes flat.
		(2) Submerged dwellings		On the evidence of the 1/50,000 scale topographical map it appears that there is no submerged dwelling.
		(3) River bed condition		The rivers in this river basin branch off into a number of small streams roughly at right angles in respect to the main river. Up to the cliffs in the middle reaches, the rivers show little erosion. Yet farther down toward the lower reaches, the main stream and the side small streams on the left bank are supposed to show more advanced erosion. In the plain surrounding the reservoir, there are talus of rock debris.
		(4) Circum-reservoir terrain		The terrain surrounding the reservoir forms a gently sloping plain. The surrounding terrain is most likely to be covered with rock debris deposits carried by the river from the upper reaches.
	(2) Lower reservoir	(1) River basin		The upper reaches of the basin form watershed peak which is surrounded by precipitous cliffs. Up to the vicinity of the reservoir the terrain slopes at a steep gradient. Towards the reservoir, however, the topography shows a gentle gradient.
		(2) Submerged dwellings		As the basin consists of rapid torrents, there is no submerged dwelling in the basin.
		(3) River bed condition		Except for the most upstream end of the basin, the findings suggest that erosion in the main stream has progressed to a significant extent. The river bed around the dam is believed to be covered with rock debris deposits washed down from the upper reaches.
		(4) Circum-reservoir terrain		Except for the right bank of the reservoir, the upper reaches and the left bank area present a gently inclined topography, with evidence to suggest the presence of rock debris deposits along the river. On the left bank there is evidence to indicate that rock debris deposits have been washed down by the river from the upper reservoir and collapsed or entrained onto the river bed.
	(3) Changes in river basin			The river in the upper reservoir reaches which is large on the eastern side meanders past precipitous cliffs to merge with the river of the lower reservoir immediately above the downstream dam site. For this reason, this project site requires no changes to the river flow in the basin.
3. Location and condition of structures	(1) Upper reservoir dam	(1) Dam site status		The river bed has a large width and is flanked on both sides with a flat topography. It appears that rock debris has accumulated either as a result of rock caving in or being washed down. The topographical findings indicate that it would be difficult, if not impossible, to raise the dam height any further.
		(2) Dam		In view of the dam site with its base and long length, this sites affords a comparatively unfavorable water storage efficiency.
	(2) Lower reservoir dam	(1) Dam site status		The narrow width of the river bed and the steep relief on the right bank contrasts with the gently sloping terrain on the left bank. While the river bed is believed to have thin deposits of rock debris, there is a possibility of the presence of rock debris deposits having formed on the left bank as a result of rock collapse.
		(2) Dam		In view of the very favorable topographical condition the selection of the site presents no problem for the dam site. Difficulties may arise, however, if the left bank is found to have collapse rock debris deposits. Nor will the dam offer a satisfactory storage capacity even if it is raised, and in any event, the topographical conditions impose limits on the extent to which the dam height can be raised beyond that.
	(3) Waterway route	(1) Geographical profile		The route of the waterway system is selected by taking into account the positional relationships for the dam site in the lower reservoir and the topographical conditions. The topography of the waterway route is characterized by a somewhat flat relief on the intake side and a shallow overburden so that the powerhouse needs to be sited somewhere midway on the waterway system.
		(2) Layout		For topographical constraints, the waterway route has a bent, curved layout and is relatively short. To deepen the headrace, the intake is to have a morning glory type and the powerhouse is to be located somewhere midway on the waterway system.
	(4) Intake and outlet			A morning glory type has been adopted for the intake in view of the headrace overburden. The outlet, however, is to use a standard type.
	(5) Surge tank			In view of the short length of the waterway, it is not necessary to provide surge tank both on the headrace and tailrace sides.
	(6) Powerhouse			The powerhouse needs to be situated somewhere midway in the waterway system to allow for the waterway system arrangement. As a result, all structures related to the powerouse is in an unfavorable position.
4. Access road and tunnel	(1) Upper and lower reservoirs			For access to the upper reservoir, a new road of approximately 25km length will need to be constructed from the existing road passing through Ghatgarh south of the dam site. For access to the lower reservoir, it will be necessary to construct a new long stretch of road of about 40km length and repair the approximately 30km long road from Kathala.
	(2) Access tunnel to powerhouse			The plan is to construct an access tunnel linking the powerhouse with with the right bank of the lower reservoir.
	(3) Cable tunnel			The switchyard is to be constructed on a flat topography and the cable tunnel is to link to the transformer room. In view of the positional relationship with the transformer room, the tunnel is to have a considerable length of over 1,000m.
5. Power transmission lines				To construct the 220kV four circuits (including return way), one conductor, 15km from Kalmanpasa PPS connected to Nasik-Padghe transmission line.
6. General evaluation				Since the waterway system has a comparatively short length, the capacity of the lower reservoir is subject to the limitations imposed by the topography. The results is a poor economic effectiveness. Though the site does not require any diversion of the river flow, it leads to the submerging of some 70ha of forest in the upper reservoir.


793
Open mixed jungle
910
RESERVED FOREST
Fairly dense mixed jungle
996
Kulanggarh
Mandangarh
Navartcha Dongar
1479
Alang
Sahnondapada
318
Kalmonda
393
RESERVED FOREST
Fairly dense mixed jungle
887
PROTECTED FOREST
Fairly dense mixed jungle
873
Ghatgarh
8. KOLMANPADA

9. General Description of the CHORNAI Project Site

1. Environment conditions	(1) Upper reservoir		The submerged area involves 56 ha of reserved forest and 29 ha of agricultural land
	(2) Lower reservoir		The submerged area involves 10 ha of reserved forest
2. River basin conditions	(1) Upper reservoir	(1) River basin	This long and narrow basin has a large number of mountain streams branching off on the left bank along the main river. The most upstream portion dips at a gentle gradient and then changes to a cliff to return to a gently sloping relief. On the right bank, there is a watershed peak taking the shape of a plateau rising to about 700m above sea level. And the stream does not develop.
		(2) Submerged dwellings	On the evidence of the 1/50,000 scale topographical map it appears that there is no submerged dwelling in the basin. As the map is old it now seems likely that there are some submerged dwellings, seeing that there are some hamlets in the plain on the lower reaches.
		(3) River bed condition	The main river forms side streams only on the left side, with the basin as a whole showing a gently sloped topography. The left bank side, in particular, is believed to have deposits of rock debris, with evidence to suggest that rock debris has deposited on the river bed.
		(4) Circum-reservoir terrain	The terrain surrounding the reservoir dips at a gentle gradient so that the areas around the reservoir are likely to have deposits of rock debris.
	(2) Lower reservoir	(1) River basin	The most upstream end, the basin is characterized by the presence of precipitous cliffs, with steep slopes generally present in the middle reaches. Near the reservoir, the terrain becomes flat and forms a plain, with a high probability of deposits of rock debris.
		(2) Submerged dwellings	Downstream of the dam, the terrain is flat, and though there are some hamlets on this plain there is no dwelling upstream of the dam.
		(3) River bed condition	The basin divides into two main rivers immediately upstream of the dam site. Both river flows are supposed to present evidence of erosion. It is inferred that in the rainy season, rock debris from caved-in rock is washed down towards the reservoir to settle with formation of rock debris deposits.
		(4) Circum-reservoir terrain	The terrain around the reservoir presents a gently inclined topography. These gentle slopes are believed to consist of deposits of rock debris which has settled here. As the water level of the reservoir changes, there is the risk that these deposits may slide down towards or into the reservoir.
	(3) Changes in river basin		The collapsed cliff on the west side at an elevation of approximately 700m forms a watershed peak whence the river flow divides into opposite directions, with the rivers of the upper and lower reservoirs flowing parallel to each other.
3. Location and condition of structures	(1) Upper reservoir dam	(1) Dam site status	The basin as a whole has a gently dipped relief with evidence suggesting the presence of rock debris deposits. Rock debris deposits are particularly in evidence in the lower reaches starting from the middle reaches of the basin. It is believed that the rock debris deposits are of considered to be deep at the dam site.
		(2) Dam	On both banks, the terrain dips at a gentle gradient, with evidence to suggest the presence of deep rock debris deposits which are supposed also to cover the river bed. The rock bed is assumed to be progressively weathered. On topographical grounds, it therefore appears difficult to raise the dam height beyond its present height.
	(2) Lower reservoir dam	(1) Dam site status	The terrain surrounding the reservoir abruptly changes to a gentle gradient, and it appears that with the exception of the left bank, the dam site is covered with rock debris deposits while the rock bed is believed to be extensively weathered. On the left bank, in particular, the natural relief is marked by bare mountain ridges dipped at a gentle gradient.
		(2) Dam	The river bed has a large width and the choice of the right bank is not considered to present any problem for the siting of the dam site. On the left bank, however, there are small mountain ridges and the foundation rock bed is believed to have weathered deeply so that it may be concluded that it would be difficult to raise the dam height any further.
	(3) Waterway route	(1) Geographical profile	The route of the waterway system has been selected by taking into account the topographical features. The vertical relief, however, shows a gently sloping pattern so that the location of the powerhouse is layouted at the midway on the waterway.
		(2) Layout	Since the upper reservoir is surrounded by a flat terrain, the intake is to consist of the morning glory type structure in order to provide the necessary head for the headrace. The waterway has a short length of approximately 3,000m. For, topographical reasons, the waterway system has to have a bent, curved layout.
	(4) Intake and outlet		To secure the necessary overburden for the headrace, the intake is to be constructed using a morning glory type structure. For the outlet, however, a normal type structure has been adopted.
	(5) Surge tank		The waterway system has a short stretch and the powerhouse is to be constructed at the midway on this short waterway system. To control the water pressure, it is not necessary to provide a surge tank.
	(6) Powerhouse		The powerhouse is situated at the midway in the waterway system as a result of the prevailing topographical constraints. Consequently, all structures relating to the powerhouse will be relatively costly.
4. Access road and tunnel	(1) Upper and lower reservoirs		The existing road already gives access to the upper reservoir so that it is sufficient to repair this road. To gain access to the lower reservoir, however, it is necessary to construct a new, approximately 25km long road from Kinglod.
	(2) Access tunnel to powerhouse		The access tunnel is to construct from the right bank of the dam along the tailrace to connect to the powerhouse.
	(3) Cable tunnel		Constructing the switchyard at 300m elevation on the right powerhouse bank, the underground cable tunnel is planned to connect the transformer room adjoining the powerhouse by using an inclined tunnel.
5. Power transmission lines			To construct the 400kV one circuit, double conductors, 60km from Chornai PPS to Padghe S/S along the 220kV double circuits transmission line between Nasik S/S and Padghe S/S.
6. General evaluation			While the waterway system is short, the storage capacity of the reservoir is subject to limitations imposed by the topography, with a somewhat low head as of only 400m. As a result, economic performance will be somewhat poor. There is also the disadvantage that some 100ha of forest will be submerged in the upper reservoir and that the project requires the diversion of the river flow.


Tahnondapada
191
318
Kalmonda
810
600
500
400
300
Δ 393
RESERVED FOREST
Fairly dense mixed jungle
782
PROTECTED FOREST
Fairly dense mixed jungle
873
Sheet rock
Kānariwādi
887
Ghatgarh
13
Gravelled
RH (PWD)
Dense scrub
Hinglod
Chondhe Khurd Met
Rudwahal
313
149
Talwāde
R
Gandulwād
Open mixed jungle

9. CHORNAI

10: General Description of the SAVITRI Project Site

1. Environment conditions	(1) Upper reservoir		The submerged area involves 40 ha of reserved forest
	(2) Lower reservoir		The submerged area involves 39 ha of reserved forest and 8 ha of agricultural land
2. River basin conditions	(1) Upper reservoir	(1) River basin	The right river bank has a steep topography. Though there is little evidence of erosion on the right bank, the left bank forms a plateau at its most upstream end. The middle reaches present a relief of steep slopes, dipping at a gentle gradient as it approaches the main stream. The side streams are long and show signs of erosion.
		(2) Submerged dwellings	There are hamlets downstream of the dam site but no dwelling can be found upstream of the dam.
		(3) River bed condition	The right bank has a steep relief with short side streams. The main river and the right bank are believed to show signs of erosion. There is probability that washed-down rock debris has deposited along the main river.
		(4) Circum-reservoir terrain	On the left bank near the reservoir, the terrain presents a steep relief. On the right bank, however, the side streams are long and the parts surrounding the reservoir are marked by steep slopes, with evidence suggesting that rock debris has settled and progressively accumulated.
	(2) Lower reservoir	(1) River basin	The upper reaches of the basin form a watershed peak with abrupt overhanging cliffs in the vicinity of this peak. Up to the reservoir the relief dips at a steep gradient. Somewhat gentler inclines can be found only along the main river.
		(2) Submerged dwellings	Upstream of the dam site the relief is generally steep so that there is no submerged dwelling.
		(3) River bed condition	At an elevation of approximately 750m, the river upstream of the dam site forks off into three side streams, with probability of erosion in the lower reaches starting from the middle reaches of the basin. The river dips at a gentle gradient downstream of the confluence of these streams, with evidence to suggest that rock debris has deposited.
		(4) Circum-reservoir terrain	The terrain around the reservoir has a generally steep gradient, with little evidence to suggest any significant weathering of the land surface.
	(3) Changes in river basin		The rivers feeding the upper and lower reservoirs flow in opposite directions and run virtually parallel to each other in the east-west direction. The river basin is divided by the watershed peak with a maximum elevation of 1,300m.
3. Location and condition of structures	(1) Upper reservoir dam	(1) Dam site status	It is supposed that the river bed is covered with rock debris deposits washed down from the upper reaches. The steeply inclined terrain on the right bank shows no evidence of weathering. In contrast, the relief on the left bank dips at a gentle gradient, with evidence to assume the presence of rock debris deposits and weathered foundation rock bed.
		(2) Dam	The natural relief on the left bank of the dam site is marked by a gently gradient with evidence to suggest that progressive weathering has taken place on the foundation rock bed. It may therefore be of great importance to conduct a thorough investigation of the geological condition prevailing at the abutment. The right bank, however, is flanked by steep slopes so that it may be assumed that weathering has not progressed here.
	(2) Lower reservoir dam	(1) Dam site status	It is assumed that in view of the steepness of the terrain on both banks, no weathering has taken place. The river bed is thought to have some minor deposits of rock debris. The conclusion is that there will be no geological problems to the construction of the dam.
		(2) Dam	On the sole evidence of the topographical map it can be concluded that there are no geological problems to the construction of the dam.
	(3) Waterway route	(1) Geographical profile	The perpendicular relief shows that the elevation drops very abruptly towards the lower reaches of the basin. In terms of the waterway system, it can be seen that the flat part lengthens here. While there are no problems on topographical grounds, the fact is that the waterway becomes somewhat long.
		(2) Layout	Both the headrace and the tailrace have a length of approximately 1km each so that the powerhouse would have to be sited somewhere in the middle of the waterway system. As will be stated later, however, the access to the powerhouse does not present any particular difficulty.
	(4) Intake and outlet		For both the intake and outlet, the ordinary horizontal type structures are adopted.
	(5) Surge tank		In view of the considerable length of the headrace, the plan is arranged a surge tank to mitigate the water pressure. The tailrace is also considerably long so that a surge tank is provided to control the pressure.
	(6) Powerhouse		The powerhouse is situated midway in the waterway system, and the plan tries to reduce the construction costs by arranging the access tunnel and cable tunnel to the powerhouse in such a manner as to make effective use of the topographical conditions.
4. Access road and tunnel	(1) Upper and lower reservoirs		Under the plan, the existing approximately 90km long road from Nondgane in the vicinity of existing Ghoom reservoir's backwater area should be repaired for access to the upper reservoir. Similarly, the existing, approximately 60km long road from Pitalawadi should be repaired for access to the lower reservoir. In addition, the approximately 40km long foot pass road should be repaired to connect the above roads.
	(2) Access tunnel to powerhouse		The project plans to construct an approximately 1km long access tunnel from the left bank of upper reaches of the lower reservoir to connect the powerhouse.
	(3) Cable tunnel		The project plans to provide a cable tunnel to connect the transformer room with the adjoining the powerhouse by using a inclined tunnel from the left bank in the upupstream of the lower reservoir.
5. Power transmission lines			To construct the 400 kV one circut, double conductors, 80 km from Savitri PPS to the planning of New Koyna S/S along the 220 kV double circuits between Kandalgaon S/S and Koyna III S/S
6. General evaluation			While the headrace is comparatively long, the reservoir has a large storage capacity and a high head so that the site offers excellent economic efficiency. Though this site is due for diversion of the river flow, the fact is that the catchment area for the upper reservoir is relatively small at 5.5km^2 so that there will be few submerged forests. Consequently, this site is one of the recommendable project site.

Mahādevmora

Khāndaj

Dhāvli N

Dhāwale

Khopgad

Chondke

643

Open scrub

U

Lāhulse

ābhil

R E S E R V E D F O R E S T

Open mixed jungle

400

500

350

1300

Koleshwar

1222

Open scrub

Dense jungle

Dhangarwāda

Arthur's Se[illegible]ng

R

Open scrub

Elphinstone Point

Mahābaleshwar Temple

△1364

Arnnud fair (Mai)

Kshetra Maha

R E S E R V E D F O R E S T

Dense jungle

10. SAVITRI

11: General Description of the MANDHALIWADI Project Site

1. Environment conditions	(1) Upper reservoir		The submerged area involves 23 ha of reserved forest and 10 ha of agricultural land
	(2) Lower reservoir		The submerged area involves 27 ha of forest including 10 ha of reserved forest as well as 33 ha of agricultural land
2. River basin conditions	(1) Upper reservoir	(1) River basin	The river basin as a whole presents a steep topography, and in the vicinity of the reservoir the terrain is dipped at a gentler gradient. The basin is continuous with the existing Koyna reservoir in the lower reaches.
		(2) Submerged dwellings	In the vicinity of the reservoir, there is already a reservoir, that is, the Koyna reservoir, in existence. The project reservoir is located at the terminal end of the Koyna reservoir. There is no submerged dwelling.
		(3) River bed condition	Evidence of the river bed having been washed or eroded out from the upstream part can be found only in the main river. In the vicinity of the reservoir, the terrain assumes a gentle gradient, with evidence to suggest the presence of rock debris deposits. Near the reservoir, the basin approaches the existing Koyna reservoir. It is estimated that there are somewhat deep deposits.
		(4) Circum-reservoir terrain	The terrain surrounding the reservoir slopes at a gentle gradient, with evidence making it probable that there are deposits of rock debris. With the changes in the reservoir water level it is therefore likely that the rock debris deposits may slide and/or fall down.
	(2) Lower reservoir	(1) River basin	The basin has a steep relief and this steep terrain changes abruptly to more gentler slopes near the reservoir to assume an alluvial fan-shaped topography.
		(2) Submerged dwellings	Near the dam site, there are dwellings both in the upper and lower reaches. The map suggests that there are some submerged dwellings.
		(3) River bed condition	There are not so many side streams on the left bank and the topography indicates that the river bed has been eroded out in the main river and the side streams on the right bank. Towards the reservoir, the river has a gentle gradient, and the rock debris deposits are likely to be somewhat deep.
		(4) Circum-reservoir terrain	The gently dipped land surface in the vicinity of the reservoir is likely to be covered with deposits of rock debris. It can be supposed that rock debris deposits have settled also in the upper reservoir area. With the changes of reservoir water level it may be feared that these deposits may collapse and slide.
	(3) Changes in river basin		The watershed peak at approximately 800m forms the borderline at which the upper reservoir flows down south at the most upstream position of the Koyna reservoir and the lower reservoir flows in the west direction.
3. Location and condition of structures	(1) Upper reservoir dam	(1) Dam site status	The left bank adjoins the end of a steeply inclined mountain ridge while the right bank forms a gently sloped terrain believed to be covered with rock debris deposits. The river bed is located in the most upstream part of the Koyna reservoir. The map suggests that the rock debris deposits are caused by the reservoir.
		(2) Dam	The dam site is located in the most upstream end of the Koyna reservoir. The rock debris deposits due to the reservoir are considered to be of somewhat depth. Even though the foundation rock bed on the left bank does not pose a problem, the gentle slopes on the right bank do, seeing that they are likely to consist of rock debris deposits and that the foundation rock bed has weathered.
	(2) Lower reservoir dam	(1) Dam site status	The terrain adjoining the dam site forms a flat topography and the river bed as well as the banks on both sides form gentle slopes. The dam site as a whole is assumed to be covered with rock debris and the foundation rock bed will be weathered.
		(2) Dam	On topographical evidence, it is feared that both the dam site river bed and the banks on either side have a deep foundation rock bed that has progressively weathered. It will therefore be necessary to exercise adequate caution in the excavation of the foundation and the foundation finishing work.
	(3) Waterway route	(1) Geographical profile	The perpendicular section of the waterway system has been selected by taking into account the topographic conditions prevailing in the basin. Once the watershed peak has been crossed, however, the elevation starts to fall at a sharp gradient. Further downstream, however, the terrain becomes much more even.
		(2) Layout	Penstock pipeline have been adopted from the position past the watershed peak, and the powerhouse is to be installed midway in the waterway system. The layout provides for the connection to the lower reservoir through a long tailrace.
	(4) Intake and outlet		For both the upper and the lower reservoirs, the ordinary type intake and outlet structures are adopted.
	(5) Surge tank		Since the waterway from the powerhouse is relatively short it is possible to omit the construction of surge tank to the headrace. The tailrace tunnel, however, is 2km long so that the project includes for the construction of surge tank to control the water pressure.
	(6) Powerhouse		The powerhouse is located midway on the waterway system, and while the powerhouse itself presents no particular problem, the arrangement of underground structures have to be considered with every effort to make effective use of the topography so as to ensure economic efficiency.
4. Access road and tunnel	(1) Upper and lower reservoirs		There is no road in the vicinity providing access to the upper reservoir so that an inclined tunnel will need to be constructed facing toward the upper reservoir from the entrance of access tunnel of the powerhouse. To reach the lower reservoir, there is a gravel path and it is convenient to repair it.
	(2) Access tunnel to powerhouse		The powerhouse access tunnel is planned so that a entrance is provided at the most upstream part of the lower reservoir. This tunnel of approximately 1km length will provide the connection to the powerhouse.
	(3) Cable tunnel		The project plans a layout for the cable tunnel in which the switchyard is to be constructed on the plain at approximately 400m elevation a little toward the right bank from the tailrace tunnel. This cable tunnel is to connect to the underground transformer room.
5. Power transmission lines			To construct the 400kV one circuit, double conductors, 40km from Madhaiwadi PPS to planning of New Koyana S/S along the planning of 400kV double circuits transmission line between Lonikand S/S and planning of New Koyna S/S through Koyna I &II S/S
6. General evaluation			For not the upper and lower reservoirs, the dam sites have to be layouted on a flat position. Compared with both the dam length and height, it will not be possible to ensure adequate storage capacity. There is also the considerable length of the waterway system . For all of these reasons, it is difficult to describe the project site as being economically favorable. While little forest area will be submerged, the project requires the river flow diversion

Shindevadi

Vasota Fort
(in ruins)

PO

Chorayne
Annual fair (Apr)
159

Dangvadi

Rocky knob

RESERVED FOREST

Open scrub

Open jungle

RESERVED FOR

Dense mixed jungle

948

185

Chaukivadi

399

Sapirdi

Devahvadi

798

Maldev

SHIV SAGAR
(KOYNA RESERVOIR)

Sakhar

Madhlivadi

Kalvantichi Dakp
(Sorin)

Open scrub

e Khurd

rsala N

Yave

548

700

800

900

Jambhulvadi

Open jungle

Bandrevadi

Phanasvadi

Gangechivadi

Bhandvadi

Open scrub

Kurval lavli

11. MADHALIWADI