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BEFORE THE NATIONAL GREEN TRIBUNAL
SITTING AT PUNE

APPLICATION NO. 40 OF 2022

(Under Section 18(1) read with Sections 14 and 20 of the National Green Tribunal Act, 2010)

NOTARY SUBHASH KRISHNA KANEKAR SALCETE TALUKA MARGAO-GOA Regd. No. 344/14 Exp. Dt: 28/02/2027 GOVT. OF GOA (INDIA)

Tulshidas Sridhar Naik and Ors) ...Applicants

Versus

State of Goa and Ors) ...Respondents

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Fernandes

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Fernandes

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BEFORE THE NATIONAL GREEN TRIBUNAL
SITTING AT PUNE

ORIGINAL APPLICATION NO. 117 OF 2024

(Under Section 18(1) read with Sections 14 and 20 of the National Green Tribunal Act, 2010)

NOTARY SUBHASH KRISHNA KANEKAR SALCETE TALUKA MARGAO-GOA Regd.No.344/14 Exp.Dt:28/02/2027 GOVT. OF GOA (INDIA)

IN THE MATTER BETWEEN :

Tulshidas Sridhar Naik and Ors) ...Applicants

Versus

State of Goa and Ors) ...Respondents

AFFIDAVIT ON BEHALF OF THE APPLICANTS

I, Xavier Fernandes, residing at House No 149, Rassaim, Loutolim, Salcete, Goa, the Applicant No 9, herein, do hereby solemnly affirm and declare as under:

1. I say that I have read the contents of the Application and have understood its contents and am therefore competent to file an affidavit in support of the said Application.

2. I state that the documents annexed herein are true copies and have been collected by us through RTI applications and from the websites of the Respondent Authorities.

3. I say that I am filing the present Affidavit to give sufficient documentary evidence as directed by this Hon'ble Tribunal to support the claim of the Appellants that the area of the project would exceed 1,50,000 mtrs, and would thus require the Respondents to obtain a prior Environment Clearance under the EIA Notification, 2006.

NOTARY SUBHASH KRISHNA KANEKAR SALCETE TALUKA MARGAO-GOA Regd.No.344/14 Exp.Dt:28/02/2027 GOVT. OF GOA (INDIA)

4. I say that the Applicants herein have filed Application No. 117 of 2024 under Sections 14 and 20 read with Section 18(1) of the National Green Tribunal Act, 2010, seeking directions of this Hon'ble Tribunal to respondent No.1-Chief Secretary, Government of Goa, respondent No.3-Executive Engineer, Works Division XV (NH), Public Works Department, respondent No.4 – Chief Engineer (NH, R&B), Public Works Department and respondent No.5 – Ministry of Road Transport & Highways be directed to reconsider or re-design and

selection of the alternative for `proposed construction of High Level New Borim Bridge on NH-17B (NH-566) in the State of Goa, because the present design/alignment of the project fails to identify and consider the presence of CRZ areas, forest areas and environmental preservation and the impact on these eco-sensitive areas and the people dependent on these areas and respondent Nos.3 and 4 be directed not to proceed with the project without first obtaining a prior Environment Clearance under the EIA Notification, 2006.

5. The Applicants submit that the project involves construction of NH-566 from km 3.870 to km 9.597, which totals a length of 5.727 km, and includes the new Borim Bridge and its approaches in Loutulim and Borim villages, and additional ramps for traffic to Margao, Loutulim and Ponda. A copy of the R0 Environmental Impact Assessment/Environmental Management Plan dated August 2020 is attached as **Annexure A-1.**

6. The Applicants submit that within this project, the NH-566 is proposed along a completely new alignment from km 4.320 to km 9.597 of the NH-566, thereby constituting a length of 5.277 km.

7. The Applicants submit these calculations which are based on the drawings obtained under the RTI Act from Respondent no. 3 and Respondent No. 6. The project includes sections of varying lengths and widths, while the lengths are accurately measured from the drawings, the Applicants have assumed the most conservative figures for the widths. While the width of the road ranges anywhere from 30m to 60m, the most conservative figure of 30m will be far exceeded in practicality, due to stone pitching and/or cutting of steep slopes, for which additional land will be constructed upon. Stone pitching is laying of stones outside the elevated ramps for stability of the ramps, which require additional land. Steep slopes need to be cut for safety of the Highway, when it passes through steep slopes in the hilly parts of Borim. The area of actual development for the project (calculated

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conservatively by the Applicants from the documents as provided by Respondents no. 3 and 6 under the RTI Act) works out to be 2,27,800 sq m, as seen in the table below:

Sr. No	Chainage (km to km)	Length (meters)	Minimum Width (meters)	Area (sq meters)
1	3.870 to 4.320	450	30	13,500
2	4.320 to 5.200	880	35	30,800
3	5.200 to 5.550	350	50	17,500
4	5.550 to 6.500	950	30	28,500
5	6.500 to 6.800	300	35	10,500
6	6.800 to 7.250	450	50	22,500
7	7.250 to 7.400	150	40	6,000
8	7.400 to 7.900	500	30	15,000
9	7.900 to 8.200	300	35	10,500
10	8.200 to 8.450	250	63	15,750

11	8.450 to 8.600	150	35	5,250
12	8.600 to 8.800	200	45	9,000
13	8.800 to 9.000	200	60	12,000
14	9.000 to 9.400	400	40	16,000
15	Margao Ramp	500	30	15,000
16	Loutulim Ramp	Not considered		
17	Ponda Ramp	Not considered		
18	Landscaping	Not considered		
Minimum Project Area Development (sq m)				2,27,800

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8. The Applicants submit that the drawings used to measure the lengths and widths required for the area calculations as mentioned above in the table are from a copy of the Alignment Plan (sheet 1 of 2) - plan for km 3.870 to km 5.200, dated 25.09.17 attached as **Annexure A-2** [which shows the dimensions of the sections from km 3.870 to km 4.320 and from km 4.320 to 5.200 used for area

calculations at sr nos 1 and 2 of the table]; a copy of the Alternative Alignment No 7 (sheet 2 of 2) - plan for km 5.200 to km dated 12.03.17, attached as **Annexure A-3** [which shows the dimensions of the sections from km 5.200 to km 9.5898 used for area calculations at sr nos 3 to 14 of the table]; a copy of the General Arrangement Drawing for proposed high level major bridge across River Zuari at CH: 8.330 dated 10.5.21 attached as **Annexure A-4** [which shows the dimensions of the sections from km 7.900 to km 8.200, from km 8.200 to km 8.450, from km 8.450 to km 8.600, from km 8.600 to km 8.800, and from km 8.800 to 9.000, and related cross-sections, used for area calculations at sr nos 9 to 13 of the table]; a copy of the Plan and L Section for Margaon Down Ramp from Km 0.000 to 0.870 dated 11.05.21, attached as **Annexure A-5** [which shows the dimensions of the Margaon Down Ramp used for area calculations at sr no 15 of the table]; a copy of thePlan and L Section from km 7.00 to 8.00 (sheet 7 of 10) dated 26.02.21, attached as **Annexure A-6** [which shows the dimensions of the sections from km 7.000 to km 7.250,

NOTARY SUBHASH KRISHNA KANEKAR SALCETE MAR... GOA Regd.No.3... Exp.Dt:28/02/2027 GOVT. OF GOA (INDIA)

from km 7.250 to km 7.400, and from km 7.400 to km 7.900 used for area calculations at srnos 6 to 8 of the table]; a copy of the General Arrangement Drawing at km 9.130 to km 9.580 - sections and width of viaducts, ramps, and approaches at Loutulim attached as **Annexure A-7** [which shows the dimensions of the section from km 9.130 to km 9.580 used for area calculations at sr no 14 of the table]; a copy of the Typical Cross Section (sheet 1 of 2) dated 05.01.2021, attached as **Annexure A-8** [which shows the dimensions of cross- sections at km 0.400, km 4.900 and km 5.300 used for area calculations at sr nos 1 to 3 of the table]; a copy of the Typical Cross Section (sheet 2 of 2) dated 05.01.2021, attached as **Annexure A-9** [which shows the dimensions of cross- sections at km 6.900 and km 7.500, and for Margaon Down Ramp, used for area calculations at sr nos 6 to 8 and 15 of the table]; a copy of the General Arrangement Drawing for flyover at Durbhat junction (sheet 2 of 2) dated 10.05.21 attached as **Annexure A-10** [which shows the dimensions of cross-

NOTARY SUBHASH KRISHNA KANEKAR SALCETE TALUKA MAPUSA Regd.No. Exp.Dt:28/02/2021 GOVT. OF GOA (INDIA)

sections at km 6.496 and km 6.763, used for area calculations at sr nos 4 and 5 of the table].

9. The Applicants further submit before this Hon'ble Tribunal that 1,62,118 sq m of the Total Project Area being acquired falls within the CRZ as per the final CZMP 2011 maps prepared under the CRZ Notification of 2011. A copy of the list of survey numbers, village names, and the area of the portion of the respective survey numbers that falls within both the CRZ as well as the project area has been annexed hereto and marked as **Annexure A-11**. The entire process of design, selection of alternatives, land acquisition and dismissal of objections has been caried out under the false premise that only one survey number is within CRZ, while the actual number of survey numbers within CRZ is 240. It appears from the minutes of the 401st meeting of the Respondent GCZMA dated 28.05.2024 that after a site inspection held on 15.12.2024 in response to Respondent No 3's application for clearances dated 16.11.2023, only 166 survey numbers are being considered for a CRZ

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clearance (16 survey numbers, namely synos 225/22 & 23, 232/23 & 24 and 431/1 of Loutulim village and synos 290/55 to 65, Borim village, are wrongly listed in the minutes). A copy of the minutes of the 401st minutes of the meeting of the GCZMA dated 28.05.2024 has been annexed hereto and marked as **Annexure A-12.**

10. The Applicants also submit that it is pertinent to note that during the course of the 401st meeting of the Respondent GCZMA, it was also noted that the total estimated land required for the project is 40.3 ha and most of the private land under acquisition is agricultural. In addition, the project corridor also has a significant amount of tree plantation; approximately 4,875 trees need to be cut with the current alignment of the project. However, it is estimated that the number of trees to be cut will actually be many times this number. Once trees are removed and the herbal cover is cleared on the proposed road, the problem of soil erosion during construction will persist. The problem of soil erosion will be further exacerbated because of the loss of herbal cover due to the

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requirement of cutting the mangroves located at the bank of river Zuari of varying widths from 25m to 125m, whose impact will be long lasting. The Respondents also require the following units: Hot mix plants, Crushers and Batch mix plants; Storage, Handling and transport of Hazardous materials; Workers camp, Equipment and storage yards; and Discharges from Labour Camp. However, the Respondents have also failed to produce any plans indicating the locations of the aforementioned units.

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11. I further say that khazan land, which forms the majority of the CRZ area to be acquired, is so ecologically fragile that the smallest amount of disruption and interference in any part of a stretch of khazans causes permanent damage to adjoining khazans. For example, the adjacent section of the same Highway, which was constructed in 2019, ends at the edge of the khazans. The damage done to the adjoining khazans by the said construction persists till date, and Respondent Authorities are not able to restore the khazan fields and water bodies

alongside the construction which were destroyed or damaged. Pages 403 to 405, 406 and 407 are a few examples of complaints filed that record the impacts on adjoining khazans. The inability of Respondent Authorities to restore the adjoining khazans till date indicates that adjoining sections of khazans, outside the lands under construction and acquisition, are also irreversibly destroyed or damaged. I say that Residents of Loutulim village wrote to Respondent No 6 on 14.06.2024 asking to reject the application for grant of CRZ Clearance for construction of new Borim Bridge. A copy of the letter from Residents of Loutulim village to Respondent No 6 dated 14.06.2024 has been annexed hereto and marked as **Annexure A-13.**

NOTARY SUBHASH KRISHNA KANEKAR SALCETE TALUKA MARGAO-GOA Regd. No. 344/14 Exp. Dt: 28/02/2027 GOVT. OF GOA (INDIA)

12. I say that information provided by Respondent No 3 under RTI to the Applicants on 04.07.2024 includes a letter written by Respondent No 3 to Dy Conservator of Forest, Forest Department (North) dated 15.03.2024 submitting that the proposed alignment is not affecting the demarcated private forest land and to therefore issue

NOC. Respondent No 3 is attempting to mislead the Forest Department by pointing out an identified private forest in sy no 357/1, Borim village which is outside the alignment of the land acquisition, but concealing the existence of dense forests within the route, including the 25,000 sqmts of dense forests in sy no 28, Queula village identified by Thomas Committee as a private forest.A copy of the letter from Respondent No 3 to Dy Conservator of Forest, Forest Department (North) dated 15.03.2024 has been annexed hereto and marked as **Annexure A-14.**

NOTARY SUBHASH KRISHNA KANEKAR SALCETE TALUKA MARGAO-GOA Regd. No. 344/14 Exp. Dt: 28/02/2027 GOVT. OF GOA (INDIA)

13. I say that the Applicants have filed the present affidavit to bring the aforementioned documents on record in compliance with the Order passed by this Hon'ble Tribunal on 31.05.2024 in the present Original Application. I say and submit that the aforesaid affidavit is necessitated so that the Application No. 117 of 2024 may be adjudicated upon by the Hon'ble Tribunal on merits.

14. I therefore humbly pray that the prayers sought by the Applicants in the Original Application 117/2024 be granted and made absolute.

Solemnly affirmed at Margao, Goa)

On this 12th day of July 2024)

NOTARY
SUBHASH KRISHNA KANEKAR
SALCETE TALUKA
MARGAO-GOA
Regd. No. 344/19
Exp. Dt: 28/02/2027
GOVT. OF GOA (INDIA)

DEPONENT
Applicant no. 9
Xavier Fernandes

Solemnly affirmed before me by
Shri/Smt. Xavier Fernandes
Who is identified to me by
Shri/Smt. Leitle Andhaar 6544 9950 8910
Who is personally known to me
this 12th day of July 2024
Reg. No. 1083/2024

12/07/2024

SUBHASH KRISHNA KANEKAR
NOTARY
SALCETE TALUKA
STATE OF GOA (INDIA)

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BEFORE THE NATIONAL GREEN TRIBUNAL SITTING AT PUNE

APPLICATION NO. 117 OF 2024

(Under Section 18(1) read with Sections 14 and 20 of the National Green Tribunal Act, 2010)

Tulshidas Sridhar Naik and Ors …Applicants

Versus

State of Goa and Ors…Respondents

AFFIDAVIT ON BEHALF OF THE APPLICANTS

Dated this 12th day of July, 2024

RONITA BHATTACHARYA
Advocate for the Applicants
17,1st Floor,
Rohit Chambers
Janmabhoomi Marg
Fort, Mumbai -400001
Email: ronita.b6@gmail.com
Mobile No. 9920097464
Enrolment No. MAH/2973/2017

ANNEXURE A-1

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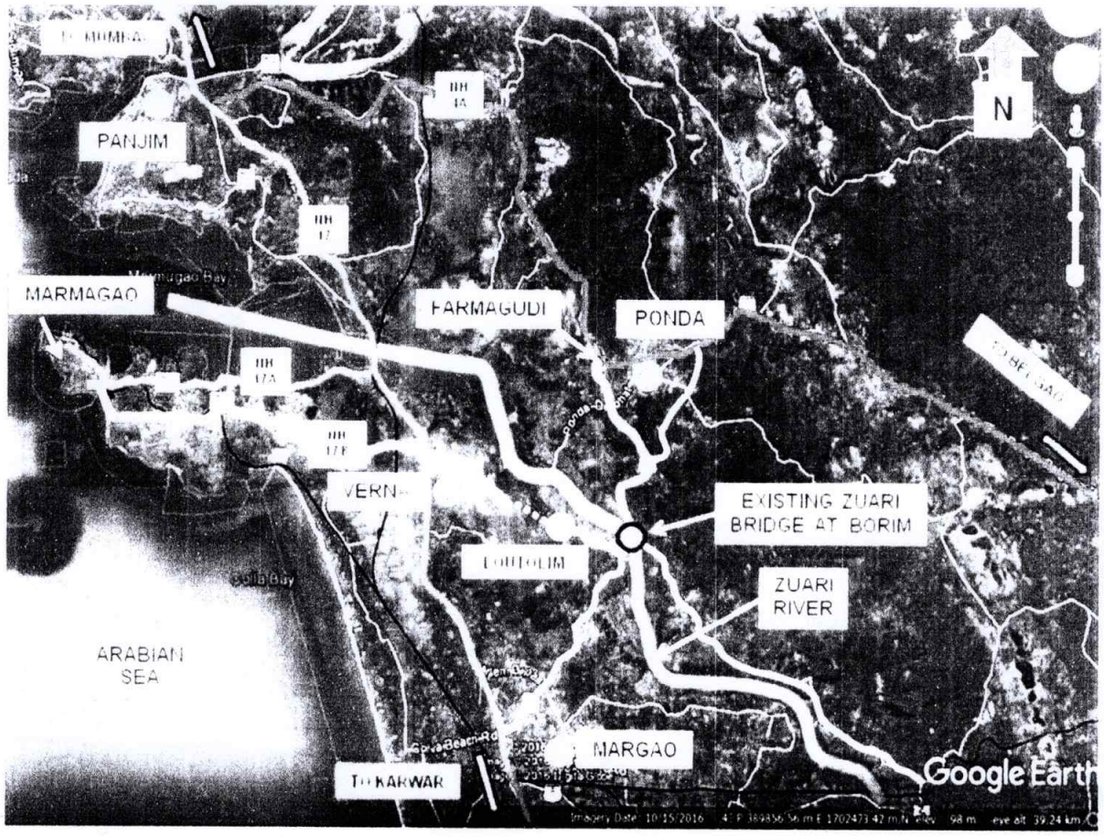
R0 ENVIRONMENTAL IMPACT ASSESSMENT/ ENVIRONMENTAL MANAGEMENT PLAN

For

Consultancy Services for the Preparation of Detailed Project Report and bidding documents for the "Proposed Construction of High Level New Bridge along with its Approaches Across River Zuari at Borim on NH-17B (NH-566) in the state of Goa."



Project Proponent:

Government of Goa, Public Works Department, Work Division XV (NH), P.W.D., Panaji, Goa

Environmental Consultant:

ENVIRO INFRA SOLUTIONS PVT. LTD.

Accredited by NABET (Quality Council of India)
for EIA studies as 'A' Category Consultant
Ph.: 0120-4151183 Email: eis@enviroinfrasolutions.com
Website: www.enviroinfrasolutions.com
QCI NABET certificate No. – NABET EIA/1922/ RA 0157
August 2020

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List of Abbreviation

BIS	:	Bureau of Indian Standards
BOD	:	Biological Oxygen Demand
CPCB	:	Central Pollution Control Board
dB	:	Decibel
DO	:	Dissolved Oxygen
DoE	:	Department of Environment
DoF	:	Department of Forests
DPR	:	Detailed Project Report
EA	:	Environmental Assessment
EIA	:	Environmental Impact Assessment
EMP	:	Environment Management Plan
EMU	:	Environmental Management Unit
EPA	:	Environmental Protection Agency
GoI	:	Government of India
HC	:	Hydrocarbons
IMD	:	Indian Meteorological Department
IRC	:	Indian Road Congress
MOEF&CC	:	Ministry of Environment Forests and Climate Change
MORTH	:	Ministry of Road Transport & Highways
NAAQS	:	National Ambient Air Quality Standards
NABL	:	National Accreditation Board for Testing and Calibration Laboratories
NGOs	:	Nongovernmental Organizations
NH	:	National Highway
NOC	:	No Objection Certificate
NO_x	:	Nitrous Oxide
PUC	:	Pollution under Control
PWD	:	Public Works Department
RoW	:	Right of Way
RPM	:	Respirable Particulate Matter
SH	:	State Highway
SO_2	:	Sulphur Dioxide
SPCB	:	State Pollution Control Board
SPM	:	Suspended Particulate Matter
SEIAA	:	State Environment Impact Assessment Authority
TOR	:	Terms of Reference
MO	:	Carbon Monoxide
NO	:	Nitrogen Oxide
PO_4	:	Phosphate
NO_3	:	Nitrates
SO_4	:	Sulphates
Na	:	Sodium
K	:	Potassium
P_2O_5	:	Phosphorus
Na_2So_4	:	Sodium Sulphate

NOTARY SUBHASH KRISHNA KANEKAR SALCETE TALUKA MARGAO-GOA Regd.No. 243/14 Exp.Dt.26/02/2021 GOVT. OF GOA (INDIA)

CHAPTER-1: INTRODUCTION

1.1 PURPOSE OF THE PROJECT

The Ministry of Road Transport & Highways (MORT&H) is responsible for the development, maintenance and management of National Highway and for matters connected or incidental thereto. Ministry of Road Transport & Highways intends to construct new bridges on National Highways as per new specification, in place of old, weak and narrow bridges in a phased and in a time bound manner. Accordingly, proposals are invited from eligible consultants for prioritization and preparation of project report for construction of bridge for which state PWD will be the implementing agency. The Project road is a section of NH-17B (NH-566). NH-17B which is declared as National Highway in July 1999 originates from intersection with NH-4A at Farmagudi (Ponda), proceeding via. Borim, Loutulim, Verna & terminating at Marmagoa port. There is missing link of this NH between village Loutulim & Verna Industrial Estate. The Project road under consideration is located between Km. 3/860 to Km. 12/160 of NH-17B i.e. 8 Km. The project corridor located in two districts South Goa & North Goa out of which majority length passes through North Goa district.

1.2 IDENTIFICATION OF THE PROJECT PROPONENT

The project proponent is Government of Goa, Public Works Department, Work Division XV (NH), P.W.D., Panaji, Goa entrusted M/s. Technogem Consultants Pvt. Ltd. for the preparation of preparation of Detailed Project Report and bidding documents for the Proposed Construction of High Level New Bridge along with its approaches across river Zuari at Borim on NH-17B (NH-566) in the state of Goa.

1.3 BRIEF DESCRIPTION OF NATURE, SIZE, LOCATION OF THE PROJECT AND ITS IMPORTANCE TO THE COUNTRY

The government of Goa intends to construct new bridges on National Highways as per new specification, in place of old, weak and narrow bridges in a phased and in a time bound manner. The main objective of the Consultancy Services is to establish an economically and strategically significant link from Ponda to Verna, Vasco and Madgaon by constructing a new bridge across River Zuari at Borim. The link will be useful for the town/ villages along the project corridor.

The construction of the high level new bridge along with its approaches across river Zuari starts near Yashwant Nagar starting from Ch. 3/860 and terminates near Loutulim location Ch. 12/160 in the state of Goa.

1.3.1 Salient features of the project are as under:

- **Proposed Project: Construction of High Level New Bridge along with its Approaches Across River Zuari at Borim on NH-17B (NH-566) in the state of Goa:-**

The length of the proposed bridge along its approaches is approx. 8 Kms. As per the available information and site observations the available ROW of the project road varies from 10m to 12m from Dhavli junction (Km. 3/860) to Margao junction (Km.9/600). From Margao junction to Loutulim (Km. 12/160) width of ROW is 20m. Additional width of ROW is available at junction locations, at high bank portion of approaches of existing bridge etc. Project corridor passes through rolling terrain. The initial portion from Km. 3/860 to Km. 5/200 is passing through hillock portion resulting steep gradient to existing road Existing road passes through 03 villages /

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towns. There are acute and substandard horizontal curves at 08 locations which are required to be improved. The salient features of existing project highway are given in **Table 1.1** below

Table 1.1: Salient features of Project Highway

Description	
Existing Road Length (Km).	8.00
Length of Single Lane Road (Km)	0.00
Length of Intermediate Lane Road (Km)	0.00
Length of 2 Lane Road (Km)	8.00
Length of 4 Lane Road (Km)	0.00
Major Bridges	1 No.
Minor Bridges	1 No.
C. D. Works	36 Nos.
Vehicular underpass 9in approach of existing River Bridge	1 No.
Ex. ROB	NIL
Ex. Level Crossing	NIL
Reserved forest abutting existing ROW length	NIL
Open forest abutting existing ROW length (km)	NIL
Existing ROW in Metre	Varies from 10 to 20m

1.3.2 Project Influence Area

The Environmental Impact Assessment study is carried out considering likely potential impacts on physical, biological, socio-economic and cultural resources within approximately 100 m each side of the project. The important ecological sensitive area up to 10 Km from the project road have also been covered in screening .This is in accordance with the commonly accepted international standards. The 100 m study area is considered adequate for the assessment of most physical and social effects arising from project development. However, it is also recognized that a number of potential (positive and negative) impacts could also have effects beyond this boundary, such as effects on road linkages, employment effects, and some community activities. The important ecological sensitive area up to 10 Km from the project road has also been covered in Environmental Impact Assessment report.

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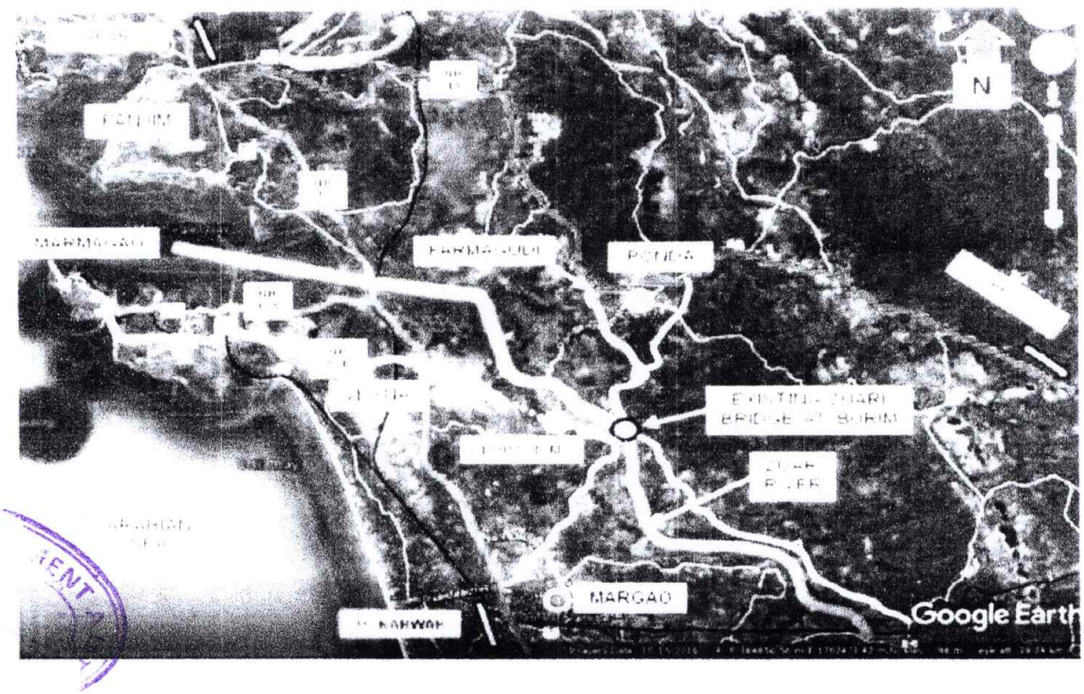

Fig.: 1.1: Key map of project with study area starts near Yashwant Nagar starting from Ch. 3/860 and terminates near Loutulim location Ch. 12/160 in districts of North Goa and South Goa in state of Goa.

Baseline environmental data play a key role in identification of environmental parameters likely to be affected due to the project. The environmental baseline data comprise the features present within a strip of 10 km on either side of the existing road. This area is referred to as study area in the report. It includes environmental features such as forest areas, conservation areas, water bodies (rivers, lakes and ponds), industries, wildlife and, places of historical importance, tourism etc. The data / features documented here under have been collected through field investigation, interaction with local population and desk research and published data sources. As mentioned, project road is situated in the districts of North Goa and South Goa, hence can be described as influenced districts along this project road located in the state of Goa as shown in the **Fig 1.1**.

1.3.3 Local level features and issues

There are few village level small markets along the road, apart from major markets such as Dhavali, Borim and Loutulim, etc. Venders sell vegetables and other commodities along the roadsides. Noise level is some times higher in peak hours of urban stretches for the road due to traffic movement. Construction of the project will leads to air pollution in some stretches. **Table 1.2** provide details of list of villages falling along the project road

Table 1.2: List of villages/towns falling along the project road

Sr. No.	Existing chainage		Name of village / towns	Tehsil	District
	From	To			
1	3/860	4/260	Dhavali	Ponda	North Goa
2	5/450	8/600	Borim	Ponda	North Goa
3	9/500	11/860	Loutulim	Ponda	North Goa

Note:

1) From Existing Ch. 3/870 to 4/400 – same alignment will be followed.

2) From Existing Ch. 4/400 to 12/160 = 7760m = There is totally new alignment at RHS of existing alignment.

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CHAPTER-2: PROJECT DESCRIPTION

2.1 INTRODUCTION

The Ministry of Road Transport & Highways (MORT&H) is responsible for the development, maintenance and management of National Highway and for matters connected or incidental thereto. Ministry of Road Transport & Highways intends to construct new bridges on National Highways as per new specification, in place of old, weak and narrow bridges in a phased and in a time bound manner. The state PWD will be the implementing agency. The construction of the high level new bridge along with its approaches across river Zuari starts near Yashwant Nagar starting from Ch. 3/860 and terminates near Loutulim location Ch. 12/160 in the state of Goa. In pursuance of the above, M/s. Technogem Consultants Pvt. Ltd has been appointed as Consultants for the preparation of Detailed Project Report and bidding documents for the "Proposed Construction of High Level New Bridge along with its approaches across River Zuari at Borim on NH-17B (NH-566) in the state of Goa.

2.2 DESCRIPTION OF THE PROJECT & SUMMARIZED FEATURES OF THE PROJECT

2.2.1 Widening Scheme:

Based on the condition survey of the bridges and CD Structures, proposed alignment, recommendations for the (existing) structures include widening, rehabilitation/repair, new construction for existing bridges & other CD structures. For Bridges and Structures the main recommendations can be categorized as stated below:

- Widening of Bridges for 2 / 4 /6 lane carriageway.
- Repair and Rehabilitation of existing bridges and structures.
- Widening of culverts to 2 / 4 /6 lane carriageway.
- Reconstruction of bridges / culverts.

There is a major commercial traffic along this corridor crossing this bridge. Over the years the traffic on the NH-17B has increased substantially and the existing two lane Bridge is burdened carrying this manifold traffic. Therefore the proposed construction of High Level New Bridge along with its approaches across River Zuari at Borim on NH-17B (NH-566) has been proposed.

Most of the length of existing road is at same/ lower level as that of the adjacent ground level. Longitudinal drains along the existing roads are available in certain stretch along the project length.

2.2.2 Realignments for Geometrical Improvements

There are acute / substandard horizontal curves in the project stretch where realignment is required. The Geometric improvements are proposed as per design standards at following locations as given in **Table 2.1** below:

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Table 2.1: Locations of Realignment Improvements

Sr. No.	Location		Side on which Improvement is required	Remark
	From 'Km'	To 'Km'		
1.	4/760	5/160	RHS	Series of curves before Bythakol junction
2.	6/680	6/860	LHS	Near Durbhat road junction
3.	7/160	7/340	LHS	Between Durbhat road junction & Shirdoa junction
4.	7/500	7/600	RHS	-------- do --------
5.	8/240	8/360	RHS	Near Shiroda junction
6.	10/220	10/380	LHS	After Margao junction
7.	11/200	11/320	LHS	Between Margao junction & Loutulim village junction
8.	11/460	11/780	LHS	--------- do ----------

Realignments for geometrical improvements are proposed in 08 locations on the proposed project.

2.2.3 Traffic Control and Safety Measures

Design standards:

The standards prescribed in IRC / MoRT&H / BIS are adopted in general. Where Indian standards are silent or where required under TOR, the applicable sections of AASHTO / BS / ASTM are adopted for design. Considering the physical condition and cost effectiveness, the improvement proposals are conceived and developed under following standards.

i) The minimum desirable standards, which could be adopted as a rule.

ii) The absolute minimum standards, which could be accepted for difficult stretches where application of the minimum desirable standards, would lead to exorbitant costs.

Accordingly, design standards for geometric elements have been proposed under "minimum desirable" and "absolute minimum" categories. These proposed standards are consistent with and fall within the parameters recommended in the IRC:SP-73-2015. The proposal is finalized in accordance with IRC:SP:84-2014 manual. The deviations which are inevitable due to various constraints the same will be given separately in contract document (Schedule – D).

2.2.4 Improvements to structures

Based on the condition survey of the bridges and CD Structures, recommendations for the (existing) structures include widening, rehabilitation/repair, new construction for existing bridges, & other CD structures.

For Bridges and Structures the main recommendations can be categorized as stated below:

1. Widening of Bridges (wherever possible) for 2 / 4 lane carriageway.
2. Repair and Rehabilitation of existing bridges and structures.
3. Widening of CD Structures to 2 / 4 lane carriageway.
4. Reconstruction of bridges / CD structures.

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➢ **Proposed design standards:** The summary of the recommended design standard is shown in **Table 2.2** below:

Table-2.2: Summary of Recommended Design Standard

Sr. No.	Element	Proposed Design Standards		Reference to IRC
		Desirable/ Ruling	Minimum	
1.	**Design speed (km/hour)**			
	Plain and rolling terrain	100	80	IRC:SP:84 - 2014
2.	**Sight Distance (m)**			
	Design speed 100 km/hr.	360 m	180 m	IRC:SP:84 - 2014
	Design speed 80 km/hr.	260 m	130 m	
3.	**Horizontal alignment**			
	Minimum radius of curve			IRC:SP:84 - 2014
	Plain & rolling terrain	400m	250m	
	Super elevation	For road:- i) Limited to 7%, if radius of curve is less than desirable minimum and shall be limited to 5% if radius of curve is more than desirable minimum. ii) For structures - 4% (Maximum)		IRC:SP:84 - 2014
	• Radii beyond which no super elevation is required Speed 100 km/hr Speed 80 km/hr	1800 m 1100 m		IRC:SP:84 - 2014 IRC: 38-1988
4.	**Vertical Alignment**			
	• Gradient			
	Plain and Rolling	2.5%	3.3%	IRC:SP:84 - 2014
	Mountainous	5.0%	6.0%	
	• Vertical curves			IRC:SP-23
	Summit curve	**Minimum length**		
	Speed 100 km/hr	135 x A	73.6 x A	
	Speed 80 km/hr	60 x A	32.6 x A	
	Speed 65 km/hr	33.8 X A	18.4 X A	
	Speed 60 km/hr	26.7 X A	14.5 X A	
	Speed 50 km/hr	15.0 X A	8.2 X A	
	Speed 40 km/hr	8.4 X A	4.6 X A	
	Valley curve			

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	Speed 100 km/hr	-	41.5 x A	
	Speed 80 km/hr	-	25.3 x A	
	Speed 65 km/hr	-	17.4 x A	
	Speed 60 km/hr	-	15.0 x A	
	Speed 50 km/hr	-	10.0 X A	
	Speed 40 km/hr	-	6.6 X A	
	A = Algebraic difference in grades expressed in percentage.			
5.	**Cross–sectional elements**	**For 2 Lane road**	**4 Lane road**	
	• Carriageway • Paved Shoulder (on both side) • Paved area (in built-up section)	7.0 m 1.5 m 2 x 1.0m	2 x 7.0 m 1.5 m ---	IRC:SP-73
	Cross–sectional elements	**For 2 Lane road**	**4 Lane road**	
	• Earthen Shoulder (on both sides) • Median (Raised)	2.0 m ---	2.00 2.5m (Built-up area)	
	• Total formation width	14.0 m	26.00 m	
	• **Camber** Main carriageway Paved shoulders Earthen shoulder	Min. 2.5 % for BT road Min. 2.0 % for CC road Same as per pavement 3.0% or 0.5 % steeper than slope of paved shoulder.		
	• **Side slope for Fill**			
	• Fill section	2H:1V		
	• **Cut portion**			
	• Soil	2H:1V		
	• Soft disintegrated rock	1H:2V		
	• Hard rock	1H:4V to near vertical		

6.	**Intersections**	As per manual & standard drawings of MoRT&H	IRC:SP-41 and Type designs of junctions prepared by MoRTH

2.3 BACKGROUND OF THE PRESENT REPORT

The Ministry of Environment, Forest and Climate Change (MoEF&CC), Government of India, in its notification S. O. 1533 dated September 14, 2006 and its subsequent amendment S.O. 2559 (E) on dated 22nd August, 2013 has made it mandatory to obtain environmental clearance of Expansion of National Highways greater than 100 km involving additional right of way or land acquisition greater than 40m on existing alignments and 60m on re-alignments or by-passes. **As our proposed project is less than 100km and the additional right of way is less than 40m on existing alignment and 60m on by-passes, therefore Environmental Clearance is not applicable for this project. The EIA report has been prepared as per the standard TOR given by Public Works Department, Work Division XV (NH), P.W.D., Panaji, Goa**.

2.4 BRIEF ABOUT THE PROJECT

The Project road is a section of NH-17B (NH-566). NH-17B which is declared as National Highway in July 1999 originates from intersection with NH-4A at Farmagudi (Ponda), proceeding via. Borim, Loutulim, Verna & terminating at Marmagoa port. There is missing link of this NH between village Loutulim & Verna Industrial Estate. The Project road under consideration is located between Km. 3/860 to Km. 12/160 of NH-17B i.e. 8 Km. The project corridor located in two districts South Goa & North Goa out of which majority length passes through North Goa district. The proposed project transverse at 15° 23' 10.14" to 15° 21'03.29" N Latitude and 74°00'12.19" to 73°58'43.45" E Longitude and at an Elevation of 38 m to 8 m above Sea level

The temperature in the project corridor being in the tropical zone and located near the Arabian Sea, Goa generally experiences a hot and humid climate all around the year. In Goa, the month of May is considered as the hottest month as it usually carries day temperatures of almost 35°C (95°F) with high humidity. Goa experiences a short winter season in the mid-month of December and February. Usually in the night, the temperature goes down to 21°C (68°F) and in the day it rises up to 28°C (84°F). The nights are considered as cool as compared to day. The details of the same are as follows;

During summer: - Max 35ºC and Min 32ºC

During Winter : - Max 28ºC and Min 21ºC

Average annual rainfall in this area is about 3000 mm.

Project corridor passes through rolling terrain. The initial portion from Km. 3/860 to Km. 5/200 is passing through hillock portion resulting steep gradient to existing road. Existing road is having carriageway width of 7.00m (Two lane). Soft shoulders of about 1.0 m to 1.5m exist on either side of the carriageway. Most of the length of existing road is at same/ lower level as that of the adjacent ground level. Longitudinal drains along the existing roads are available in certain stretch along the project length. Existing road consists of flexible pavement and the same is in fair condition. **Table 2.3** describes the project road characteristics.

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Table 2.3: Project Road Characteristics

Sr. No.	Existing Chainage		Carriageway Configuration	Carriageway width (m)	Shoulder		Terrain
	From	To			Type	Width (m)	
A)	Consultancy Services for the Preparation of Detailed Project Report and bidding documents for the "Proposed Construction of High Level New Bridge along with its Approaches Across River Zuari at Borim on NH-17B (NH-566) in the state of Goa."						
1.	3/860	5/200	2- lane with soft shoulder	7.00	Soft	1 to1.5	Rolling
2.	5/200	12/160	2- lane with soft shoulder	7.00	Soft	1 to1.5	Plain

2.4.1 Land Requirement

The existing RoW varies from 10 to 20 m .Land acquisition is proposed only where the tow line is going beyond the existing ROW. The total land requirement for the project is 40.3 ha. Most of the private land is agricultural.

2.4.2 Water Requirement

The average water requirement for the project is 200 m^3/day and the peak demand is 265 m^3/day. The water requirement will be met through canal / other surface water sources. However, as per Central Ground Water Authority, the project area does not fall under notified critical/ overexploited areas. The details of water requirement are as per **Table-2.4.**

Table-2.4: Water requirement for the Project

Purpose	Average (Cu. m./day)	Peak cu. m/day)	Source
Road making	133	165	Surface & Ground water sources
Dust suppression	37	56	
Others including drinking	30	44	
Total	**200**	**265**	

2.4.3 Raw Material and Its Requirement

The total soil requirement for the project is 750000 m^3, out of which 498000 m^3 will be taken from cutting locations and 252000 m^3 from borrow areas.

The section wise requirement for various raw materials is presented in **Table-2.5**.

Table-2.5: Raw Material Requirement

Description	Unit	Qty.
Total Required Soil Qty.	Cum	750000
Qty. taken from cutting sections	Cum	498000
Qty. to be brought from borrow area	Cum	252000
Use of flyash from Power Plant	Cum	0
Bitumen	MT	4410
Aggregate for Bituminous Surfaces and Concrete Works	Cum	274300
Sand for Concrete Work	Cum	110550
Granular Sub base	Cum	44100
Wet Mix Macadam	Cum	46750

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Description	Unit	Qty.
Filter Media	Cum	17700
Bituminous surface scarification	Sqm	750
Dismantling of existing bituminous layer	Cum	770
Dismantling of existing Granular layer	Cum	1950
Concrete and stone masonry dismantling	Cum	1300

2.4.4 Quantity of Solid Waste Generation

The Quantity of Waste generated from the project is as follows:-

Concrete and stone masonry dismantling : 1300 cum

The topsoil will be utilized for plantation in median and RoW. The bituminous waste and concrete waste will be used for development of village roads connecting to the highway.

2.5 ENVIRONMENTAL & SOCIAL SCREENING STUDY AND APPLICATION TO EIA

The Environmental & Social Screening report was prepared after thorough interaction with the engineering section of the consultants so that the negative impacts on the environment and human population could be avoided as far as possible. Some of the important findings of the study are as follows: -

- There is no critical issue in the natural environmental except cutting of trees which can be minimized by concentric widening within existing ROW.
- The proposed project falls in CRZ areas and mangroves may be present in the vicinity of the project, however the CRZ areas will be identified after the preparation of the CRZ maps from approved MoEF&CC recognized agencies.
- There is no archeological protected/unprotected monuments exists along the project.
- There is no schools/colleges and hospitals along the project.
- There are 03 number of temples/church exist along the project road. These are adjacent to the road but mostly are outside the existing RoW. Detailed public consultation will be done before shifting of these structure if shifting is necessary

2.6 SCOPE OF THE EIA/EMP STUDY

The scopes of the EIA/EMP study are: -

- Identification of the potential impacts during pre-construction, construction and operation phases.
- Developing mitigative measures to sustain and maintain the environmental scenario.
- Providing compensatory developments wherever necessary, including plans for highway side tree plantation.
- Designing and monitoring the Environmental Management Plan.
- Suggesting the Environmental Enhancement Scheme and its monitoring.
- Screening, scoping and consultations with public, experts in various fields, non-government organization (NGOs), etc.

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- Review of policies and legal framework.

2.7 OBJECTIVES

The objectives of the EIA include:

- Collection of baseline data on various components of the environment.
- Determination of the magnitude of environmental impacts so that due consideration is given to them during planning, construction, and operational phases of the project implementation.
- Assessment of the socio-economic conditions of the project affected persons and suggestions for their improvement.
- Identification of areas and aspects, which are environmentally or socio-economically significant.
- Submission of environmental enhancement plan and environmental management plans for enhancing and mitigating the negative impacts.
- Development of the road alignment in such a way that the environment and settlements are least affected.
- Presentation of public view on various aspects of environment and socio-economic.

2.8 POLICY CONTEXT FOR ENVIRONMENTAL ASSESSMENT IN INDIA

The policy of the Government of India with regard to environmental assessment on different kinds of projects are laid down in 'The Environmental Impact Assessment Notification', 2006, issued by the Ministry of Environment, Forest and Climate Change, New Delhi. As per Ministry of Environment, Forest and Climate Change Notification no. S.O. 2559 (E) dated 22nd August, 2013, MoEF&CC clearance is only required for " Expansion of National Highways greater than 100 km involving additional right of way of land acquisition greater than 40m on existing alignments and 60m on re-alignments or by-passes." It is envisaged at this stage MoEF&CC clearance is not required for this project as per the above referred Notification. The State Pollution Control Boards (SPCB) has been assigned the responsibility for implementing (i) The Air (Prevention and Control of Pollution) Act, 1981 and (ii) The Water (Prevention and Control of Pollution) Act, 1977. With regard to cutting of trees, etc., the Forest (conservation) Act 1980: Rules and Guidelines are applicable.

2.9 PUBLIC CONSULTATION

Public consultation at all stages of planning and implementation of a project is necessary. It helps in making the project more environment-friendly and easy to implement. Public consultation in this project is done by field-testing of questionnaires for various environmental / socio-economic parameters /wild life and interviews with the Project Affects Persons / Forest Guard / Road Users.

2.10 ENVIRONMENTAL & SOCIAL IMPACTS OF ROAD WIDENING

Transport facilities including roads bring development. They not only facilitate transportation and movement, but, as a whole, bring significant economic growth and social benefits. It is a well-known fact that the economy and human welfare activities of an area depend on its proximity to the road. Be it health, hygiene or education, be it agriculture or business-almost all shades of human life are changed once a road is developed in an area. The road allows cultures to mix and interact.

In regions where roads already exist, they need to be strengthened at regular intervals. The highways need widening in view of the growing traffic pressure, Road safety, travel time and the vehicle operating costs. It also increases the access to markets, jobs, education and health services. Obviously, with this intent the Government of India through Public Works Department (P.W.D.) Goa undertook the Proposed Construction of High Level New Bridge along with its approaches across River Zuari at Borim on NH – 17B (NH-566) in the State of Goa.

However, all is not rosy in road development. Whether a new road is laid or an existing road is widened, it disturbs and destroys many more things. The widening/new construction of the road may result in loss of productive agricultural land, damage to sensitive ecosystems, removal of trees, dislodgment of large number of people, disruption of local economic activities and accelerated urbanization. The properties and people in many cases may fall in the direct path of road widening. The livelihood of people is often disrupted. Such a developmental project may cause soil erosion, interfere with animal and plant species, and change the level of under ground water. People may lose accustomed travel paths and community linkages and can be culturally affected. The exhaust emissions will also grow significantly leading to increase in respiratory and other health problems. Some of the negative impacts may even have far-reaching consequences. One has to be very careful and cautious in assessing these impacts and to then mitigate them.

In fact, it is easy to quantify the magnitude of physical impacts such as land clearance, trees removed, and homes affected; but difficult to quantify effects on the biological and aesthetic environment such as physiological alteration on flora & fauna, reproductive and behavioral changes in organisms etc. The study therefore has been carried out with utmost care to analyze, predict and mitigate the environmental and social aspects of the region in consequence to the proposed highway widening.

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CHAPTER-3: POLICY, LEGAL & ADMINISTRATIVE FRAMEWORK

3.1 INSTITUTIONAL SETTING FOR PROJECT

Considering the growing need of better road transport Ministry of Road Transport and Highways (MoRTH), Government of India through Public Works Department (P.W.D.) Goa has decided to Propose the Construction of High Level New Bridge along with its Approaches Across River Zuari at Borim on NH-17B (NH-566) starting chainage 3+860 and ending chainage is 12+160 in the state of Goa.

3.2 INSTITUTIONAL SETTING IN ENVIRONMENTAL CONTEXT

The primary responsibility of administration and implementation of the Government of India's policy with respect to environmental management, conservation, ecologically sustainable development, and pollution control rests with the Ministry of Environment, Forest and Climate change (MoEF&CC). The MoEF&CC has a number of agencies and institutions to implement the environmental polices. Such as:

- **Central Pollution Control Board (CPCB):** It is a statutory authority attached to Ministry of Environment, Forest and Climate Change (MoEF&CC)
- **MoEF&CC Regional Offices:** The country is divided into several regions, with each region having a Regional Office.
- **State Pollution Control Board (SPCB):** These play the role in environmental management at the state level, with emphasis on air and water qualities.
- **State Department of Environment and Forests:** These perform function similar to MoEF&CC only at the state level.

3.3 GOVERNMENT OF INDIA - ACTS AND REGULATIONS

The Government of India has laid down various policy guidelines, regulations, acts and legislations pertaining to sustenance of environment. The following **Table 3.1** shows the relevant environmental legislations and implementing agencies.

Table 3.1: Relevant Environmental Legislations and Implementing Agencies

Sl. No.	Act/Regulation	Main Objective	Implementation Agency
1.	Air (Prevention and Control of Pollution) Act, 1981	To control and monitor air quality as per prescribed limits	Goa State Pollution Control Board.
2.	Indian Motor Vehicles Act, 1988	To check vehicles for air and noise pollution	Motor Vehicles Department, Govt. of Goa.
3.	The Water (Prevention and Control of Pollution) Act, 1974	To control and monitor water pollution as per prescribed limits	Goa State Pollution Control Board.
4.	The Forest Conservation Act, 1980	To check deforestation	Goa forest- up to 5 htr. Regional Chief

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Sl. No.	Act/Regulation	Main Objective	Implementation Agency
			Conservator of Forest between 5 – 20 htr. • MoEF&CC – Above 20 htr.
5.	National Forest Policy, 1988	To preserve and restore biological diversity	Forest Department GOI and Government of Goa.
6.	Wild Life (Protection) Act, 1972	To protect and improve the overall wild life	Chief Conservator wild life, Forest Department, Goa/State Level Eco Sensitive Monitoring Committee.
7.	Environment Protection Act, 1986	To protect and improve the overall environment	Dept. of Environment and Forest, Goa.
8.	Ancient Monuments and Archaeological Sites and Remains Act, 1958	Preservation of culture and historical remains	Indian Heritage Society, and Indian National Trust for Art and Culture Heritage
9.	EIA Notification, September 14, 2006 & its amendment till date	For all Development Projects	Ministry of Environment, Forest and Climate Change(MoEF&CC)
10.	National Environmental Appellate Authority Act, 1997	For Grievance Redress	Ministry of Environment, Forest and Climate Change (MoEF&CC)
11.	Coastal Regulation Zone, 2011	For projects passing through CRZ areas	State Coastal Zone Management Authority (SCZMA) and Ministry of Environment, Forest and Climate Change (MoEF&CC)

3.4 KEY STATUTORY CLEARANCE REQUIREMENTS – CONSTRUCTION STAGE

During the construction stage, some of the key statutory requirements that need to be obtained by the Contractor as part of mobilization (pre-construction) have been listed in the **Table 3.2** given below.

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Table 3.2: Key Statutory Clearances to be obtained by the Contractor

S. No.	Clearance Required for	Statute under which clearance is required	Statutory Authority
1.	Hot mix plants, Crushers and Batch Mix Plants	Air (Prevention and Control of Pollution) Act, 1981 and Noise Pollution (Regulation and Control) Rules, 2000	State Pollution Control Board
2.	Storage, handling and transport of hazardous materials	Hazardous Waste (Management and Handling) Rules, 1989 and Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989	State Pollution Control Board
3.	Location/ layout of workers camp, equipment and storage yards	Environment Protection Act, 1986 and Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989	State Pollution Control Board
4.	Quarries (in case of opening of new quarries)	Environment Protection Act, 1986	Dept. of Mining; Concerned District Administration
5.	Discharges from Labor Camp	Water (Prevention and Control of Pollution) Act, 1974	State Pollution Control Board
6.	Permission for withdrawal of groundwater for construction	Environment Protection Act, 1986	State Ground Water Board
7.	Permission for sand mining from river bed	Environment Protection Act, 1986	SEIAA, Goa
8.	Disposal of bituminous wastes	Hazardous Waste (Management and Handling) Rules, 1989	As per state norm/ Local Civic Body

3.5 WORLD BANK/MORT&H POLICIES

The World Bank's/MORT&H environmental and social safeguard policies (ten of them) are a cornerstone of its support to sustainable poverty reduction. The objective of these policies is to prevent and mitigate undue harm to people and the environment in the development process. These policies provide guidelines for the identification, preparation, and implementation of programs and projects. The following **Table 3.3** shows operational policies are relevant in context of the Project from an environmental viewpoint:

Table 3.3: Applicable Safeguards Policies of the World Bank/MORT&H

World Bank/MORT&H Policy	Description	Applicability	Measures to be incorporated
Environmental Assessment OP 4.01	This policy is triggered if a project is likely to have significant adverse	The project may have impacts on the	Application of EMF in project planning, DPR preparation and project

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World Bank/MORT&H Policy	Description	Applicability	Measures to be incorporated
	environmental impacts in its area of influence. For category A projects, a comprehensive EIA is required with emphasis on integrating environmental measures in project planning, design, implementation and operation.	environmental components such as on water bodies, trees, and hill slopes.	implementation. Integration of EHS requirements in standard bidding documents will provide enabling mechanism for required enforcement.
Natural Habitats OP 4.04	This policy supports the protection, maintenance and rehabilitation of natural habitats. The Bank doesn't finance projects that involve the conversion of designated critical Natural habitats.	Some projects are likely to be in close proximity to sensitive natural habitats.	Development of environmental screening tool and conduction of the said exercise to determine the nature and magnitude of impacts on sensitive and ecologically critical areas. Appropriate measures to deal with such findings, including exclusion of some project roads, as may be necessary.
Forests OP 4.36	Policy covers all projects that affect natural or planted forests, whether positively or negatively.	Some projects are in close proximity to or traverse forest areas and may need forest land diversion.	Avoidance and/or minimization of forest uptake by appropriate methods in the engineering design; Forest Clearances prior to award of works; Use of EMF to address impacts as necessary; Compensatory Afforestation.
Consultation and Disclosure Requirements (BP 17.50)	The policy requires the borrower to consult Project Affected People and local NGOs through the various phases of the project: before EIA TORs are finalized and when the draft EIA is available.	For each sub-project road, comprehensive consultations will be required during the design, planning and	Feasibility/DPR consultants have carried out consultations during the screening exercises. Where reports from the consultations have been found to be grossly insufficient, the Bank

World Bank/MORT&H Policy	Description	Applicability	Measures to be incorporated
	It requires that groups being consulted be provided on-time, comprehensible and easily accessible information before consultations. The policy also requires that the borrower to make the EA summary available in the state (in a local language) and a public places to all the stakeholders prior to appraisal.	implementation stages: to determine the baseline conditions/ issues; locally viable mitigation measures for addressing environmental impacts; consensus on engineering designs especially where realignments and bypasses are concerned; community involvement/ support for supervising and monitoring project implementation.	has provided further guidance for additional consultations with regards to ensuring representativeness in both number and categories of stakeholders, prior notification and methodology to adopt in order to ensure usefulness of the consultations to both the affected groups and the borrower in terms of design, planning, implementation, supervision and maintenance of the roads projects. Another important dimension of the consultations is with seeking consensus on road engineering designs where realignments and bypasses are concerned.

1) Environmental Assessment (OP 4.01)

Environmental Assessment is used in the World Bank/MORT&H to identify, avoid, and mitigate the potential negative environmental impacts associated with Bank's lending operations early-on in the project cycle. The policy states that Environment Assessment (EA) and mitigation plans are required for all projects having significant adverse environmental impacts or involuntary resettlement. Assessment should include analysis of alternative designs and sites, or consideration of "no option" and require public participation and information disclosure before the Bank approves the project.

In World Bank/MORT&H operations, the purpose of Environmental Assessment is to improve decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted and their concerns addressed.

The World Bank's/MORT&H Environmental Assessment Policy and Recommended processing are described in Operational Policy (OP)/Bank Procedure (BP) 4.01: Environmental

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Assessment.

2) Natural Habitat (OP 4.04)

The policy implementation ensures that Bank-supported development projects give proper consideration to the conservation of natural habitats, in order to safeguard their unique biodiversity and ensure the sustainability of the environmental services and products which natural habitats provide to human society.

This policy is applicable when a project (including any subproject under a sector investment or financial intermediary loan) with the potential to cause significant conversion (loss) or degradation of natural habitats, whether directly (through construction) or indirectly (through human activities induced by the project).

3) Forest Policy (OP 4.36)

The implementation of the policy ensures that envisaged forest sector activities and other Bank sponsored interventions which have the potential to impact significantly upon forested areas:

(a) Do not encroach upon significant natural forest areas that serve important social, environmental or local economic purposes.

(b) Do not compromise the rights of local communities to continue their traditional use of forests in a sustainable fashion.

(c) Do not finance commercial logging operations, in the case of primary tropical moist forest, nor any purchase of equipment for this purpose.

4) Cultural Property (OP 4.11)

The MORT&H policy defines physical cultural resources as movable or immovable objects, sites, structures, groups of structures, natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above or below ground, or under water. Their cultural interest may be at the local, provincial or national level, or within the international community.

The Bank assists countries to avoid or mitigate adverse impacts on physical cultural resources from development projects that it finances. The impacts on physical cultural resources resulting from project activities, including mitigating measures, may not contravene either the borrower's national legislation, or its obligations under relevant international environmental treaties and agreements.

The borrower addresses impacts on physical cultural resources in projects proposed for Bank financing, as an integral part of the Environmental Assessment (EA) process.

3.6 MORTH AND IRC SPECIFICATIONS

All road works in India are to be in accordance with the MoRT&H specifications for Road and Bridge works and guidelines of Indian Roads Congress (IRC). The MoRT&H specifications have special provisions towards protection of environment under Clause 501, Annexure A and the contractor is to satisfy the provisions. Apart from the Annexure A to clause 501, there are provisions for control of erosion, drainage, dust suppression, borrow area and haul road

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management under relevant sections. Provisions of clause 501 Annexure A, cover the environmental aspects as:

General	The contractor shall take all necessary measures and precautions to carry out the work in conformity with the statutory and regulatory environmental requirements. The contractor shall take all measures and precautions to avoid nuisance or disturbance from the work. It shall be precautionary measures than abatement measures taken after generation of nuisance. In the event of any soil, debris, waste or any deleterious material from site being deposited on adjacent land, the same shall be removed and affected area shall be restored to its original state.
Air	The contractor to devise and arrange methods to control dust, gaseous or other airborne emissions in such a way that adverse impacts on air quality are minimized. Dust shall be minimized from stored material and stockpiles by spraying water. Covering of material likely to generate dust during transportation is to be covered with tarpaulin. Spraying of water on haul roads, if found necessary.
Water	The contractor shall prevent any interference with supply/abstraction of water resources. Water used for dust suppression shall be reused after settlement of material in collected water Liquid waste products to be disposed off such that it does not cause pollution. No debris is to be deposited or disposed into/adjacent to water courses.
Control of wastes	No uncontrolled disposal of wastes shall be permitted. The contractor shall make specific provisions for disposal of all forms of fuel and engine oil, all types of bitumen, cement, surplus aggregate, gravels, bituminous mixtures etc. conforming to local regulations and acceptance of the engineer
Noise	The contractor shall use all necessary measures to reduce noise from construction equipment and maintain all silencing equipment in good condition.
Emergency Response	The contractor shall plan and provide for remedial measures in case of occurrence of emergencies as spillages of oil, bitumen or chemicals.

In addition to the above conditions, avoidance measures and control of activities having potential for generation of environmental impacts are devised. These include:

Section 111	Precautions for safeguarding the environment
Clause 201.2	Preservation of Property/Amenities during clearing and grubbing
Clause 301.3.2	Stripping and storing of topsoil for reuse during excavation for roadway and drains
Clause 302.4	Restriction on timings for blasting operations
Clause 304.3.6	Public safety near towns/villages where excavation is carried out
Clause 305.2.2.2	Locations of borrowing and relevant regulations

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Clause 305.3.3	Stripping and storing of topsoil at borrow locations
Section 306	Soil erosion and sedimentation control
Clause 407.4.2	Provisions for turfing on median and islands
Section 517	Recycling of bituminous pavement and excavated material
Clause 701.2.1	Use of geo-textiles for control of soil erosion
Section 810	Use of Metal beam crash barriers for safety, relevant regulations and specifications
Clause 2501	Precautions during river training works

3.7 OTHER APPLICABLE LAWS

Environmental issues during road construction stage generally involve equity, safety and public health issues. The road construction agencies require complying with laws of the land, which include inter alia, the following:

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006. This act recognizes forest dwellers rights and makes conservation more accountable.

The provision of (Extension to the Scheduled Areas) Act, 1996 (PESA). The PESA provisions are intended to intrinsically protect the resources of the tribal communities and empower them to act against the forcible acquisition.

Workmen's Compensation Act 1923: The Act provides for compensation in case of injury by accident arising out of and during the course of employment;

Contract Labour (Regulation and Abolition) Act, 1970: The Act provides for certain welfare measures to be provided by the contractor to contract labour;

Minimum Wages Act, 1948: The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act;

Payment of Wages Act, 1936: It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers;

Equal Remuneration Act, 1979: The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees;

Child Labour (Prohibition and Regulation) Act, 1986: The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labour is prohibited in Building and Construction Industry;

Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979: The inter-state migrant workers, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, travelling expenses from home to the establishment and back, etc.;

The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996: All the establishments who carry on any building

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or other construction work and employs 10 or more workers are covered under this Act; the employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for Workers near the workplace, etc.;

The Factories Act, 1948: The Act lays down the procedure for approval of plans before setting up a factory, health and safety provisions, welfare provisions, working hours and rendering information-regarding accidents or dangerous occurrences to designated authorities;

Hazardous Wastes (Management and Handling) Rules, 1989: Occupiers generating hazardous wastes given in the list shall take all practical steps to ensure that such wastes are properly handled, i.e. collection, reception, treatment, storage, and disposal of without any adverse effects to human health and environment (Rule 4 Such occupier shall apply for authorization in prescribed format to the State Pollution Control Board)

Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996: The Rules provide for mandatory preparation of On-Site Emergency Plans by the industry and Off-Site Plans by the district collector and the constitution of four tier crisis groups at the centre, district, and local levels for the management of chemical disaster.

3.8 INSTITUTIONAL STRENGTHENING AND ARRANGEMENT

Though rich in legal and regulatory instruments, the implementing agencies are unable to regulate and monitor a sound environmental management plan due to lack of enforcement capacity. Therefore, violations or missed mitigation commitments often go unreported. The gaps and deficiencies pointed out can be removed by proper arrangements. Institutional strengthening component has accordingly been identified. As such, the overall arrangement is as follows:-

1. Organizational Arrangements

An environmental Unit will be established in each construction package with a manager to address the environmental issues. The Environmental Unit will have proper staff to ensure the implementation of EMP and related measures. The manager (Environment) will be familiar with the Indian environmental legislation, will have proper training of the environment of the region, and will be able to coordinate with NGOs, community groups, and government department.

2. Environmental Training

Training of staff will be done at a number of levels. Some short-term training is required for the Environment Manager, other staff members of the Environment Unit and the contractor staff to raise their levels of environmental awareness. The Environment and Natural Resources Division and the State Pollution Control Boards conduct the training programmes, and their help will be sought in this regard. In the long-term training, the specialized training or special environmental issues will be examined and provided to the Environment Unit

3. Environmental Monitoring

In order to ensure that the prescribed environmental norms are maintained during the constructional and the operational phases, the regular monitoring is one of the most important components of the institutional arrangement. The regular monitoring of Air pollution, Water

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quality, Noise pollution, and maintenance of trees, etc. will be done at regular intervals. The field reports of various environmental components will be received at quarterly basis, and any lapse has to be taken care of.

Awareness training will be provided to the contractors and their personnel to ensure that the EMP is implemented effectively. The project co-coordinator will assess the contractor practices and, if high pollution levels are suspected, will government or private sector laboratories check them.

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CHAPTER-4: DESCRIPTION OF ENVIRONMENT

In order to understand the baseline environmental status and impacts due to the proposed road widening, observations were made by repeated field visits. The relevant secondary data were also collected. The methodologies adopted may be classified in the following way:

1. The preparation of questionnaire for environmental surveys.
2. Field observations of these questionnaires including public consultation.
3. Screening, testing and monitoring of environmental factors like air, water, soil and the noise level.
4. Collection of secondary data from various departments.
5. Compilation, analysis and presentation of the report.

4.1 PREPARATION OF QUESTIONNAIRES FOR ENVIRONMENTAL PARAMETERS

Questionnaires were prepared after thoroughly studying the environmental guidelines and conditions of the Ministry of Environmental, Forests and Climate Change (MoEF&CC), World Bank and Asian Development Bank. Questionnaires for Environmental appraisal for Road / Highway projects by MoEF&CC were also taken into account while preparing Questionnaire. Total four sets of questionnaires were prepared for field survey/data collection. The details of these are as follows:

1. Environmental screening information like national parks, wild life sanctuary, forests, archeological, cultural, religious structures etc. within 10 Kms on both sides of the road.
2. Environmental screening survey, effects on environment: views of the community.
3. The survey of features within Right of Way (ROW) on both the sides of the Road.
4. Forest survey questionnaires for villagers, road users and forest guards.

4.1.1 Field Observation on Questionnaire

A team under the leadership of a senior Environmental Engineer was constituted to undertake the field survey of the questionnaire. The young workers were apprised of the comprehension of the work emphasis on public consultation.

4.1.2 Screening, Testing & Monitoring of Physical Environmental Factors

The entire stretch of present section was surveyed and screened. The collection of water samples, soil samples and other data pertaining to air quality and noise were done within ROW.

4.1.2.1 Ambient Air Quality

Ambient air quality was monitored along the road at selected sites. The locations selected were those of the city / town area, the market place and the rural areas. The details of locations and monitoring results are discussed in Chapter – 4. The air quality parameters considered for the

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study include Particulate Matter10 (PM10), Particulate Matter 2.5 (PM2.5), Nitrogen Oxides (NOx) Sulphur Di-oxide (SO_2), and Carbon monoxide (CO).

a) Particulate Matters (PM10 & PM2.5)

PM10 and PM2.5 were monitored using a Respirable Dust sampler (RDS) and PM2.5 Sampler. A pre-conditioned and weighted glass fiber filter paper is used for PM10 and PTFE filter paper is used for RDS/PM2.5 samplers. A known quantity of the air was sucked through the filter paper in a prescribed sampling time. The flow was noted from the manometer. The multiplication of time with rate gave the total quantity of air passed through the filter paper. After sampling, the filter paper was removed, conditioned, and weighed finally for getting the concentrations in ambient air.

b) Sulphur Di-Oxides (SO_2)

A known quantity of the air was bubbled through impingers containing tetrachloromercurate. SO_2, formed a disulfiltomercurate complex, which gave a pinkish blue colour with p-rosaniline and formaldehyde solution. The intensity of colour produced was proportional to concentration of sulphur dioxide. The measurement was made by using spectrophotometer at the wavelength of 560 nm.

c) Nitrogen Di-Oxides (NOx)

A known quantity of air was passed through impingers containing sodium hydroxide-sodium arsenite solution. The estimation of NOx was done colorimetrically using hydrogen peroxide, sulfanilamide, NEDA, etc. The intensity of the colour was measured at 540 nm using a spectrophotometer.

d) Carbon Monoxide (CO)

Nondispersive Infrared detector (NDIR) based samplers are used to monitor the carbon monoxide levels.

4.1.2.2 Water Quality

Samples of ground water were collected from hand pumps, Borewells and river. To assess the water Quality of the area samples were tested for physico-chemical parameters.

4.1.2.3 Soil Quality

The samples were collected from 60 m corridor of the road, at 5-15 cm depth. Besides studying their texture (sand/silt/clay ratio) they were monitored for physico-chemical parameters to assess the soil quality of the area.

4.1.2.4 Noise Level

The noise level (Leq) was measured using noise meter at various sites along the entire stretch of road during day (6.00 am to 10 pm) and night (10 pm to 6.00 am).

The noise levels is expressed as an equivalent noise level (Leq) which is the measurement duration of sound pressure level as the averaging time. It is calculated as follows:

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$$Leq = 10 \text{ Log}10 \left[\frac{\sum^{n} 1}{n 10^{n/10}} \right]$$

Where, Li = Instantaneous sound intensity level dB (A)

n = No. of observations

4.1.3 Secondary Available Data

The secondary data were collected from following sources:

1.	General information	District Collector/Gazetteer Office, North Goa and South Goa
2.	Meteorological data	Indian Meteorological Department
3.	EIA Notifications	MoEF&CC, New Delhi, September 2006
4.	Environmental guidelines for Rail / Road / Highway Project	Ministry of Environment, Forest and climate change Department of Environment, Forests & Wildflife Government of India New Delhi 1989
5.	Mineral Production in the state of Goa	Mines and Geological Department
6.	Statistical data	District Statistical Office
7.	Irrigation and hydrogeology data	Central Ground Water Board
8.	National Highways Act, 1956	MORTH, Govt. of India, New Delhi
9	Drainage Pattern Maps of North Goa and South Goa	Central Ground Water Development Board.
10.	General Land use and Cropping Pattern	Asst. Director of Agriculture
11.	Relief and slope	Survey of India
12.	Rocks and minerals	Geological Survey of India
13.	Industries	District Industries Center
14.	Operational Policies – OP - 4.04 - Natural Habitats	The MoEF&CC / International Funding Agencies Operational Manual
15.	Operational Policies - OP - 4.36 - Forestry (1999)	The MoEF&CC / International Funding Agencies Operational Manual
16.	Operational Policies - OP 4.01 - Environmental assessment (1999)	The MoEF&CC / International Funding Agencies Operational Manual Manual
17.	Maps and Topo sheets	Survey of India
18.	Road Maps of North Goa and South Goa	Road Development Dept, Govt. of Goa
19.	Flora and Fauna	Divisional Forest Office, North Goa and South Goa

4.2 PREPARATION OF STRIP MAPS

Strip maps of 1 km each have been used in the process of conducting the screening survey. All types of structures have been mapped on the 'road –inventory.

4.2.1 Photography

Photographs of the important places such as villages, market places, old trees, consultation with people, plantation areas, etc. were taken to confirm the baseline data of these areas.

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4.3 ANALYSES, COMPILATION AND PREPARATION OF REPORT

The data collected by survey teams were compiled. Along with the field monitoring studies and secondary data, these were used to identify the environmental problem spots or 'Hot Spots'.

The following analyses were carried out based on compiled information:

1. The levels of environmental parameters were compared with the prescribed limits suggested by Central Pollution Control Board (CPCB). This gave a clear idea that special attention is paid in areas where the level of pollution is higher than desirable. Those stretches, where the pollution level does not exceed the desired limits despite widening of the road will be dropped from further study.
2. The sites where the impact is minimum or nearly absent has been identified. This may help in selection of major storage sites during construction work.
3. The mitigation measures have been suggested to reduce the adverse impacts due to the proposed widening/construction and detailed environmental management plan have been prepared covering both the phases i.e. construction and operation of highway.

4.4 BASELINE ENVIRONMENTAL CONDITIONS

4.4.1 Natural Environment

Baseline environmental data plays a key role in identification of environmental parameters likely to be affected due to the project. This also facilitates the decision maker to assess a particular environmental parameter which needs to be incorporated during the detailed Environmental Assessment study and for further detailed investigation. The scope of this chapter is limited to only those issues, which are of concern in the environmental assessment. With rapid strides in economic development, the need to rationalize the development is imperative. During the process of development, there has been intensive use of natural resources, very often leading to ecological imbalances. In a road project like this involving wide ranging construction activities, conservation of flora, fauna and the ecosystem forms important aspect of overall sustainable development process. The data/ features documented hereunder have been collected through field investigation, interaction with local population and desk research and published data sources.

The environmental baseline data comprise the features present within a strip of 10 km or affected area whichever is more on either side of the proposed alignment. This area is referred to as study area/ project area in the report. It includes environmental features such as forest areas, conservation areas, water bodies (rivers, lakes ponds and reservoirs), industries and, tourism etc.

4.4.2 Geographical Location of the project

The construction of the high level new bridge along with its approaches across river Zuari starts near Yashwant Nagar starting from Ch. 3/860 and terminates near Loutulim location Ch. 12/160 in the state of Goa. The project passes through two districts of Goa namely North Goa and South Goa

4.4.3 Climate and Micro-Meteorological Parameters

4.4.3.1 Climate

The temperature in the project corridor being in the tropical zone and located near the Arabian Sea, Goa generally experiences a hot and humid climate all around the year. In Goa, the month of May is considered as the hottest month as it usually carries day temperatures of almost 35°C (95°F) with high humidity. Goa experiences a short winter season in the mid-month of December and February. Usually in the night, the temperature goes down to 21°C (68°F) and in the day it rises up to 28°C (84°F). The nights are considered as cool as compared to day. The details of the same are as follows;

During summer: - Max 35ºC and Min 32ºC
During Winter : - Max 28ºC and Min 21ºC

Average annual rainfall in this area is about 3000 mm.

Wind speed/Direction:

Generally, light to moderate winds prevail throughout the year with speed ranging from 1 to 19 kmph. Winds were light and moderate particularly during the morning hours, while during the afternoon hours the winds were stronger. The wind rose diagram developed during the month of March 2017 shown in Figure 8.2 which reveals that pre-dominant wind direction occurs mostly blowing from West direction in Panjim district and the average wind speed is 10.3 kmph.

Table- 4.1 shows the Meteorological Data Parameters of Panjim district, Nearest IMD from the proposed project (during the month of March 2017).

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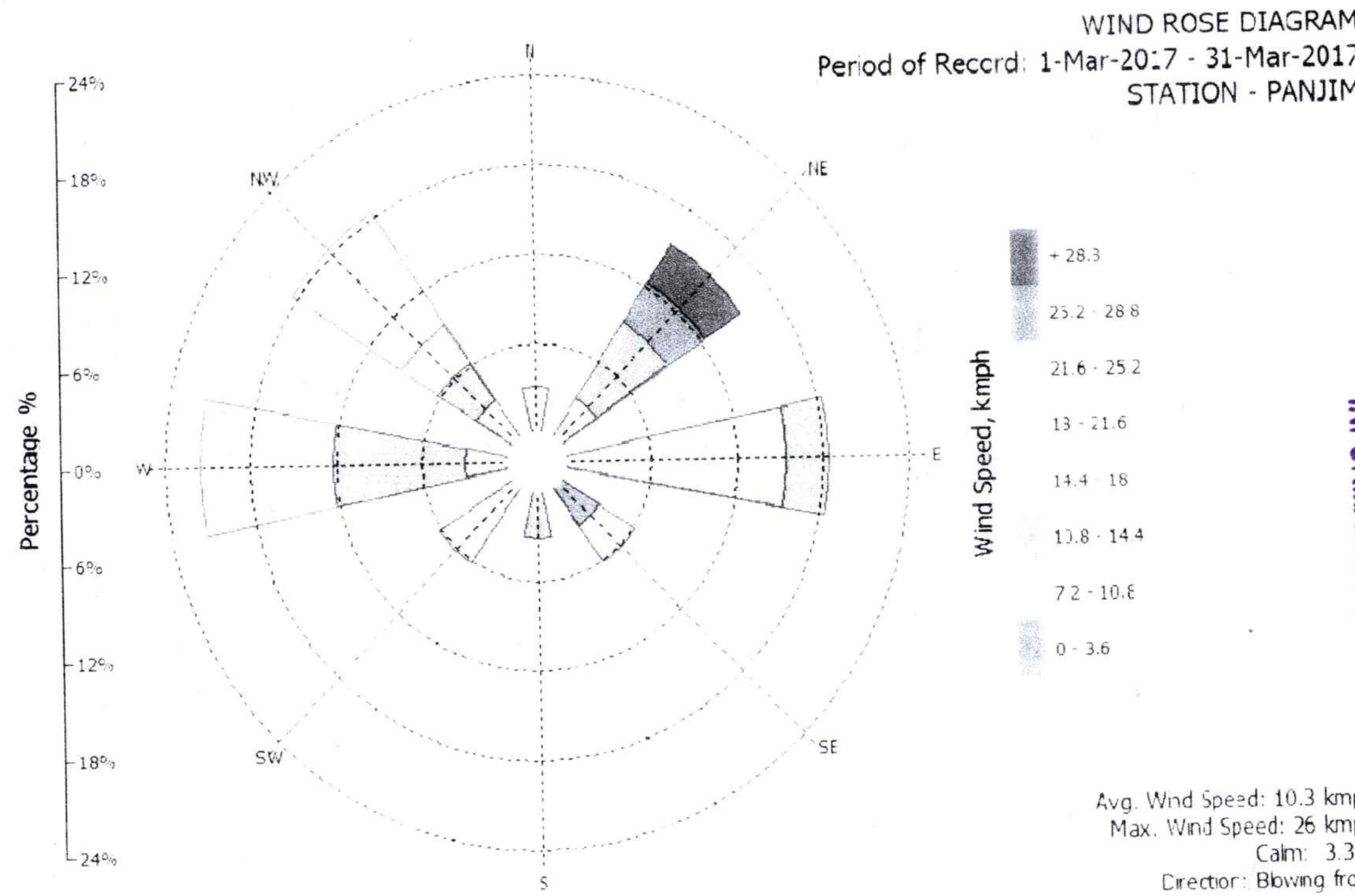

Fig.4.1: Site Specific Wind rose Diagram of Panjim district (Nearest IMD from the proposed project)

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Table-4.1: Meteorological Data Parameters at Panjim district, Nearest IMD from the proposed project (March 2017)

Date	Temperature, deg C			Humidity, %			Pressure, hPa			Wind Speed, km/Hr	Predominant Wind Direction	Rainfall mm
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Avg		
March	20.4	35.2	27.8	61	79	70	1001.4	1005.8	1003.6	10.3	W	0.6

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4.4.3.2 Natural Resources Availability

Minerals

The State of Goa is endowed with Mineral Resources. Iron ore, Manganese ore, Bauxite are minerals of economic importance. Besides there are minor minerals like Basalt, Laterite stones and rubbles, River sand, Murrum etc., which are in great demand as construction material. This industry is labour intensive and provides work to large number of people. A map showing the regions of Goa which yield different types of minerals is given below in **Figure 4.2.**

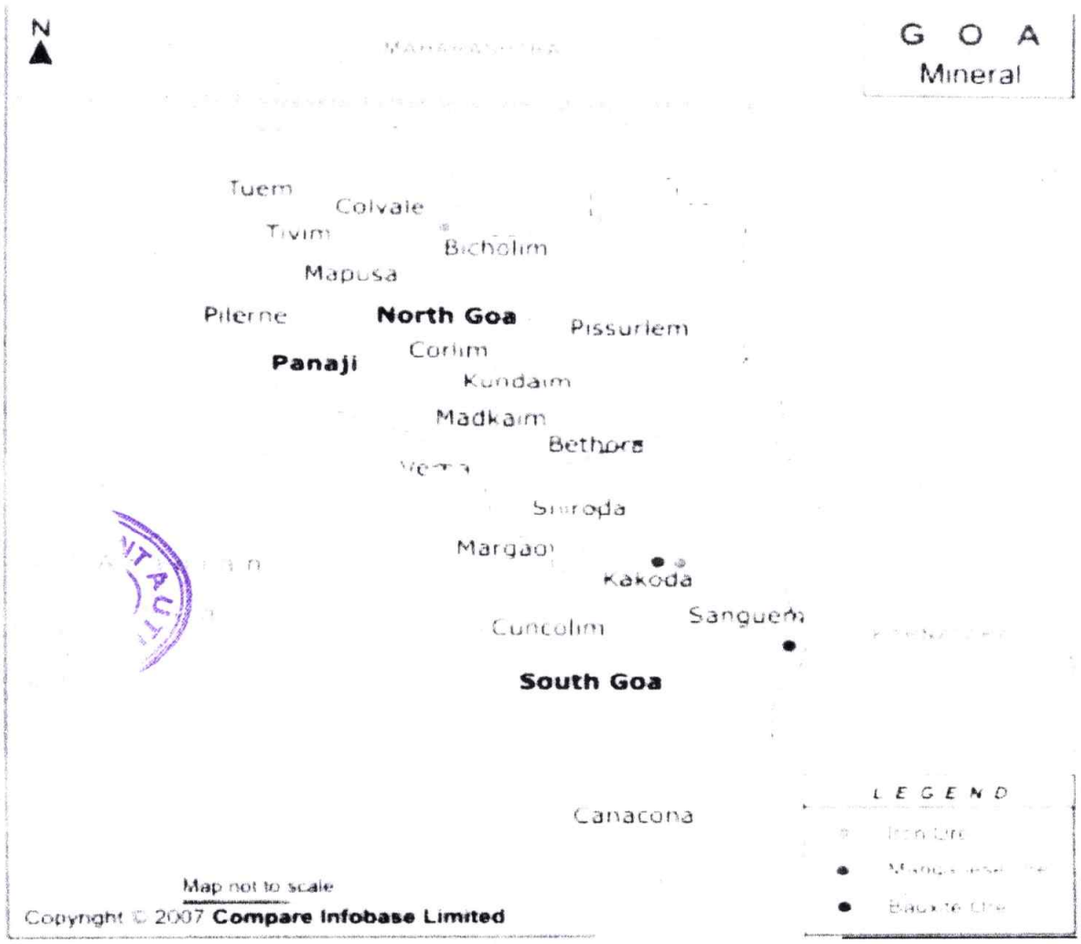


Fig.4.2: Goa mineral map

1. Agriculture:

Rice and fish being the staple diet of the people, paddy becomes the principal crop in the scenario of agriculture in Goa. The important crops, apart from paddy, are ragi, maize, jowar, bajra and pulses. Cash crops like coconut, cashew-nut, arecanut, mango, jackfruit, banana, pineapple are also grown in abundance. Cashew is an important crop in Goa. A kind of intoxicating drink called Feni is produced from cashew. Sugarcane cultivation has been taken up

only recently and a sugar factory has also been set up in Goa. A variety of mangoes are grown in Goa. Some of the famous Mango varieties are mancurade, mussarade, fernandine, xavier, alfonsa, colaco. There are two varieties of jackfruit grown here namely kapo (hard) and rasal (soft).

Paddy being the principal crop of Goa, it is grown in two seasons, namely Kharif or sorod and the rabi or vaingan. The monsoon crops are called the kharif crops and the winter crops are called rabi crops. The main sources of irrigation for winter crops are the nallahs, rivers and streams, tanks, wells and canals. Crops grown in the Kharif season consist of paddy, ragi (locally called nachani) and some pulses. Crops grown in the rabi season are comprised of paddy, pulses like horse-gram (kulith), black gram (udid), a variety of beans and some vegetables. A map showing the regions of Goa which yield different types of agriculture is given below in **Figure 4.3.**

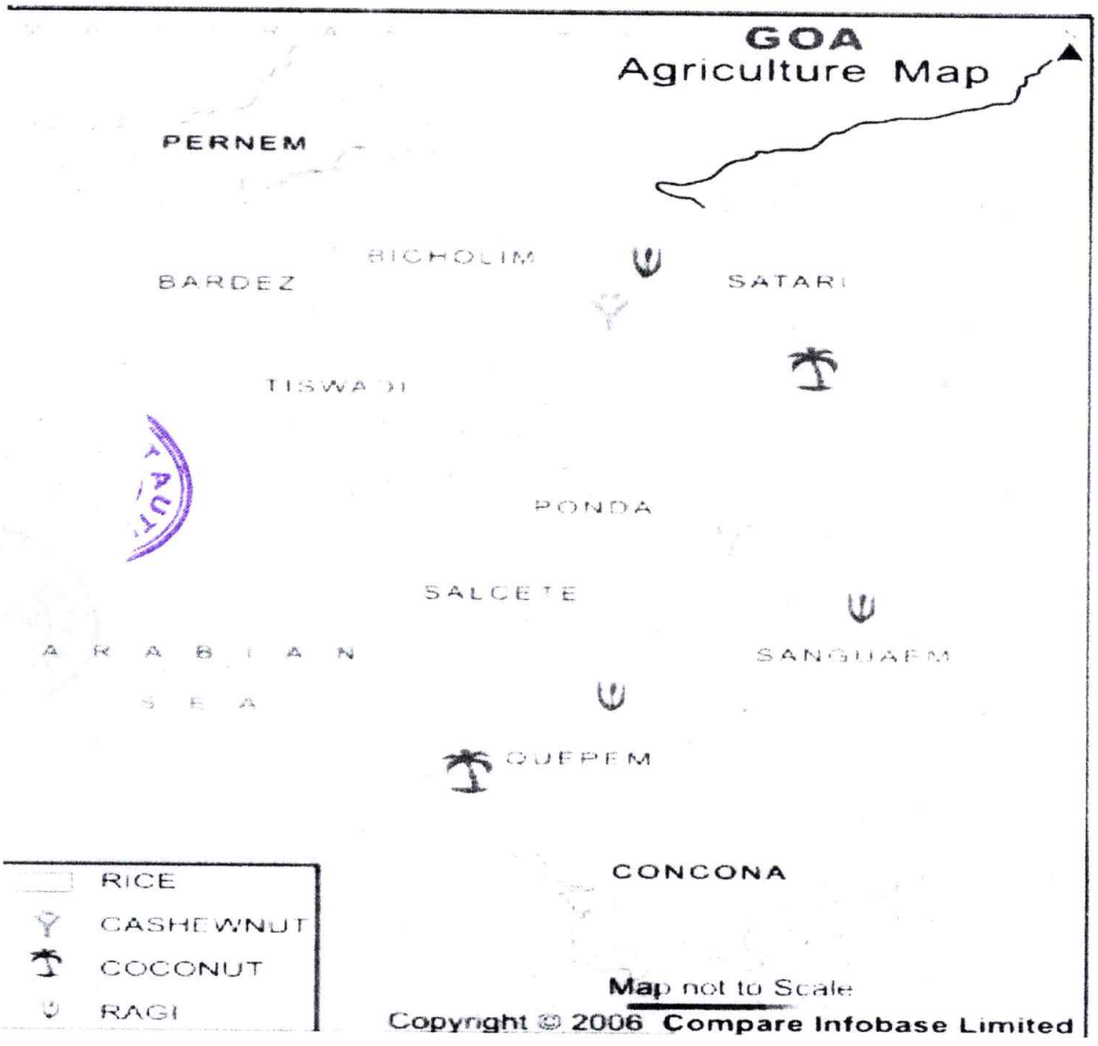


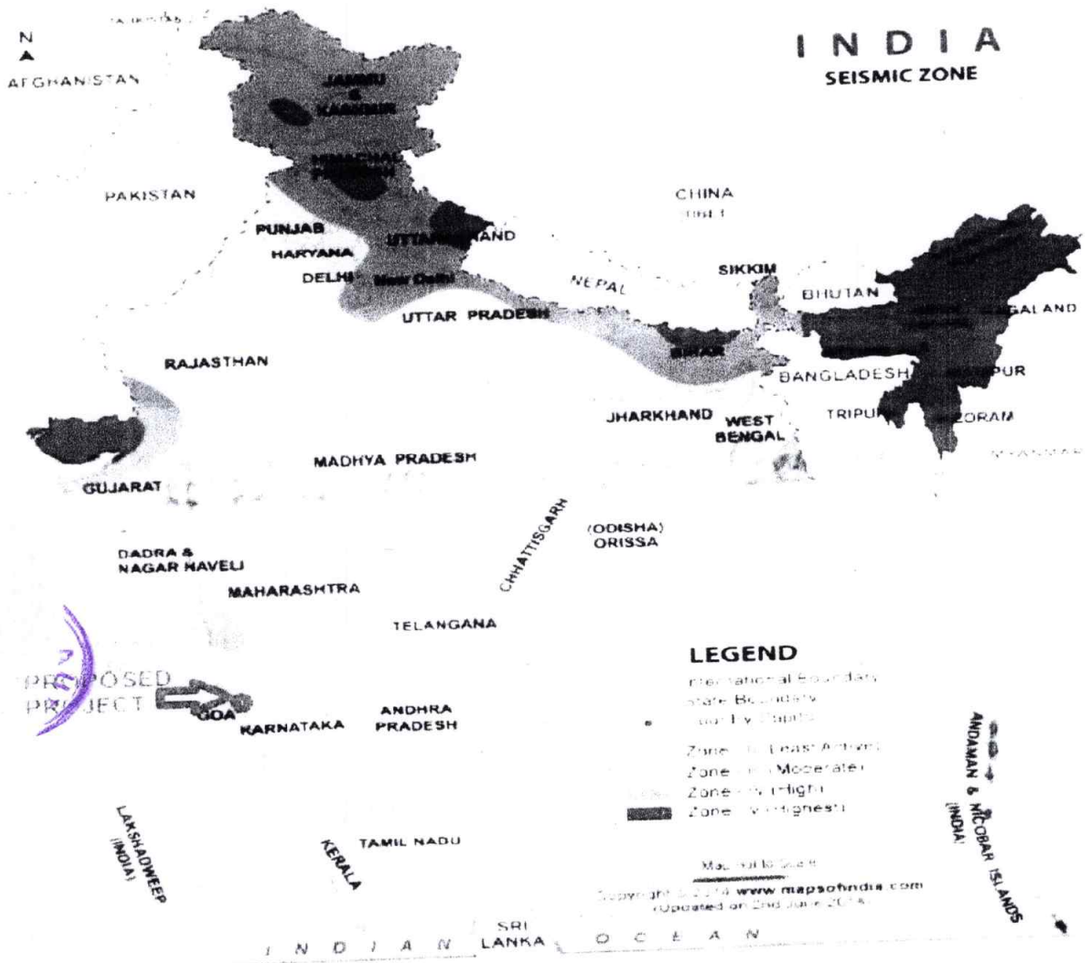
Fig.4.3: Agricultural in Goa

4.4.4 Natural Hazards and Vulnerability of the sub project area

4.4.4.1 Seismic Profile of the area

The seismic hazard map of India was updated in 2000 (5) by the Bureau of Indian Standards (BIS). The coastal districts as well as the northern interior districts along the border with Maharashtra, lie in Zone III, where a maximum MSK intensity of VII can be expected. The 1984 BIS zoning map had placed it in Zone III. It must be noted that BIS estimates the hazard, based in part, on previous known earthquakes. Since the earthquake database in India is still incomplete, especially with regards to earthquakes prior to the historical period (before 1800 A.D.), these zones offer a rough guide of the earthquake hazard in any particular region and need to be regularly updated

North Goa and South Goa districts falls under the moderate earthquake zone area (zone III) in the earthquake zone map of India. . A map showing the seismic zones of India is provided as **Figure 4.4**



Source: http://asc-india.org/.

Figure-4.4: Seismic Zone of India

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4.5 AMBIENT AIR QUALITY ALONG THE PROJECT

There is not any major Air pollution along the project. The proposed project starts near Yashwant Nagar starting Ch. 3/860 and terminates near Loutulim location ending Ch. 12/160 covers settlements areas at Baythkhol and at start point of Proposed Zuari Bridge. The ambient air quality was measured during the month of March, 2017 at two locations and results are presented in **Table4.2**. The results show that all the parameters are well below the National Ambient Air Quality standards, 2009.

Table 4.2: Value of the AAQ along the project locations

S. No.	Parameter	Limits as per Environment (Protection) Act	Units	Baythkhol	Start point of Proposed Zuari Bridge
1.	Particulate Matter (PM_{10})	**100.0**	µg /m^3	82.6	79.2
2.	Particulate Matter ($PM_{2.5}$)	**60.0**	µg /m^3	40.4	34.8
3.	Sulphur Dioxide	**80.0**	µg /m^3	13.7	10.5
4.	Nitrogen Oxide	**80.0**	µg /m^3	18.2	16.9
5.	Carbon Monoxide	**4.0**	mg/m^3	1.20	0.940

4.6 NOISE LEVELS ALONG THE PROJECT

The noise levels are monitored at two locations during March, 2017 along the project road to assess the baseline status of noise environment along the project road. The results are presented in **Table 4.3.**

The Noise levels are within National Ambient Air quality standard w.r.t. Noise, 2000.

Table 4.3: Value of the Noise along the project location

Location	Eq. Noise levels dB(A) , Day.(Leq).	Eq. Noise levels dB(A)Night, (Leq)	CPCB Guidelines Limits in dB(A) Day. (Leq)	CPCB Guidelines Limits in dB(A) Night. (Leq)
Baythkhol	63.6	46.2	**65**	**55**
Start point of Proposed Zuari Bridge	60.8	44.3	**65**	**55**

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4.7 WATER QUALITY ALONG THE PROJECT:

The objectives behind the monitoring are to develop an overall picture of the ground and surface water quality of the district. The sampling of ground and surface water was carried out in the month of March 2017 (pre-monsoon period). The water samples after collection were immediately subjected to the analysis of various parameters in the NABL Accredited laboratory. The parameters analyzed, includes pH, Electrical Conductivity (EC), Total Alkalinity (TA), Total Hardness (TH), Nitrate (NO3) and Fluoride (F). The sample collection, preservation, storage, transportation and analysis were carried out as per the standard methods given in the manual of American Public Health Association for the Examination of Water and Wastewater (APHA, 1998). The ground water quality data thus generated was first checked for completeness and then the validation of data was carried out using standard checks.

The ground water and surface water Quality was monitored at two locations along the project. One ground water sample of well and one surface water of Zuari river samples were collected. The results are presented in **Table 4.4:**

Table 4.4:- Water Quality of the Study Area Locations

S. No.	Parameters	Unit	Baythkhol Jh. Open well Ground water	Zuari river Mid-point
1.	pH	-	6.68	7.01
2.	Colour	Hazen Unit	Colorless	Colorless
3.	Odour	-	Odorless	Odorless
4.	Total Hardness (as $CaCO_3$)	mg/l	53.00	5200
5.	Calcium (as $CaCO_3$)	mg/l	35.00	2230
6.	Magnesium (as $CaCO_3$)	mg/l	18.00	2970
7.	Chloride (as Cl)	mg/l	9.28	14688
8.	Fluoride (as F)	mg/l	0.12	1.89
9.	Chemical Oxygen Demand (as O2)	mg/l	4.8	900
10.	Sodium	mg/l	3.4	9200
11.	Phosphates (as P)	mg/l	BDL	0.092
12.	Sulphate (as SO_4)	mg/l	1.63	2044.88
13.	Nitrate (as N)	mg/l	<1.0	41.85
14.	Alkalinity as ($CaCO_3$)	mg/l	50.00	112.00
15.	Dissolved Oxygen	Mg/l	6.8	4.8
16.	BOD (at 27^0C 3-Days)	mg/l	<2.0	20
17.	Potassium (as K)	mg/l	<1.0	2600
18.	TKN	mg/l	BDL	0.98
19.	Electrical Conductivity @ 25°C	µs/cm	98.00	39200
20.	Total Suspended Solid	mg/l	<1.0	129.5
21.	Total Dissolve Solid (TDS)	mg/l	64.0	25088
22.	Total Coliform	MPN/100 ml	Nil	>1600
23.	Faecal Coliform	MPN/100 ml	Nil	>1600

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4.8 RIVER BASINS

Goa has an extensive network of river systems. Goa is drained by the west flowing rivers. The high hill ranges of the western Ghat form the main watershed, from which many streams originate to flow into Goa and join into the Arabian Sea or meet other big rivers. The Ugem and Guloli rivers of highlands join to form the Sange river, which flows in a northwesterly direction to form the Zuari river. The Kushavati and the Kumarzuva are the tributaries of the zuari, the latter meeting the Zuari at Sankawali. The Sal river flows parallel to the coast to meet the Arabian Sea near Betul. Major portion of the state is drained by the two rivers, viz. River Mandovi and river Zuari. The river Terekhol forms the northern boundary of Goa state and separates it from the Maharashtra state. The other smaller rivers draining the state are Talpona, Chapora, Galgibag, Saleri, Sal and Baga. Important rivers in the state are Mandovi and Zuari.

In general, the drainage is dendritic depending upon the underlying geological formation, but the trend of the drainage courses is guided by the structural lineaments. The Zuari forms the major northwestern synclinal axis. The cross profile of most of the river courses, like those of the Sal and the Zuari, is flat in most of their lengths. On the contrary, cross profile of the Kushavati, the Guloli, the Ugem, etc, is typically 'V' shaped. Further, the drainage density decreases from east to west, when the rivers flow from the highlands to the midlands and then to the coastal tract. The river basins map of Goa have been shown in **Figure 4.5**.

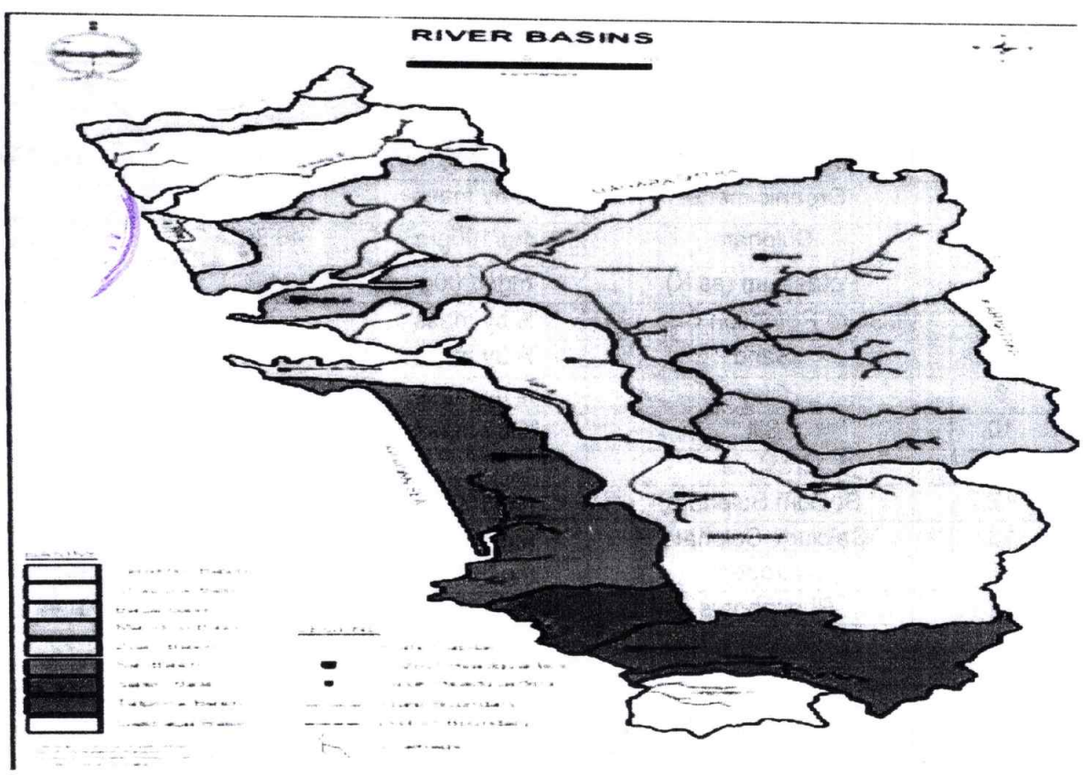

Figure 4.5: River Basin map of Goa

4.9 SOIL TYPES

4.9.1 Soil quality along the project road

Soil plays a very important role in the agricultural activities and forest growth of the area. The fertility of the soil from agricultural point of view depends upon the texture and structure which controls the retaining and transmitting capacity of moisture and various nutrients such as nitrogen, phosphorous and potassium present in the soil. The main types of soils found in the state of Goa are Coastal Alluvial soil, mixed red and black soil, laterite soil and red sandy soil which are sub divided into 32 soil series. The type of soils of Goa predominantly includes Laterites (73.4%), Alluvial & Marshy (11.7%), Coastal sandy soils (10.11%), Saline soils (4.79%) with pH ranging from 4.5 – 7.5. The soils of Goa in general fairly good in organic matter and respond well to the application of N and P fertilizers.

The Soil Quality was monitored at two locations along the project. The sample collection, preservation, storage, transportation and analysis were carried out as per the standard methods. The soil samples after collection were immediately subjected to the analysis of various parameters in the NABL Accredited laboratory. The results are presented in **Table 4.5.**

Table 4.5: Soil quality along the project

S.No.	PARAMETERS	UNIT	Baythkhol Jh.	Mid point of Zuari River
1.	pH (1:5 suspension)	-	6.86	6.59
2.	Electrical Conductivity at 25°C (1:2 suspension.)	µmhos/cm	161	62
3.	Infiltration Rate	mm/hr	142	132
4.	Organic matter	% by mass	1.06	0.98
5.	Sulphate	mg/100gm	46.30	18.4
6.	Potassium (as K)	mg/1000g	64.0	65.0
7.	Moisture Retention Capacity	% by mass	22.4	21.30
8.	Sand	% by mass	66.41	73.21
9.	Clay	% by mass	24.32	16.60
10.	Silt	% by mass	9.27	10.19
11.	Texture	-	Sandy Loam	Sandy Loam
12.	Sodium Sulphate	mg/1000g	NIL	NIL
13.	Calcium Sulphate	mg/1000g	BDL	BDL
14.	Nitrogen	mg/1000g	1250	1065
15.	Phosphorus	mg/1000g	38.20	21.30
16.	Moisture	% by mass	0.76	1.72
17.	Color	-	Reddish Brown	Reddish Brown

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➢ **Borrow Soil:**

The project road is passing through Solapur and Osmanabad districts and plenty of soil is available adjacent to road side, which can be used as borrow materials after suitable testing. The details of available source, location, average lead distance to the project road and approximate available quantity are given in **Table-4.6**.

Table 4.6: Details of Available Sources, Location and Distance for Borrow soils

Sr. No	Name of Village	Type of Material	Approx. Distance of project road (Km)	Approx. Quantity (Cum)
1	Dhamase quarry and Crusher at Gamjem village	Coarse & Fine Aggregate	20 km	Sufficient
2	Nanu Quarry at Nanus Village	Coarse & Fine Aggregate	20 Km	Sufficient
3	Amona sand quarry	River Sand	20 Km	Sufficient
4	Mangalore Refinery	Bitumen	350 Km	Sufficient
5	Local Quarry	Murrum	5 Km radius	Sufficient

4.10 Ecology and Biodiversity

4.10.1 Introduction

Natural flora and fauna are important features of the environment. They are organized into natural communities and are sensitive to outside influences. Integrating ecological thinking into the planning process is urgent need in the context of deterioration of natural environments, which is unwanted but direct consequence of development. Biological communities, being dependent on the condition and resources of its location may change if there is change in the environment. Hence change in the status of flora & fauna are an elementary requirement of Environment Impact Assessment Studies, in view of the need for conservation of environmental quality and biodiversity. Information on flora fauna was collected within the study area.

Study of biological environment is one of the most important components for Environmental Impact Assessment, in view of the need for conservation of environmental quality and biodiversity. Ecological systems show complex inter-relationships between biotic and abiotic components including dependence, competition and mutualism. Biotic components comprise of both plant and animal communities which interact not only within and between themselves but also with a biotic components viz. Physical and chemical components of the environment.

Generally, biological communities are good indicators of climatic and edaphic factors. Studies on biological aspects of ecosystems are important in Environmental Impact Assessment for safety of natural flora and fauna. Information on the impact of environmental stress on the community structure serves as an inexpensive and efficient early warning system to check the damage to a particular ecosystem. The biological environment includes mainly terrestrial ecosystem and aquatic ecosystem.

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Biological communities are dependent on environmental conditions and location of its resources. They show various responses and sensitivities to anthropogenic activities. Due to over exploitation for food, fodder, timber and herbal medicines many plant species have become extinct from the wild area and remaining are facing threat. As per Ayurveda, there is no plant on the Earth, which does not possess medicinal property". This means that each and every plant is equally important for its biological activities, ecology and environment. Therefore, the conservation of medicinal plants means every species of plant in its actual habitat should be protected and preserved. Because of continuous exploitation of medicinal plants from their natural habitats, it is required to regenerate and conserve them elsewhere having similar habitat or environment.

In the present study, changes in biotic community are studied by the pattern in the distribution, abundance and diversity. These changes over a span of time can be quantified and related to the existing environmental conditions. The sensitivity of plants and animal species to changes occurring in their ecosystem can therefore be used for monitoring the biological environment for environmental impact assessment of the proposed project.

4.10.2 National Park/ Sanctuaries and Biosphere Reserves:

There is 01 National Park namely Bhagwan Mahavir (Mollem) National Park and 06 Wildlife Sanctuaries i.e. Bondla Wildlife Sanctuary, Chorao Island (Dr.Salim Ali) Wildlife Sanctuary (Bird), Cotigaon Wildlife Sanctuary, Madei Wildlife Sanctuary, Bhagwan Mahavir (Mollem) Wildlife Sanctuary and Netravali Wildlife Sanctuary present in the state of Goa. There is no National Park, Sanctuary, biosphere reserves, wildlife corridors, Tiger/Elephant reserves within the study area, which has been confirmed by the site visit for reconnaissance survey.

Flora and Fauna – Mangroves are located along both side banks of the Zuari River. The width of the mangroves varies from 25m to 125m. Beyond 500m on D/s side of the existing bridge width of mangroves is less (25m to 30m). Goa's state animal is the Gaur, the state bird is the Ruby-throated yellow Bulbul, which is a variation of Black-crested Bulbul, and the state tree is the Matti. The important forests products are bamboo canes, Maratha barks, chillar barks and the bhirand. Coconut trees are ubiquitous and are present in almost all areas of Goa barring the elevated regions. A large number of deciduous vegetation consisting of teak, sal, cashew and mango trees are present. Fruits include jackfruits, mangos, pineapples and blackberries. Foxes, wild boars and migratory birds are found in the jungles of Goa. The avifauna includes kingfishers, mynas and parrots. Numerous types of fish are also caught off the coast of Goa and in its rivers. Crabs, lobsters, shrimps, jellyfish, oysters and catfish form some of the piscine catch. Goa also has a high snake population, which keeps the rodent population in control. Goa has many famous National Parks, including the renowned Salim Ali bird sanctuary.

4.10.3 Tree Cutting

Project Corridor on both sides has significant amount of tree plantation. However, alignment has been selected in such ways which cause very less tree cutting. Still trees will be impacted due to road widening and the construction of bridges. The main species observed are Teak, Sal, Cashew, Coconut, Blackberries, mango etc. Approximately 4875

trees need to be cut along the project road. The removal of these trees and the loss of vegetation cover will have some effect on local ecological balance, such as the disruption of habitat for small birds, mammals, etc., that will be forced to migrate to other areas. With the addition of trees and shrubs, following re-forestation, the short term impact of construction is expected to be reversed over the long term. **Table-4.7** presents the girth-wise summary of trees need to be cut on both side of present road.

Table-4.7: Girth-wise Details of Tree to be cut

Girth in mm	Nos. of affected Trees
300 – 600	1550
600 – 900	1200
900 – 1200	850
1200 – 1500	650
1500 – 1800	350
1800 and above	275
Total	**4875**

4.11 PHYSICAL AND SOCIO-ECONOMIC ENVIRONMENT

4.11.1 Land Use and Terrain

The existing road passes through predominantly plantation, open, agricultural and built-up area. Project road is passing through Plain/rolling terrain. Red, Clay & sandy loam soil are mostly in along the project area. The project road passes through many important towns/settlements named Dhavali, Borim and Loutulim. The land use pattern along the project road is given in the **Table 4.8**. The land use map of the project District North Goa and South Goa is shown in **Figure-4.6 (a)** and **Figure-4.6 (b)** respectively.

Table-4.8: Land use pattern along the project

Sr. No.	Proposed Chainage		Length	Land Use	
	From	To	"Mtr"	LHS	RHS
1	3/870	4/400	530	Open Land	Built-up Area
2	4/400	5/200	800	Open Land (Hillock)	Open Land (Hillock)
3	5/200	6/400	1200	Open Land (Private)	Open Land (Private)
4	6/400	7/000	600	Built-up Area	Built-up Area
5	7/000	8/150	1150	Agricultural Land	Agricultural Land
6	8/150	8/550	400	Zuari River Portion	Zuari River Portion
7	8/550	9/599	1049	Agricultural Land	Agricultural Land

Note:-

The chainages given above and corresponding land use is along the proposed alignment as almost there is new alignment for entire length excluding initial 530m length.

Table-4.9: Land use pattern along the project (500 m)

Sr. No.	Particulars	Area (ha)	Percentage
1	Settlements	4.8	0.6
2	Water bodies	42.9	5.3625
3	Fallow land	5.9	0.7375
4	Forest land	110.8	13.85
5	Crop land	635.6	79.45
	Total	**800**	**100**

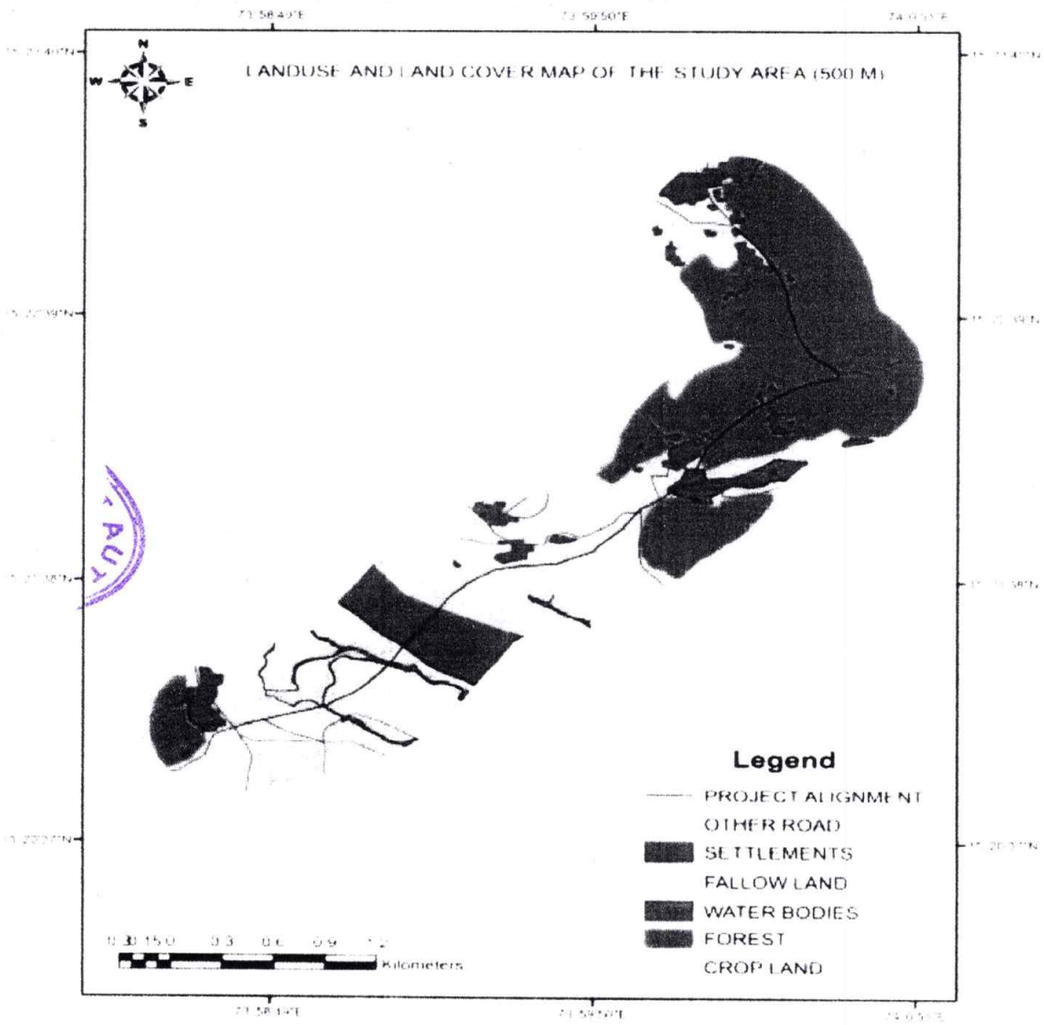

Figure-4.6: Land Use Map of the study area

4.11.2 Socio-economic characteristics of the population area.

The project road passes through two districts of Goa i.e. North Goa and South Goa. The demographic details of the project area are listed in **Table 4.10** below.

Table 4.10: Demographic details of Goa, North Goa and South Goa districts

	Goa	North Goa	South Goa
Total Population	14,58,545	8,18,008	6,40,537
Rural Population	5,51,731	3,24,927	2,26,804
Urban Population	9,06,814	4,93,081	4,13,733
Males	7,39,140	4,16,677	3,22,463
Females	7,19,405	4,01,331	3,18,463
Sex Ratio	973	963	986
SC Population	25,449	17,606	7,843
% SC	1.74	2.15	1.22
ST Population	149,275	56,606	92,669
% ST	10.23	6.92	14.47
Density of Population(per sq. Km)	394	471	326

According to the 2011 census of India, the total population of Goa is 14,58,545 out of which 7,39,140 are males and 7,19,405 are females, or 973 females per 1,000 males. The total population growth in this decade was 15.99 percent while in previous decade it was 22.57 percent. The population density is 394 per km² and 35% of the people live in rural areas and 65% live in urban areas. Konkani, Hindi and English is the official language of Goa and spoken as a native language by about 80% of the people. Other linguistic minorities in the state are Marathi, Gujarati and Hindi. The literacy rate is 82.9% with 88.38 % of males and 69.87 % of females being literate. Scheduled Castes and Tribes form 1.74 % and 10.23% of the state population, constituting 15.99% growth in population from 2001-2011. The dominant ethnic group is the Konkani people. Many other groups are defined as Scheduled Tribes. As per 2011 census, North Goa has a population of 8,18,008 Male constitutes 4,16,677 and female 4,01,331 of total population. As per 2011 census, South Goa has a population of 6,40,537 Male constitutes 3,22,463 and female 3,18,463 of total population. Employment is the issue of common man. The condition of the roads was not so good and electricity is believed to be an occasional visitor to the homes of common man.

- **Road Network:**

Roads are considered the most important component of infrastructure, to which national economy either directly or indirectly connected. Constructing high quality roads of international standard has come to reality in the soil of Goa because of the potential will of the Government of Goa. The state is connected to other neighbouring states like Maharashtra, Karnataka, Kerela, Telangana, Gujarat, Daman & Diu, Dadra & Nagar havelli and Andhra Pradesh through all-weather high standard roads. The approaching roads to the main roads have qualitatively improved. In recent years the internal roads connecting villages, hamlets have become R.C.C roads. The roads connecting to Gram Panchayats

Road and Taluka (Block) Road have also been constructed through R.C.C. In recent days attempts have been made for constructing roads through Public Private Partnership (PPP).The road map of Goa has been shown in the following **Figure 4.7.**

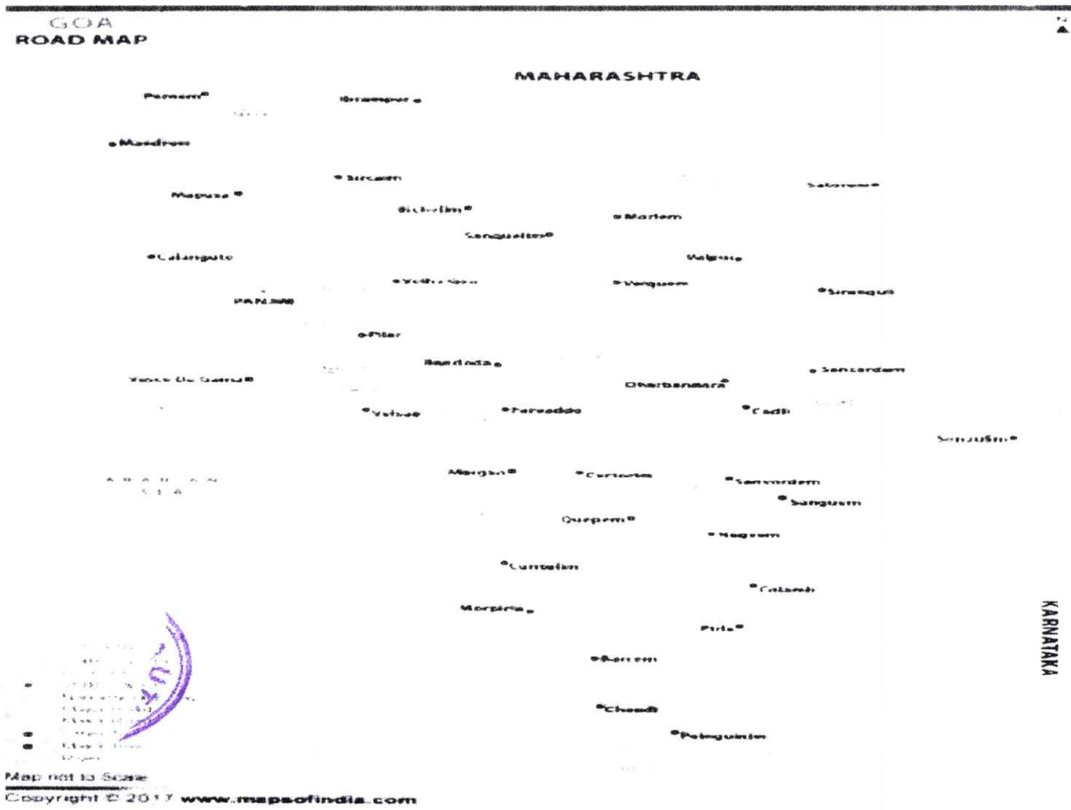

Fig.4.7: Road Map of Goa

4.11.3 Existing Economy & Employment Base

Agriculture is the mainstay of the people of the region. It plays a significant role with respect to both generation of employment and share in the GDP. Agriculture is closely followed with livestock rearing. Many families in the project region mainly depend on Agriculture, Allied Agriculture & commercial works. There are some small scale industry units where people are employed to work as laborers.

4.11.4 Cultural/Religious resources along the project road

The language spoken by the majority of the people is Konkani and Hindi. English is widely used for official purpose and Konkani is used as regional/local language. A few tribes are Gowdas, the Kunbis, the Velips and the Dhangars. Goa is visited by large numbers of international and domestic tourists each year for its white sand beaches, nightlife, places of worship and World Heritage-listed architecture. It has rich flora and fauna, owing to its location on the Western Ghats range, a biodiversity hotspot. There is no protected or unprotected ASI monument exists along the project road. There are total 04 No's of religious places such as Churches/Temple / Small Temple/ in the project corridor. Out of total structures some religious places are located

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closer to RoW and some inside RoW. List of religious structure along the road are given below in **Table 4.11**.

Table 4.11: List of religious structures (Churches, Temples) along the project

Sr .No.	Existing Chainage	Properties	side
1.	5/580	Church	RHS
2.	6/700	Ganpati Temple	LHS
3.	7/450	SaibabaTemple	LHS
4.	8/450	Church	LHS

Note: From Ex. Ch. 4/400 onwards, there is totally new alignment, hence all these properties will be away from proposed alignment. Only at ex. Ch. 6/700 the proposed alignment will be crossing existing alignment and Ganpati Temple located at Ch. 6/700 will be closer to proposed alignment. But this temple will not be affected in proposed improvement.

4.12 Safety

The road safety features observed along the project road is discussed in the following paragraphs.

Landscaping

Safety Issues related to Landscaping:

Uncontrolled change in land use over time leads to incompatible roads. Inadequate planning leads to excess travel & exposure to traffic hazards. Absence of development control leads to:

- Illegal buildings/Stalls
- Unsafe access
- Encroachments on busy road

Truck and Bus Lay byes

Truck as well as bus lay byes were few along the project road. It was seen during the audit that number of buses stopped on the road creating road safety issues. Also numbers of trucks were also seen parked at few locations. Traffic queuing behind a stopped bus will required to cross oncoming traffic lane to pass, thus increasing risk of head-on collision. Thus bus lay byes and truck lay byes will be provided to reduce bottleneck situation.

Footpath

For most part of the road, footpath does not exist.

Pedestrian Crossing

At number of intersections, villages, schools pedestrian crossing facilities are lacking, leading to pedestrian traffic crossing the road carriageway, which increases risk of pedestrian vehicle conflicts. Thus to improve safety for pedestrians, zebra crossings will be provided at major

intersections, school, villages etc. Pedestrian were seen crossing the road most haphazardly due to ribbon development along the project road.

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Emergency Vehicles

Emergency vehicles were absent along the project road. Emergency vehicles may not have adequate space available to safely negotiate the road.

Alignment Requirements

The road has sub-standard horizontal and vertical curve with insufficient sight distance. Existing geometry is improved with minimum design speed of 80km/hr to reduce hazardous situations. In addition to this at the locations three Sections are designed with 'Speed Limit Zones' at speed of 50-60Kmph to utilize existing bridges, bridges under construction, to reduce land acquisitions, R&R in the project.

Improving Visibility

Adequate sight distance is not provided at many locations, reduced visibility at these locations may lead to accidents and loss of life. Hence, to improve visibility, realignments have been proposed along few sections. The requirements and locations for the same is given 'Chapter 9 - Improvement Proposal' of this report. Also road users will be warned well in advanced through proper signs about upcoming features on road.

Interface of new and Existing Road

The interface of Existing and Proposed road will play vital role. Existing road will interface with proposed alignment at 60^0 to 90^0 angles, thus ensuring safety and good visibility. Also gradient of existing road will be taken into account while designing new alignment. Future expansion of the town/community is taken into account while providing Bypasses.

Safety aid at horizontal Curves

As the existing geometry is substandard, all the curves having radius less than 300 m will be considered for Safety aid like road side delineators, crash barriers and cats eye reflectors for safe traffic movement.

Junctions

The major and minor junctions along the project road are poorly developed, Hence viability is a key issue on all existing junctions due to encroachments. Signs related to junctions were practically missing on almost every junction. Absence of Pedestrian crossing along any junction endangers the safety of people crossing the road. Improvements of all major as well as minor intersection will be done as per relevant codes. There are three major junctions (junction with SH/ NH) in the project corridor i.e. at Bythakol with NH – 17C. In addition to this there is an important junction at start of project corridor near Dhavli (road leading to Ponda city). Details of major / important junctions are shown in **Table 4.12.**

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Table 4.12: Major/ Important Junctions on Project Road

Sr. No.	Existing Chainage	Location / Identification	Type	Remark
1.	3/860	Dhavli	Y	Rotary junction (road leading to Ponda city)
2.	5/200	Bythakol	Y	Rotary junction SH - bypass to Ponda city
3.	8/200	Shiroda	Y	Rotary junction SH-6 – road leading to Shiroda
4.	9/520	Margao	T	SH-5 road leading to Margao

➢ **Pipe Culverts on the project road:**

There are approx. 36 Nos. of culverts on the project highway and in the entire corridor cross drainage works are observed. As per the inventory of culverts based on site inspection carried out. It has been observed that there are canal crossing structures (Pipe / Slab) across the project road. The various types of culverts are as below. The details are presented in **Table-4.13**.

Table 4.13: Details of Culverts on the project road

Sr. No.	Type of Structure	Nos.
1.	Slab Culvert	15
2.	Pipe Culvert	12
3.	Arch Culvert	03
4.	Unidentified / Buried	05
5.	Viaduct	01
Total		**36**

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Deviation from Standards in Modifying Layout

While developing the intersections design codes and standard drawings of Type design will be followed.

Reduction in Conflict Points

Special care will be taken while developing the junctions to reduce conflict points.

Traffic channelizing islands will be provided as far as possible. Acceleration and deceleration lanes will be provided at the major junctions to reduce conflicts. Proper warning signs and road markings will be provided to reduce the conflict points.

Road Side Drains

Road side drains plays important role in the pavement performance. Adequate safety measures are required at the critical locations along the drain. Covered drains with footpaths will be provided along the urban sections for adequate drainage.

Provision for Non-Motorised Traffic

Non-Motorised traffic consists of pedestrians, cycle rickshaw, hand carts, animal drawn vehicles etc. All such road users creates traffic jam and hazardous conditions in villages & towns. The best way to ensure safety is to segregate no-motorised vehicles from motorised ones, but its nearlly impossible along the road.

Signs and Lightings

Road signs are limited to warning signs preceding sharp curves. Road centre line makings are observed throughout the project road. At some locations the markings have weathered due to ageing. Road edge markings are absent at most of the locations in this stretch. It is observed that the stretches that have recently been treated with surface treatment have proper pavement markings. Destination/Direction Signs are seen throughout the project road; however it's not as per relevant IRC codes. It can be seen in the picture, it is hard for road user to see the sign while driving. Thus to improve safety of all road users, signs and markings will be provided as following.

- All curves with R < 750 m to be delineated outer side of the curve from both directions
- All embankments with height 3 m or more shall have W-beam metal crash barriers with delineating reflectors fitted on them.
- In low embankments and flat curves, where crash barriers are not provided, these need to be delineated by 1.5 m high reflectorized delineators.

One-way reflective road studs shall be provided on edge lines and lane lines on the approach to an intersection or a high level bridge/culvert with high embankment. Also such studs shall be provided along the sharp curves.

4.13 Local level features and issues along the project road

There are some village level small markets all along the road, apart from major markets such as Dhavali, Borim, Loutulim etc. Venders sell vegetables and other commodities along the roadsides. Thus blocking the road width available to the traffic and also making the area prone to accidents. Noise level is some time higher in peak hours of urban stretches for the road due to traffic movement. Bad condition road surface leads to air pollution in some stretches. The list of villages/towns present along the project road has been shown in **Table 4.14.**

Table 4.14: List of villages falling along the project road

Sr. No.	Name of village / towns	Existing chainage		Habitation on LHS / RHS of road
		From	To	
1.	Dhavali	3/860	4/260	RHS
2.	Borim	5/450	8/600	LHS & RHS
3.	Loutulim	9/500	11/860	LHS & RHS

CHAPTER-5: ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

The assessment of potential environmental impact consists of comparing the expected changes in the environment with or without the project. The analysis predicts the nature and significance of the expected impacts. The magnitude and duration (short-term or long-term) of impacts are also discussed.

In the following pages impacts on each biophysical environmental component (like soil, water, air, noise, flora and fauna) and socio-economic environmental component (like removal of property, land acquisition, etc.) will be discussed.

5.1 ENVIRONMENTAL ISSUES WHICH DO NOT AFFECT THE PROJECT

1. There will be some loss of bio-diversity as Mangroves located along both side banks of the Zuari River. The width of the mangroves varies from 25m to 125m. Beyond 500m on D/s side of the existing bridge width of mangroves is less (25m to 30m).
2. The chemical composition of the soil is not going to be affected by and large.

5.2 POTENTIAL IMPACTS ON SOIL

Soil is one of the most important components of the natural environment. For road development the soil is primarily needed for altered road embankment.

Table-5.1 shows assessment of some of the impacts on soil.

5.2.1 Loss of Productive Soil

The potential impacts include:

- Loss of productive soil is negligible, as the proposed widening requires 40.3 ha of private land which consists agricultural land at number of locations.
- The productivity of crops in the region will not be affected
- The local economy is not going to be affected badly.

Table-5.1: Type and Scale of Soil Impact

Location	Type of Impact		Scale of Impact	Mitigation measures suggested
	Loss of productive soil	Erosion / Contamination		
Road side open stretches	Loss	Very less	May be negative impact during construction	More trees plantation to enhance environment and for soil conservation.
Market and congested areas	No Loss; Beneficial	No	May be negative impact during construction	Not needed
Borrow Pit	Loss of	No	-	Can be developed

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Location	Type of Impact		Scale of Impact	Mitigation measures suggested
	Loss of productive soil	Erosion / Contamination		
Area	productive soil; Beneficial			into pond for fisheries
Near Bridges	No significant Loss of productive soil	Soil erosion due to high embankment	-	By turfing, slope should be gradual

Erosion

The soil along the proposed road is sandy clam loam in texture. The erosion factor of present soil is less.

The two important eroding agents are, (i) the run-off water, and (ii) the wind. The run-off dynamics are affected by the degree of slope, extent of deforestation and the amount of water stored for irrigation. Grasses and other herbaceous plant limit the surface erosion effectively.

The potential impact includes:

- The ROW of the proposed road is covered by wide range of plantation at few places. Even in areas of high embankment the slopes are stable due to vegetation and other physico-chemical features. The degree of soil erosion is noted to be less.
- Once trees are removed and the herbal cover is cleared on the proposed road, the problem of soil erosion during construction is going to be there. Some mitigation measures like:

  (i) Cutting of trees in phases,

  (ii) Taking advantage of the period of monsoon,

  (iii) Developing not too high and steep slopes,

  (iv) Improving drainage,

  (v) Replantation of trees, and

  (vi) Turfing of the new embankment, should be adopted.

These steps will reduce the severity of the issue and by the time the road starts operating, the ecosystem will restore itself.

- Excavations of soil borrow areas may lead to higher degree of erosion. However, care has been taken that (i) many borrow areas are located on raised lands, earth mounds and heaps, (ii) in some cases the owner or villagers want to develop the area into pond for rearing fishes, (iii) re-plantation borrow pit areas will minimize the soil erosion.

5.2.2 Contamination of Soil

In the present project, the contamination of the soil is negligible, as there is no use of hazardous material which can contaminate the soil. However, at material storage site, interceptor / HDPE sheets will be provided to avoid any soil contamination.

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5.3 IMPACTS ON WATER RESOURCES

Road/Bridge development can lead to three types of modifications to the natural hydrological environment. These are:

5.3.1 Modification of the Surface Water Flow

The proposed project will no way alter the existing course of the surface water flow. However, the existing drainage problem will be mitigated in the present project.

5.3.2 Modification of the Groundwater Flow

The water table along the proposed roads ranges between 2.17m bgl to 19.23 m bgl during pre-monsoon. Since the proposed new carriageway is higher or same height as compare to existing one, the groundwater flow is not going to be affected.

5.3.3 Use of Local Water Supply

No local water supply will be used for construction purposes. Water will be taken from nearby surface water sources as canals; tanks etc are available nearby to the highway. New hand-pumps will be bored to take out underground water at construction sites if required. As the underground water table is moderate and water requirement is during construction phase only, the crisis of water will not be there.

5.3.4 Water Quality Degradation

Some important parameters like pH, Conductivity, TDS, Total Hardness, COD, BOD, Chlorides, alkalinity etc. were compared with the acceptable standard for drinking water. No direct impact on water quality is predicted.

5.4 IMPACT ON AIR QUALITY

The ambient air quality in the project corridor is generally good and well within the National Ambient Air Quality Standards, 2009. Some important observations in the Ambient Air quality are:

- Since no major industry is located along the project corridor, most of the pollution is vehicular.
- The emissions of individual vehicles, their monitoring and regular checks are important. The fuel composition, maintenance of engines, and engine temperature must be properly regulated for improved scenario.
- As there is no structure of archaeological importance going to be affected due to proposed alignment, the impact does not need an assessment from this point of view.
- By and large the pollution level with regard to Particulate Matter 2.5 ($PM_{2.5}$) and Particle Matter 10 (PM_{10}) at all study sites were within the limits. The other parameters of air quality measurements, namely, NO_x, SO_2 and Carbon Monoxide at all selected sites were also recorded to be within the prescribed limits.

- The mitigative measures suggested include the policies, regulation and enforcement programms covering vehicle standards and maintenance requirement, fuel quality and technology, management of traffic efficiency and removing the high-pollution vehicles besides plantation of tall, leafy, and dense vegetation to filter and adsorb some pollutants.
- Sensitive areas will be taken care of especially in this regard.

5.4.1 Impacts During Construction Phase

The project site impact on Ambient Air Quality within the project site and nearby areas may be significant during the construction phases. The particulate matter will be the main pollutant due to the excavations, handling and transport of earth and construction material etc. at site. The other pollutants will be NO_x due to the construction activities like operation of construction equipment and traffic movement.

Since the construction activities is a temporary activity and hence the increase in particulate matter and NO_x will be for short duration and its impact will be felt close to the construction site only. Outside the boundary of project activities, the Impacts would be marginal or insignificant.

5.4.2 Impacts During Operation Phase

This widening of the proposed highway will naturally increase the traffic load on it after the construction is over and as predicted the traffic load will be increased. However, impact will be less as traffic density is not high.

5.5 IMPACT ON NOISE LEVELS

The assessment of potential road noise impacts helps in understanding one of the most significant pollution, the noise pollution. Some salient features related to potential noise impact of a road development include: (i) the road noise impact is greatest where busy road passes through densely populated areas, townships and markets (ii) the range of noise level should be understood in relation to the habitation type also; for example, road noise in industrial area is not likely to be problematic but at sensitive location like schools and hospitals; its impact my be significant, (iii) mitigation of noise in urban areas is rather difficult, specially at the road intersections.

Environmental noise particularly highway traffic noise, is a complex phenomenon because its intensity and characteristics vary with time depending upon the frequency as well as type of vehicles on the road.

The impacts of noise due to the project will be of temporary significance locally in the construction phase and slight increase may occur during the operation stages. Table below present the source of noise pollution and the impact categorization.

Sr. No.	Phase	Source of Noise pollution	Impact categorization
1	**Pre-construction**	• Man, material & machinery movements • establishment of labor camps onsite offices, stock yards and construction	• all activities will last for a short duration and also shall be localized in nature

Sr. No.	Phase	Source of Noise pollution	Impact categorization
		plants	
2	**Construction Phase**	• **Plant Site** - stone crushing, asphalt production plant and batching plants, diesel generators etc • **Work zones** - Community residing near to the work zones	• **Plant Site:** Impact will be significant within 500m. • **Work zones**: Such impacts again will be of temporary nature as the construction site will go on changing with the progress of the works.
3	**Operation Phase**	• due to increase in traffic (due to improved facility)	• Will be compensated with the uninterrupted movement of heavy and light vehicles.

The baseline day & night time noise levels monitored at two locations along the project road are within permissible limits specified by the MoEF&CC except for commercial area except at Baythkhol still, noise is a major area of concern. The highest Leq noise levels was recorded at Baythkhol location which is 63.6 dB(A) during daytime. The Mathematical equation is used for noise prediction is L2 = L1-20 Log D2/D1.

5.6 IMPACT ON FLORA, FAUNA AND ECOSYSTEM

Some important positive and negative impacts on flora, fauna and ecosystem of the present project are: -

- There will be some loss of bio-diversity as Mangroves located along both side banks of the Zuari River. The width of the mangroves varies from 25m to 125m. Beyond 500m on D/s side of the existing bridge width of mangroves is less (25m to 30m).
- There will be no loss of habitat by the road itself, borrow pit areas and quarry sites.
- The aquatic habitat will not be damaged.
- The loss of herbal cover, at least during the construction phase, is likely to produce some negative impacts.

5.6.1 Removal of Trees

Approximately 4875 no. of trees will be impacted due to the proposed project, as, the cutting of trees has been minimized due to integration of this factor exclusively in designing the proposed road expansion. The impacts of tree cutting on the environmental quality will be as follows.

- The loss of trees will lead to higher degree of soil erosion. This has to be compensated by re-plantation of trees in the first priority, at the pre-construction stage.
- The loss of trees will reduce the ambient air quality since trees act as adsorbent of air pollutants thereby improving the air quality.

- The reduction in number of trees, especially in or near congested market places will enhance the raising of noise level.
- The other benefits of such trees such as shade, availability of fruits etc. will be worst affected till the new trees grow up and compensate.

However, a careful and proper planning of re-plantation of trees right at the commencement of construction and the phase wise removal of existing trees will mitigate the negative impacts.

5.6.2 Removal of Herbal Cover

The removal of herbaceous plants from the expanding side, will lead to soil erosion. However, the degree of erosion will be of smaller magnitude since the soil type has greater stability. Yet, the loss of soil by erosion could be mitigated by regular watering and re-plantation of herbal cover, i.e., turfing.

5.7 IMPACT ON PROTECTED MONUMENTS AND CULTURAL HERITAGE SITES

It has been observed that no archaeological site or monument and cultural heritage site exists close to highway. Therefore there would not be any kind of significant impact on the cultural heritage sites.

5.8 IMPACTS ON SOCIAL ENVIRONMENT

The economic and social interaction of communities is going to be improved by the road projects. However, the widening of the existing road and new alignment will cause disruption to local interactions. In fact, at few places over the years people have occupied the open space of the Right of Way (ROW) encroaching upon it. The encroachments are most common in market places, road crossings and in midsections. The local community activities go on the roadside, the footpath, the bus stops and even the road surface itself. These activities may take many forms, for example,

- Development of dhabas, tea shops, café and repair shops in view of catering the needs of trucks and truck drivers besides other automobiles.
- Make-shift shops in market places for catering the need of travelers and passengers besides the drivers of the vehicles.
- Uncontrolled stops by buses, taxis and informal public transport

Some important observations during the field visits are:

1. The ROW is squatted and encroached at the start and end point of the project.
2. Public consultation reveals hat people are aware of their illegal occupancy and are willing to support the project. Still, in our opinion, how will they behave at the time of project implementation is difficult to assess.
3. One of the topmost priorities in designing the alignment was to save as many properties as possible.

5.9 IMPACTS ON ROAD SAFETY AND HUMAN HEALTH

The planning and designing of the new road is in accordance with the improved safety measures and better health conditions. The chances of accidents could be minimized by

(1) widening of existing carriageway, (2) strengthening the pavements, (3) improving upon the curves in road geometrics, (4) proposing the service lanes in market places and near schools, etc (5) providing proper median, (6) improving upon road crossings (7) putting right signals and signboards, (8) new under passes, (9) fly-over and grade separators.

The human diseases caused by the contamination of water, increase in air pollutants and noise may go up by 5-10% but proper mitigation can take care of the situation.

5.10 SUMMARY OF IMPACT ASSESSMENT

Table-5.2 presents the summary of impact assessment and mitigation.

Table 5.2: Summary of Impact Assessment

Sl. No.	Parameters	Potential Impact	Mitigation Measures Suggested
1.	Topography and Soil	• Cut and fill operations during road construction	• The alignment passes through plain/rolling terrain and no substantial cut and fill operations are planned
		• Borrow earth	• Borrow soil will be procure from approved quarry. • IRC guidelines will be followed during excavation
		• Quarries	• Operational and government licensed quarry have been identified, which will be used to procure the material
2.	Air environment	• Generation of Dust	• Sprinkling of water - Earth handling site - Borrow area - Road construction site • Air pollution control at stone crusher - PPE for workers - Stone crushing units environment compliance • Regulation of construction timings near sensitive receptors and settlements
		• Gaseous Pollution	• Vehicles and machineries will be regularly maintained to conform to the emission standards. • Asphalt mixing sites should be 1 km away from residential area. • Asphalt plant will be equipped with pollution control equipment • Use of PPE by workers engaged in construction and application of asphalt mix on road surface. • Responsibility of contractors and supervising officers that the worker use the PPE
3.	Noise environment	Noise level may likely to increase during construction phase	• Properly maintained equipments to be used • Noise levels of machineries used shall conform to relevant standard prescribed in Environment (Protection) Rules, 1986. • Ear plugs and muffs will be used by workers as per requirement during construction activities.

Sl. No.	Parameters	Potential Impact	Mitigation Measures Suggested
			• Regulation of timing of construction work generating noise pollution near the residential areas
4.	Water environment	• Drainage pattern	• Provision of proper drainage through culverts along the project. • All the water bodies will be crossed by bridge and structures without affecting their original course and flow • Stabilization and turfing of slopes along the water bodies
		• Siltation of water bodies	• Silt fencing around water bodies during construction to avoid silt laden runoff entering water body • Turfing or pitching of embankments of water bodies affected will be done where possible to prevent erosion that causes siltation. • No solid waste will be dumped in or near the water bodies or rivers.
		• Flooding due to siltation of drainages channel	• Excavated earth and other construction materials should be stored away from water bodies
		• Water for construction	• Water source would be selected so that local availability is not affected
		• Rainwater harvesting	• Rainwater harvesting drains provided along the road side
		• Contamination from wastes	• Provision of septic tanks to prevent any untreated sewage discharge from construction workers camps • Oil interceptors at construction machine maintenance yards
		• Contamination from fuel and wastes	• Vehicle maintenance will be carried out in a confined area, away from water sources, and it will be ensured that used oil or lubricants are not disposed to water courses
		• Sanitation and water use in construction camps	• Construction camp will be organized in a planned manner. • Proper sanitation facilities including toilets. • Camps will have separate water supply facilities so that local water sources are not affected

Sl. No.	Parameters	Potential Impact	Mitigation Measures Suggested
5.	Land environment	• Loss of topsoil	• Topsoil on stripping shall be removed and stockpiled on sides to be used on the side slopes, for top cover of borrow areas and for plantation pits
		• Loss of topsoil from borrowing	• Arable lands will be avoided for earth borrowing. If needed, topsoil will be separated and refilled after excavation
		• Borrowing of fill materials	• Excavation from pre-selected locations. After excavation the borrow pits will be dressed to match with the surrounding.
6.	Ecological resources	• Loss of trees	• About 4875 no. of trees are likely to be felled. • At least, three times of trees for each tree to be cut will be planted. • More than 9750 trees (1:2 ratio) are likely to be planted as a part of compensatory afforestation.
7.	Public health and occupational safety	• Safety to public	• Signs will be posted on road before construction areas informing public and travelers about the work and safety provisions.
		• Restriction to Access	• Safe and convenient passage for vehicles, pedestrians and live stocks will be arranged during construction work
		• Occupational safety for workers	• Contractor will arrange all safety measures for workers as per factories act.
		• Occupational safety for asphalt plant workers	• All worker employed on mixing asphaltic material, cement, lime mortars, concrete etc. will be provided with protective footwear and protective goggles

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5.11 MITIGATION MEASURES

The project is likely to bring some negative impacts on the environment and socio-economic structure of the region. While avoidance and analysis of the alternatives for deciding the alignment from environment point of view were the first priority, some negative potential impacts are unavoidable. In such cases, adoption of mitigation measures is the only solution. A brief description of the approach to mitigation measures on environmental issues is enumerated herewith:

5.12 SOIL

The potential impacts, their mitigation, and the phase of implementation to topographic and soil characteristics were assessed and presented below.

Potential Impacts	Mitigation	Implementation Phase
A. Altered embankment	• Action confined within ROW • Good engineering & construction practices • Stabilization and turfing (revegetation)	Pre-constructional phase & constructional phase
B. Borrow pit excavation	• IRC standards to be followed • Borrow areas identified close to road • Non-productive land will be used • Good engineering & construction practices	Pre-constructional phase & constructional phase

5.13 WATER RESOURCES

The potential impacts, their mitigation and the phase of implementation regarding water sources were assessed with regard to surface water bodies, like ponds, irrigation channels and underground water tables with reference to wells, tube wells and hand pumps.

Potential Impacts	Mitigation	Implementation Phase
A. Surface water bodies	• Provision of proper drainage • Construction camps are properly located • Good engineering practices to be followed	Pre-constructional, constructional, post-constructional and operational phases
B. Underground water	• No appreciable impacts • Water to be used for construction should have separate source	Per-construction and constructional phase

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5.14 AMBIENT AIR QUALITY

Potential Impacts	Mitigation	Implementation Phase
Due to construction activities and transport of material	• Machinery to be fitted with pollution control device • Asphalt plant will be equipped with dust collectors • Sensitive places like schools and hospitals to be avoided (at least 500 m away) for Asphalt plants and other generators	Pre-constructional, constructional and post-constructional phases
Due to additional traffic, specially in market places	• Plantation of pollutant adsorbing trees	Operational phase & constructional phase

5.15 NOISE LEVELS

Noise particularly highway traffic noise, is a complex phenomenon because its intensity and characteristics vary with time depending upon the frequency as well as type of vehicles on the road.

Sr. No.	Item	Impact	Impact (Reason)	Mitigation/Enhancement
1	Sensitive receptors	Direct impact	Increase in noise pollution	Noise barrier to be provided Traffic calming devises to be used. NO Horn Zone sign Post.
2a	Noise Pollution (Pre-Construction Stage)	Direct impact, short duration	Man, material & machinery movements Establishment of labor camps onsite offices, stock yards and construction plants	Area specific and for short duration Machinery to be checked & complied with noise pollution regulations. Camps to be setup away from the settlements, in the down wind direction.
2b	Noise Pollution (Construction Stage)	Marginal Impact	stone crushing, asphalt production plant and batching plants, diesel generators etc Community	Camps to be setup away from the settlements, in the down wind direction. Noise pollution regulation to be monitored and enforced. Temporary as the work zones will be changing with

Sr. No.	Item	Impact	Impact (Reason)	Mitigation/Enhancement
			residing near to the work zones	completion of construction will be compensated with the uninterrupted movement of heavy and light vehicles
2c	Noise Pollution (Operation Stage)	Marginal Impact	due to increase in traffic (due to improved facility)	
3	Noise Pollution Monitoring		Effectiveness / shortfall (if any) Any unforeseen impact	Measures will be revised & improved to mitigate/ enhance environment due to any unforeseen impact.

5.16 CULTURAL/RELIGIOUS RESOURCES

There is no protected or unprotected ASI monument existing along the project. However, 04 number of religious structure mainly Churches and temple exists along the project road. From Ex. Ch. 4/400 onwards, there is totally new alignment, hence all these properties will be away from proposed alignment. Only at ex. Ch. 6/700 the proposed alignment will be crossing existing alignment and Ganpati Temple located at Ch. 6/700 will be closer to proposed alignment. But this temple will not be affected in proposed improvement. The list of religious structures along the road is given below in **Table-5.3.**

Table 5.3: List of cultural /religious properties along the project road

Sr .No.	Existing Chainage	Properties	side
1	5/580	Church	RHS
2	6/700	Ganpati Temple	LHS
3	7/450	SaibabaTemple	LHS
4	8/450	Church	LHS

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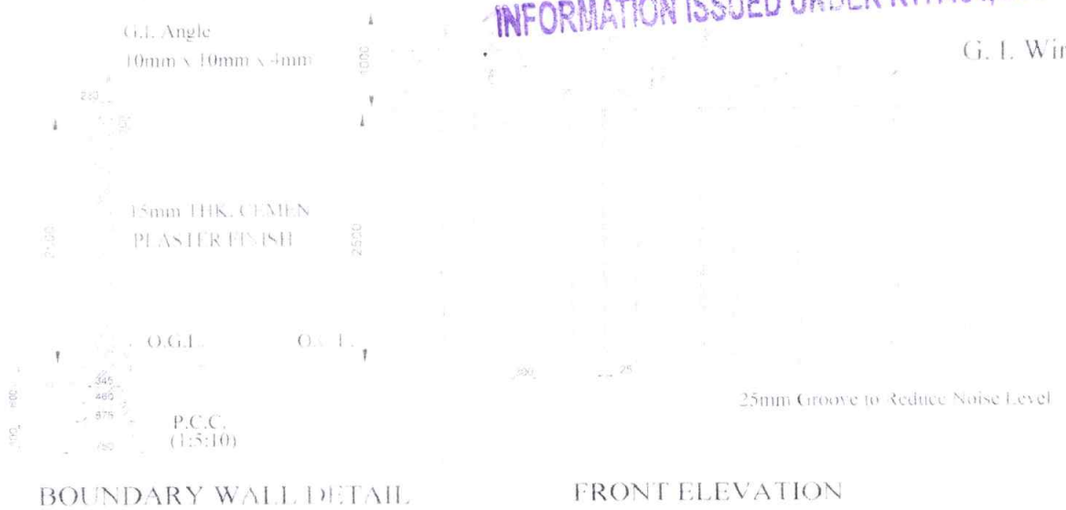

Conceptual Drawing for Noise Barrier

➢ **Noise Pollution – Mitigation**

- Noise standards will be strictly enforced for all vehicles, plants, equipment, and construction machinery. All construction equipment used for an 8-hour shift will conform to a standard of less than 90dB(A). If required, high noise producing generators such as concrete mixers, generators, graders, etc. must be provided with noise shields.
- Machinery and vehicles will be maintained regularly, with particular attention to silencers and mufflers, to keep construction noise levels to minimum.
- Workers in the vicinity of high noise levels will be provided earplugs, helmets and will be engaged in diversified activities to prevent prolonged exposure to noise levels of more than 90dB(A) per 8 hour shift.
- During construction vibratory compactors will be used sparingly within the urban areas. In case of complaints from roadside residents, the engineer will ask the site engineer to take suitable steps of restricting the work hours even further or use an alternative roller.
- Proposed tree and shrub plantations planned for avenue plantation especially close to settlements, may form an effective sound buffer during the operation stage.
- People will be convinced / educated to prevent sensitive land uses from developing up adjacent to the project corridors.

5.17 HUMAN HEALTH AND SAFETY

Due to inadequate width of the road, heterogeneous nature of traffic, congested market places, the accidents are not uncommon. Besides this the truck-drivers may carry contagious diseases, which might spread in the area if proper care is not taken.

Potential Impacts	Mitigation	Implementation Phase
Accidental spots can be reduced by correcting the curves, improvement of junctions, new under process, fly-over	• Proper provision of service roads, junctions, fly-over, under passes to be provided at appropriate places • Truck parking places to be identified • Medical facility to be provided (an ambulance fitted with all medical equipments and a doctor)	Constructional and operational phases Constructional and operational phases Operational phases
Sexually transmission diseases (STDs)	• Detected diseased person to be carried to the nearest city hospital • Preventive measures should be taken to check the spreading of STDs	Operational phases

5.18 MEASURES TAKEN FOR PEDESTRIAN SAFETY

Following measures are taken for pedestrian safety in built-up areas:-

- Railing is provided on both sides of the carriageway in built-up areas.
- Pedestrian crossing is provided in built-up area and bus bays.
- Proper signage is provided at appropriate locations.

5.19 BIOLOGICAL CHARACTERISTICS

The most important negative impact that the project will cause is the loss of number of trees, leading to (a) enhanced degree of soil erosion, (b) loss of shade, fruits, timbers and other economic activities, and (c) ecology of the ecosystem. However, if re-plantation management scheme is launched vigorously, though slow shall restore the ecological balance.

Potential Impacts	Mitigation	Implementation Phase
Cutting of 4875 Nos. of trees	• Minimum thrice new tress to be planted at the loss of one tree	Pre-constructional, constructional and operational phases
No loss of bio-diversity	• Not needed	

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CHAPTER-6: ANALYSIS OF ALTERNATIVES

6.1 Alternative Alignments:

As per scope of work, consultants had studied 7 alternative alignments and Alignment Option cum Inception Report was submitted to the PWD (NH) Goa & MORTH for approval. The detailed study of these 7 alternatives has been submitted in the Alignment Option Report and provided in Pre-feasibility report.

6.2 General:

The scope of work includes identification of alternative alignments for the proposed River Bridge across River Zuari. The realignment minimum up to 2 Km or more, if situation warrants for smooth flow of traffic is included in the scope of work. Accordingly, various alternatives have been studied and explained in this chapter. The emphasis while study of the alternative alignments has been given for the followings;

- the proposed alignment shall be economical,
- smooth flow of traffic shall be ensured,
- to provide best possible geometrics,
- least disturbance to the mangroves located along the banks
- access to the local traffic shall be ensured,
- least numbers of structures shall be affected,
- to ensure minimum adverse impact to the environment,
- to minimize the numbers of tree cutting.

Basically, the alternatives alignments are studied for the proposed new Bridge across River Zuari and its approaches. The stretch between Bythakol junction to Loutulim end is undertaken and covered in this alternative alignments as per demands of each alternative. For the road stretch between Dhavli and Bythakol junction, eccentric widening of existing road to 4/ 6 lane road will be proposed and necessary local realignment/ curve improvement will be proposed as per site situation.

6.3 Constraints:

Followings are the main constraints in the project corridor which were considered during the study of the alternative alignments;

- width of available ROW is inadequate (varies from 10m to 20m),
- there is habitation closer to the existing road in majority length,
- from Dhavli junction to existing bridge location, there is hillock on either side of the existing road,
- large numbers of trees are located in hillock portion as well as along the existing road,

- mangroves located along the banks of River Zuari,
- Margao junction (junction of NH-17B with SH-5) is located at close distance of 720m from the River Bank.

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CHAPTER-7: ENVIRONMENTAL MONITORING PROGRAMME

7.1 ENVIRONMENT MONITORING PROGRAMME

The Environmental Monitoring Programme provides such information on which management decisions may be taken during construction and operational phase. It provides basis for evaluating the efficiency of mitigation and enhancement measures, and suggested actions that need to be taken to achieve the desired effect. The monitoring includes:

(i) Visual observation,

(ii) Selection of environmental parameters at specific locations, and

(iii) Sampling and regular testing of these parameters.

The objectives are:

- Evaluation of the efficiency of mitigation and enhancement measures.
- Updating of the actions and impacts of baseline data.
- Adoption of additional mitigation measures if the present measures are insufficient.
- Generating the data which may be incorporated in the environmental management plan in future projects.

Table-7.1 provides details of how the monitoring of various components will be undertaken.

Table-7.1: Environmental Monitoring Plan

Components	Action to be Taken	Implementing Agency	Monitoring Agency	Approximate Unit Cost
AIR	**Parameters:** • PM2.5, PM10, SO_2,NOx, CO. Monitoring Frequency • **Construction Phase:** following locations viz., Baythkhol Jh. and Zuari river (Mid-point), once in a fortnightly during the construction period • **Operation Phase:** Same locations once in a year for construction period Monitoring Standard Existing National Ambient Air Quality Standard issued by the CPCB	MORTH	SPCB / NABL Accredited laboratory	Rs. 10,000/- per location
NOISE	**Parameters:** • Noise measurement in dB(A) for day & night Monitoring Frequency • **Construction Phase :** Twice a year for 24 hours period at Baythkhol Jh. and Zuari river (Mid-point) • **Operational Phase:** Adhoc only if complaint is lodged Monitoring Standard Existing Noise standard issued by the CPCB	MORTH	SPCB / NABL Accredited laboratory	Rs. 3,000/- per location
WATER QUALITY	**Parameters:** • pH, BOD, COD, DO, Chloride etc. Monitoring Frequency • **Construction Phase:** Ground water quality at one Location or where construction camps are located. • Surface water quality of river Zuari Monitoring Standard • Water quality standard issued by the CPCB	MORTH	SPCB / NABL Accredited laboratory	Rs. 10,000/- per location
SOIL	• **Construction Phase:** Twice a year during construction period at two locations near construction camp, agriculture field, near BT disposal site and borrow area. • Parameters: pH, Conductivity, NPK, texture and organic matter etc.	MORTH	SPCB / NABL Accredited laboratory	Rs. 7,000/- per location

Components	Action to be Taken	Implementing Agency	Monitoring Agency	Approximate Unit Cost
FLORA	**Parameters:** • No of trees surviving after 1.5 yr. And 2 yrs. in relation to total number of trees planted • Re-vegetation success, in terms of survival of plantings Monitoring Points: Throughout the stretch Monitoring Standards: 100% newly planted trees, shrubs and brushes	MORTH	Through forest department / independent agency	Rs. 2,00,000/- for inspection every time counting is done
FOREST	**Parameters:** • Any accident on the project road • Visual survey of reserved forest crossing points • Information collection and compilation of data on reserved forest area crossing the highway	MORTH	Through forest department / independent agency	Rs. 50,000/- per year

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CHAPTER-8: PUBLIC CONSULTATION

8.1 INTRODUCTION

Public involvement is one of the most important methods for the success of any project. It is useful for gathering environmental baseline data, understanding likely impacts, determining community and individual preferences, selecting the alternative and for designing sustainable mitigation and compensations plans.

The guiding principles include

(i) Dissemination of information: - The information regarding the proposed road project should be disseminated to the project affected people directly and indirectly.

(ii) Soliciting information: - The basic information regarding various environmental and socio-economic issues is solicited.

(iii) Consultation: - The consultation involves engaging people in dialogue. It is a religious process. There has to be a continuous dialogue between the components of the project and the public.

(iv) Application of the gathered information: - The aforementioned three components of public involvement should be applied at various lines throughout the EIA process.

The public consultations are held at all the stages, namely, inception, screening, feasibility, and EIA preparation.

8.2 METHODOLOGY FOLLOWED FOR PUBLIC CONSULTATION

In order to make the project sustainable and effective, communication with the stake-holders, other affected people and interviews with individuals was made.

The methods used for public consultation were as follows: -

- The questionnaires regarding the amusements of various environmental impacts due to the project and suggestion on their mitigations were field tested by a group under the leadership of two supervisors. The data were recorded at the screening and feasibility stages.

8.3 LIST OF ISSUES INVOLVED

During public consultation, individually and field testing of questionnaire an effort was made to create an awareness amongst the people about the proposed project. The positive and negative impacts were explained so that affected people could raise their problems and suggest some better alternatives in mitigating the negative impacts and make the project successful.

The following benefits resulting from the project were pointed out:

1. Improvement of the road shall result in less travel time requirement for people and goods. This will benefit the public in general and shall lower the cost of commodities.

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2. The problem of traffic jams will be reduced.
3. Due to the improved transport fruits, vegetables and other perishable goods could be saved from early decay.
4. The availability of consumer items shall be ensured.
5. With this the improvement shall result in reduction in fuel consumption which, in turn shall result in saving valuable foreign exchange
6. The accidents shall decrease as a result of widening.
7. There shall be general economic improvement of the area and the living standard of people will improve.

The following negative effects and mitigative measures of the project were explained for PAPs awareness:

1. The implementation of the project shall result in necessary land acquisition and dislocation of the people. Dislocated Project Affected Peoples (PAPs) shall be paid compensation as admissible and shall be consulted to know their priorities regarding the mode of compensation, for e.g., land for land, cash compensation, etc.
2. People below poverty line, or belonging to scheduled caste and scheduled tribe, or physically handicapped, shall be given due care while planning for their resettlement.
3. A general attempt shall be made to safeguard the sources of earning of the affected.
4. The efforts shall be made to save as many trees as possible. The proposal for dense tree plantation shall be suggested in consultation with the people to improve the environment.
5. The problem arising due to the shifting of electricity, telephone lines and other utilities shall be solved with the co-operation of the respective departments.
6. Compensation will be paid for all the private trees going to be cut. This compensation will be based on the species and their commercial value.

The above points were raised to create awareness about the project. Suggestions were sought from PAPs for improving the road alignment by raising following questions:

1. Do they agree with this project or disapprove it?
2. Whether central widening or one side expansion is preferred?
3. If trees are cut, how many trees for one tree should be planted?
4. What are the provisions for the private owner trees and how they will be compensated?
5. Compensation to be paid for standing crop?
6. What kind of trees do they want along the road?

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7. What do the people living on ROW want in assistance?
8. Do they want to have some training for earning their livelihood?
9. Are they willing to allow relocating the religious structure?
10. Do they want their road should be expanded or want a bypass?
11. Are they aware about the environmental impact?
12. Do they want some more facilities?

8.4 STAKEHOLDER CONSULTATION

8.4.1 Definition of Stakeholder

Stakeholders are the individuals or groups that are likely to affect or be affected positively or negatively by a proposed project or activity. Stakeholders play a very important role in deciding the course of project implementation.

It is very much essential to address the interests of the stakeholders in implementation of the proposed project and also to modify/accommodate their views in the project plan or programme. It is crucial to develop the co-operation between stakeholders & the project team so as to ultimately achieve the successful completion of the project. Benefits of reaching out to stakeholders through surveys and one-on-one meetings consultations are:

- **Quality input leads to quality decision-making**. A broader perspective reduces "group think", helps to challenge traditional thinking, and sparks creativity in problem solving.
- **Greater stakeholder satisfaction with the final planning product** comes from their involvement in shaping it.
- **The chances of successful implementation increase** as more stakeholders feel committed to the plan or project's goals and take ownership of the plan's design.
- **Good governance, transparency and open communication** are served when we communicate and receive feedback from stakeholders, instead of being guided by personal agendas.

8.4.2 Types of Stakeholders Consulted for Feasibility / Screening Studies

In our present study, most important stake holders are the public living by or near the project road, Road development/construction department officials including project implementation unit, forest officials and NGOs working in the locality. These stakeholders hugely influence the process of project decision making.

Stakeholders were identified to ensure as wide coverage as possible of the project area as follows:

- Households in the project area including potential Project Affected Persons
- Local voluntary organizations / Non-government Organizations (NGOs)
- Government agencies / forest department

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Date	Venue / Place	Participants
March 2017	1. **Baythkhol Jh**	Total – About 14 participants including Local villagers, shop owners, farmers, community leaders

The interviews with groups of local people were carried out and the form viz. "Practical view of the community about Environmental Scenario" was filled up at various locations. The form is having details regarding Water quality, noise level, air quality, Archaeology/ historical importance in their vicinity, history of natural disaster, cultural activities etc. Sample list of people interviewed during public consultation is attached below along with photographs of the public consultation. The summary of the filled forms are as under:

Table-8.1: People's Perception about Environment Degradation

Sr. No.	Question asked about	No. of people interviewed	Positive response (%)	Negative response (%)
1.	Water quality of rivers, ponds, wells, and canals	**14**	65	35
2.	Noise quality of the area	**14**	78	22
3.	Air quality of the area	**14**	60	40
4.	Presence of Archaeological sites	**14**	20	80
5.	Natural disaster	**14**	25	75
6.	Adverse effect on Rare species of animals and birds	**14**	10	90
7.	Adverse effect on Cultural sites i.e. market, melas	**14**	60	40

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Format for Public Consultation Meeting

Name of Project Road: Proposed construction of High level new bridge along with its approaches across River Zuari at Borim on NH-17B (NH-566) in the State of Goa.

Pkg. No. -

Baythkhol Jhuari

Public Consultation Date: March 2017 Village: Baythkhol Tehsil: District: North Goa

List of Stakeholders/Participant at Public Consultation Meeting

Name & Address of	Occupation	Signature	Remarks/Opinions
Krishna Parsekar	Private Job		
Pratap Singh	Shopkeeper		
Angela Naval	Private Job		
[illegible]	Shopkeeper		
Maria Pinto	Teacher		
Anthony Pinto	Teacher		
Suresh Pal Singh	Shopkeeper		
[illegible]	Teacher		
Jerry Pinto	Pensioner		
Yasmin Khan	Farmer		
Rajeev Naik	Shopkeeper		
Manohar Lal	Shopkeeper		
Ravindra Velip	Shopkeeper		
Swapnil Bhatt	Private Job		

AUTHOR

(Sample list containing name, occupation & signature of people consulted at Baythkhol Jh. location)

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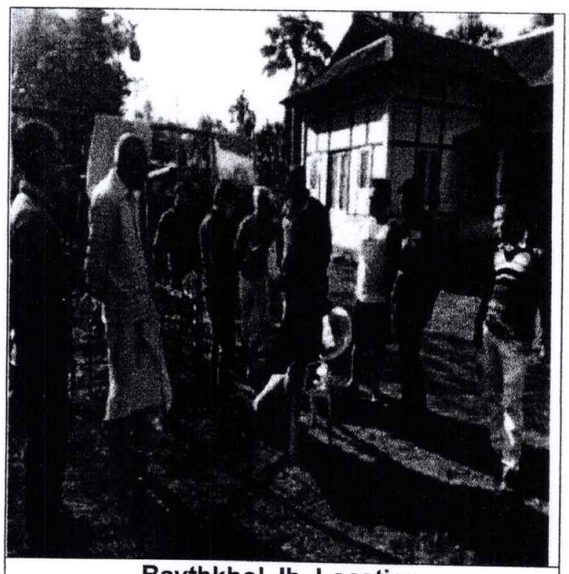

Baythkhol Jh Location

(People expressing their views during interview)

8.4.6 Findings of the Stakeholder Consultation and Issues of Concern that need Attention

The General issues which were put forward before us during the public consultation were:

- Poor provisions of both on road & road side drainage.
- Unsafe access to roads, absence of truck lay byes, footpaths, pedestrian crossing, signs & lightings were also put forward by the people during consultation.
- Increased Air pollution due to poor condition of Road.
- Land acquisition for road improvement.
- Safety of wild animals

CHAPTER-9: PROJECT BENEFITS

9.1 ENVIRONMENTAL BENEFITS FROM THE PROJECT

- Better level of service in terms of improved riding quality and smooth traffic flow.
- Faster transportation will ultimately lead to massive savings in the form of reduced wear and tear of vehicles, reduced vehicle operating costs (VOCs) and total reduction in transportation costs etc.
- With the improvement of road surface, the traffic congestion due to obstructed movement of vehicles will be minimized and thus wastage of fuel emissions from the vehicles will be reduced.
- Increased road landscaping and safety features.
- Enhanced connectivity between rural & urban population which will benefit the all sections of the society like general population, small-medium-large scale industries, farmers, businessmen etc.
- Plantation of tree all along the project road will improve the tree density along the RoW and road improves aesthetically as well as tree will act like a pollution absorber.
- Overall Environment improvement of the region.

9.2 SOCIO-ECONOMIC BENEFIT OF THE PROJECT

The improvements proposed in the project road will result in the following benefits:

- Providing better level of service in terms of improved riding quality and smooth traffic flow.
- Faster transportation will ultimately lead to massive savings in the form of reduced wear and tear of vehicles, reduced vehicle operating costs (VOCs) and total reduction in transportation costs etc. Approximately 02 lakh people of North and South Goa districts will get benefitted by this project.
- With the improvement of road surface, the traffic congestion due to obstructed movement of vehicles will be minimized and thus wastage of fuel emissions from the vehicles will be reduced.
- Introduction of additional safety measures like crash barrier, road illumination, retro-reflective boards, delineators etc. will result in lesser accidents.
- Increased passenger comfort due to good road condition shall be an added benefit.
- It will increase access of the villages and other small settlements to urban areas, thus providing connectivity of rural produce to urban markets, thereby enhancing the reach and export of perishable farm-goods, leading to better remuneration for the producer.
- The reach and export of perishable farm-goods will have quite a positive impact and this will prove to be a boon for the rural agricultural sector.
- Providing connectivity to the urban infrastructure.
- Rural industrial produce, whether from Commercial industries, small-scale industries or medium-scale industries will have easy access to the urban markets.

- Strengthening of rural economies: The rural sector / economy are sure to get strengthened, though at a gradual pace.
- Higher education: Education is considered to be one of the most dominant indicators towards the development of a region. Though primary education facilities are present along the project road, access to high schools, higher secondary schools, and colleges is not so easy at present. Provision of easy access to higher education can be directly linked to the improved educational scenario.
- By reducing the transportation costs, it will be more feasible to transfer construction materials which are important for many economic activities (house building, school building, small hydro-electric, projects etc) to hinterland. This will in turn, lead to direct as well as indirect strengthening of local economies.
- During the execution of the project, i.e. during the construction period, employment will be provided to workers from the local communities.
- The educated as well as uneducated people from villages will obtain access to new employment centers.
- The improvement of the road will reduce the number & frequency of collisions. This would be very beneficial from the safety point of view and will thus, reduce accident rate.
- Overall improved quality of life for the lesser developed areas in the neighborhood.

9.3 OTHER TANGIBLE BENEFITS

- Enhanced connectivity between rural & urban population which will benefit the all sections of the society like general population, small-medium-large scale industries, farmers, businessmen etc.
- Improved access to higher education facilities & modern health facilities.
- Strengthening of both rural & urban economies which in turn will improve economic scenario of the state and country.
- Improved road connectivity helps in better implementation and management of government schemes.
- With improvement in economy, more generation of employment opportunities.

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CHAPTER 10: ENVIRONMENTAL MANAGEMENT PLAN (EMP)

10.1 Introduction

10.1.1 General

Environmental Management Plan (EMP) is prepared for all the identified environmental impacts during pre-construction, construction and O&M stages due to implementation of various Project activities and associated development. The methodology followed for preparing the EMP is given in Figure below and consists of the following steps:

- Deriving mitigation/protection measures for identified impacts for each of the Project activity and environmental component,
- Recommend mitigation, compensation and enhancement measures for each identified impacts and risks,
- Developing a mechanism for monitoring the proposed mitigation measures,
- Estimating budget requirements for implementation mitigation and monitoring measures, and
- Identifying responsibilities of various agencies involved in the Project for implementation and monitoring of mitigation measures.

Fig. 10.1: Framework for Preparation of EMP during Construction and O&M

The EMP prepared in accordance with the above framework is given in **Table 10.1** in the following sections. The EMP will be included in all the bid documents of the Project and will become a part of the civil works contract. The strict implementation of the EMP and project management's strict enforcement of the adequate construction practices and standards will greatly reduce the negative impacts of the Project.

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10.1.2 Monitoring Mechanism

The monitoring of environmental components and mitigation measures during construction and operation stages is a key component of the EMP is given in EIA//EMP report under Chapter 7.0. Environmental monitoring program is presented in Table 7.1 in EIA report –Vol. IV.

10.1.3 Budget Estimates

A cost estimates are prepared for all the mitigation and monitoring measures proposed in the EMP. The details of the cost estimates and the budget during construction stage and first five years of operation stage for the mitigation measures are given in Table 10.2. The cost estimates for some of the mitigation measures that were already part of civil works contract or Resettlement Action Plans (RAP) are not included in the EMP.

The cost estimates also includes the budget for environmental monitoring, consultants for EMP implementation, institutional strengthening and capacity building of CSC / MORT&H and environmental enhancement/compensation measures. The total budget for EMP implementation is estimated to be **Rs. 2,20,75,900.**

10.1.4 Institutional Framework for Implementation of EMP

Various institutions will be involved during implementation of the project as shown in Fig. 10.2.

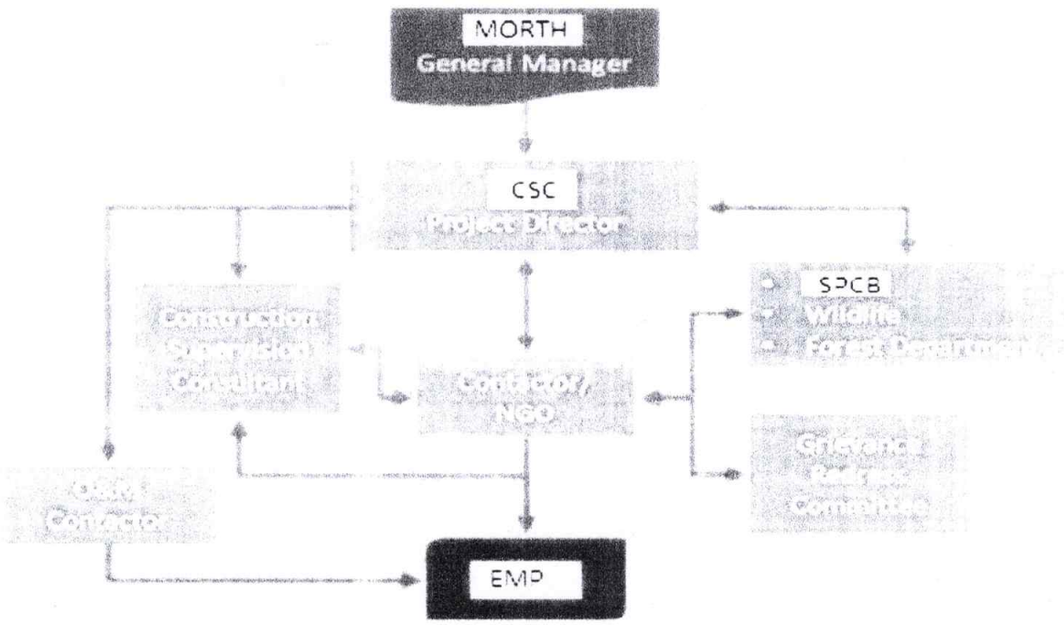

Fig. 10.2: Proposed Institutional Framework for EMMP Implementation

Contractor is responsible for implementation of EMP during construction works and Construction Supervision Consultant (CSC) is primarily responsible for supervision of monitoring of the implementation of the EMP. MORT&H will be supported by a CSC to advise and assist

them in quality and capacity enhancement and independent quality monitoring. O&M Contractor will be responsible for implementation of EMP during O&M stage. Relevant institutions responsible for implementation and supervision of proposed mitigation and monitoring measures are given in the EMP.

Each Contractor procured under this Project (especially the contractors for main bridge / road) will be recommended to be a compliant of Environmental Management System (EMS) certification. Further conditions of compliancy for OHSAH 18000 (2007) related Occupational Health and Safety (OHS) and SA 8000 (Social Accountability) could also be imposed on the Contractors. Each contractor will be recommended to have one Environmental Specialist and one Occupational, Health and Safety (OH) Specialist, who will be working in close coordination with the environmental staff of CSC.

CSC will be responsible to monitor all activities of all contractors procured under the project. As several contractors will be working simultaneously for timely and speedy implementation of the project, it is important that CSC has an Environmental Specialist to effectively supervise and monitor the environmental activities being implemented in the field. The CSC is also responsible to update or make necessary changes to the EMP if required based on the revised designs and locations.

A combined grievance redress committee is proposed to address grievances in both social and environmental issues. In addition, there will be NGOs working for plantation program and environmental awareness.

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Table 10.1: Environmental Management Plan

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision
PRE-CONSTRUCTION STAGE					
Land Acquisition and Resettlement					
Land Acquisition	**Acquisition of about 40.3 ha land for the project.**	• Provide compensation in accordance with resettlement action plans' (RAPs) • Engage NGOs for implementation of RAP		CSC(Construction supervision consultant), MORT&H	CSC(Construction supervision consultant), MORT&H
CONSTRUCTION STAGE					
A. Main Bridge					
Large quantities of material Import	Exploration of illegal source	• Environmental permits of suppliers from relevant authority	Included in civil works contract	Contractor	CSC(Construction supervision consultant), MORT&H

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision
Mobilization of equipment and Materials through road	• Road Safety and Traffic Management • Damage of local roads due to movement of heavy axle loads	• Ensure that all construction vehicles observe speed limits on the construction sites and on public roads • Provide adequate signage, barriers, and flag persons for traffic control. • Fit audible warning devices in all vehicles to alert during reversing. • Maintain all existing roads in traffic worthy condition ensuring maintenance of uninterrupted movement of traffic. • Temporary bypasses to be constructed and maintained (including dust control) during the construction period • Form a grievance redress committee in association with affected population before starting the civil work and advance notice must be given to the community about the construction schedule. • Repair the damaged local roads to their original condition after project completion.	Included in civil works contract	Contractor	CSC

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision
	Dust and emissions from construction vehicles and equipment may cause health problems or accidents and injuries to construction workers and nearby community.	• Each vehicle related to the construction has to have valid "Pollution Under Control Certificate" during construction • Vehicular traffic through communities will be avoided as far as possible. Vehicle speeds will be kept low if they should pass through communities. • Cover haul vehicles carrying dusty materials • Watering of the unpaved roads	Included in civil works contract	Contractor	CSC
Mobilization of equipment and materials through river	• Affecting flora and avian fauna • Dredging to increase navigation depth, access/transit channels, and equipment manoeuvring	• minimum disturbance to habitat • Movement of barges should be within the designated project areas • Disposal of materials in accordance with the dredge material management plan	Included in civil works contract	Contractor	CSC

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision
Operations at Construction Yards and Construction Sites	• Air pollution from material storage sites and mixing sites	• Water to be sprayed during the construction phase in all mixing areas where dry materials are handled and / or crushed. • Temporary access roads to aggregate sites must be included in the dust suppression program. • A spraying schedule will be prepared by the contractor and will serve as the basis of a dust control program. The **supervision consultant** will regularly monitor this schedule. • Materials to be covered in vehicles going to and from the construction sites to reduce spills.	Monitoring Budget	Contractor	CSC
	• Noise pollution from operation of construction yard and construction activities	• Provide temporary noise barriers near the sensitive sites • Vehicles and equipment to be fitted with the silencer and maintained accordingly • Use of vehicles, machineries and equipment that are of good quality and generates noise as per their specifications			

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision
	• Pollution risk from fuel and other hazardous material storage sites	• Obtain Explosive License from Explosive Department to store class "A" and "B" petroleum product • Contractor to develop and undertake construction waste management strategy for both hazardous and non-hazardous wastes separately. • Contractor to confine the contaminants immediately after such accidental spillage • Contractor to collect contaminated soils, treat and dispose them in environment friendly manner • All areas intended for storage of hazardous materials to be quarantined and provided with adequate facilities to combat emergency situations complying all the applicable statutory stipulation • Train the personnel in-charge of these sites to control access to these areas and entry to be allowed only under authorization	Included in civil works contract	Contractor	CSC

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision
	Air and noise pollution from Operation of generators for electricity generation	• Obtain Consent to Operate from SPCB • Routine maintenance and regular inspection of these generators. • Use of canopy for diesel/gas generators for noise control/reduction	Included in civil works contract	Contractor	CSC
	Surface water pollution	• Discharge sediment laden construction water into settling tanks prior to final discharge • Discharge alkaline water from the concrete works that consists of fine particles into settling tanks prior to final discharge	Included in civil works contract	Contractor	CSC
	Solid Waste, excess materials	• Develop appropriate construction waste management strategy along with its strict adaptation • Install proper waste disposal facilities; • Organize proper collection and transportation of wastes	Included in civil works contract	Contractor	CSC
	Occupational health and safety issues	• Ensure construction related safety measures as an integral part of the construction works • Provision of adequate on site First Aid Boxes and treatment facilities	Included in civil works contract	Contractor	CSC

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision

Construction of Substructure (pile driving and concreting)	Underwater noise impacts on fisheries and other aquatic life	• Use vibratory hammer. Under those conditions where impact hammers are required for reasons of seismic stability or substrate type, it is recommended that the pile be driven as deep as possible with a vibratory hammer prior to the use of the impact hammer.
		• Monitor sound levels during pile driving to ensure that they do not exceed the NOAA or any other international recognized criteria.
		• Implement measures to attenuate the sound when sound pressure levels exceed the NOAA or any other international recognized criteria. Methods to reduce the sound pressure levels include, but are not limited to:
		  • Installation of underwater enclosures to minimize sound
		  • Surround the pile with an air bubble curtain system or air-filled coffer dam.
		  • Use a smaller hammer to reduce the sound pressure. The sound produced in pile driving has a direct relationship to the force used to drive the pile. A smaller hammer will have less force on the pile therefore, producing less sound.
		  • Use a hydraulic hammer if impact driving cannot be avoided. The force of the hammer blow can be
			Monitoring Budget	Contractor	CSC

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision
	Impact on turtle	• Limit the construction activity within the designated areas • Check the site for turtle trapped in, or in danger from civil works and use a qualified person to relocate the animal. • Monitor area to ensure they are well away from the piling site – scare them away if they are too close to the site using pingers	Part of civil works contract	Contractor	CSC
	Impact of air noise levels on endangered and migratory birds	• Acoustic enclosure should be placed to cover the hammer and the exposed pile to reduce the air noise. The air noise levels can be reduced to about 60 dB with these measures	Included in the civil work contract	Contractor	CSC
	Risk of water contamination with concrete	• Unused concrete should not be disposed into the river water. • Unused concrete should be collected properly and disposed in the designated waste dumping site.	Included in the civil work contract	Contractor	CSC

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision
Construction of Superstructure	Occupational, health and Safety	• Provision of adequate lighting along the bridge alignment and in the area particularly where construction works will take place • Proper safety training for all participating in the construction works and distribution of PPE (such as helmets, masks, safety shoes and goggles, rain coats, ear plugs etc.) to the construction labours, engineers.	Included in the civil work contract	Contractor	CSC
	Air pollution from welding	• Proper safety training for all participating in the welding works and distribution of personal protective equipment (such as helmets, masks, safety shoes and goggles, rain coats, ear plugs etc.) to the construction labours, engineers.	Included in the civil work contract	Contractor	CSC
	Movement of barges in the river	• Movement of Barges only within the designated areas in the river.	Included in the civil work contract	Contractor	CSC
B. River Training Works					
Dredging and construction works	Loss of wildlife and aquatic habitat	• Compensation by supporting research works	-	External Agency	CSC

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision
	Impact on surface water quality due to eroded soils and underwater slope protection works.	• Increase coverage of open surface area by planting grass and creepers so that washing away of materials from sloped surfaces would be reduced to a significant extent. • Store the construction materials containing fine particles, e.g. limestone or laterite, in an enclosure such that sediment laden water does not drain into nearby watercourses, but rather percolates slowly into the soil. • Provide fences, sediment barriers etc., to prevent siltation in the construction sites.	Included in civil works contract Included in the monitoring budget	Contractor	CSC
	Air and noise pollution from dredging Equipment	• All equipment should be properly maintained in compliance with manufacturers guidelines	Included in the monitoring budget	Contractor	CSC

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision
	Water contamination in the adjacent water bodies and agricultural lands from wastewater from dredge material storage/backfilling etc.	• Minimise the quality of wastewater to be disposed into adjacent water bodies • Discharge sediment laden construction water into settling tanks prior to final discharge. Ensure sufficient retention time to allow waste water disposal from land filling sites in the adjacent lands with required TSS level	Included in civil works contract	Contractor	CSC
	Dredge materials disposal	• Disposal dredge materials will be carried out in accordance with the Dredge material management plan.	Included in civil works contract	Contractor	CSC
	Drainage problem behind RTW works and around the land filling site	• Design and implement drainage structures around the RTW and landfill site	Included in civil works contract	Contractor	CSC
	Loss of vegetation and agriculture crops	• Implement Tree compensation and greenbelt development plan to develop vegetation around the Project sites	Plantation Cost	Contractor, NGO	CSC

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Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision
	Interference with local navigation and hindrance to the river traffic	• Provide adequate navigation clearance for the passenger and goods carrying boats/lunches/cargos	Included in civil works contract	Contractor	CSC
C. Approach Roads					
Clearing of sites	Loss of top-soils	• Collect/strip top soil before earth-filling and store and re-use it for final surfacing of road embankment and tree plantation	Included in civil works contract	Contractor	CSC
	Cutting of trees	• Tree plantation along roadside open spaces.	Included in plantation budget	Forest Department	CSC, Forest Department
	Loss of agricultural lands	• Undertake agriculture development plan to boost up crop production • Development of demonstration plots along with training to farmers for high yield variety of crop production.	RAP	NGO	CSC
Earth Filling by borrowed material	Loss of productive soil	• Borrow soil will be procure from approved quarry. • IRC guidelines will be followed during excavation • care has been taken that (i) many borrow areas are located on raised lands, earth mounds and heaps, (ii) in	Included in civil works contract	Contractor	CSC

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision
		some cases the owner or villagers want to develop the area into pond for rearing fishes, (iii) re-plantation borrow pit areas will minimize the soil erosion.			
Operation of hot mix plants, etc. Transportation of construction materials and carrying out construction activities	Air pollution and dust generation	• Undertake precautionary measures for reducing dust emissions from DG sets, hot mix plants, crushers and batching plants; • Provide adequate stack height and dust extraction systems for the hot mix plants • Ensure Water spreading to suppress dusts particularly during dry and windy weather • Provide grass cover immediately after the completion of final earth surface along with watering until they grow and survive • Tree plantation on the slopes all along the approach road embankment • Monitor ambient air quality and comply with the standards by reducing the emission levels of air pollutants	Included in civil works contract	Contractor	CSC
Asphalting	Spills from bitumen plants may contaminate surface	• Disposal of bitumen will not be allowed to enter either running or dry streambeds and nor will be disposed of	Included in civil works	Contractor	CSC

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision
	water quality during -Thinning of bitumen - Leaks in drums -Handling of bitumen	in ditches or small waste disposal sites prepared by the contractor. • Bitumen storage and mixing areas must be protected against spills. • Proper handling of contaminated soil according to MoEF&CC guidelines. • As a minimum, these areas must be contained, as to allow immediate collection and clean up • Careful management of any petroleum products used in the preparation of the bitumen mixture to avoid spills and contamination of the local water table.	contract		
	Impact on Traffic safety	• Control speed of construction vehicles through road safety education • Allow adequate traffic flow around construction areas. • Provide adequate signage, barriers and flag persons for traffic control.	Included in civil works contract	Contractor	CSC
	Traffic jams and congestions	• Communicate to the public through community consultation and newspaper announcements regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restrictions.	Included in civil works contract	Contractor	CSC

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision
D. Bridge End Facilities					
Site Clearance and preparation	Loss of top soils	• Collect/strip top soil before earth-filling and store and re-use it for final surfacing of railway embankment and tree plantation	Included in civil works contract	Contractor	CSC
	Loss of trees and agriculture lands	• Tree plantation to compensate the lost trees and agriculture promotion activities	included in Plantation budget	Forest Department	CSC, Forest Department
E. Construction Camps					
Establishment of camps	Lack of proper services in camps such as safe drinking water and sanitation	• Provision of necessary facilities in construction camps	Included in civil works contract	Contractor	CSC
Maintenance of camps	• Contamination from solid waste • There will be potential for diseases to be transmitted including malaria, exacerbated by inadequate	• Implement waste management activities in Construction Camp Management • All construction materials will be reused, recycled and properly disposed of. All worn out parts, equipment and empty containers must be removed from the site to a proper storage • There will be no site-specific landfills established by the contractors. All solid waste will be collected and removed	Included in civil works contract	Contractor	CSC

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Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision
	health and safety practices. There will be an increased risk of sexually transmitting infections and HIV AIDs	from the work camps and disposed in approved waste disposal sites. • Implement Health and Hygiene guidelines • Implement Workers Health and Safety • Environmental specialists and occupational, health and safety specialist to be hired to monitor workers health, safety and hygiene for entire construction period			
OPERATIONS AND MAINTENANCE STAGE					
A. Main Bridge					
Road traffic	Deterioration in air and noise quality	• Plantation of pollutant adsorbing trees • Connection of noise barriers close to sensitive receptors • Proper road and traffic maintenance		O&M Contractor Traffic Police	PWD, GOA, MORT&H
Operation of the bridge	Vehicle accidents, Accidental spillage of oils/fuels, lubricants Gas leakage and explosion	• Environmental Response Plan is prepared for undertaking measures for emergency evacuation of vehicles, victims from bridge • Environmental Response Plan is prepared for addressing gas leakage and explosions	ERP Budget	O&M Contractor	PWD, GOA, MORT&H
B. River Training Structures					

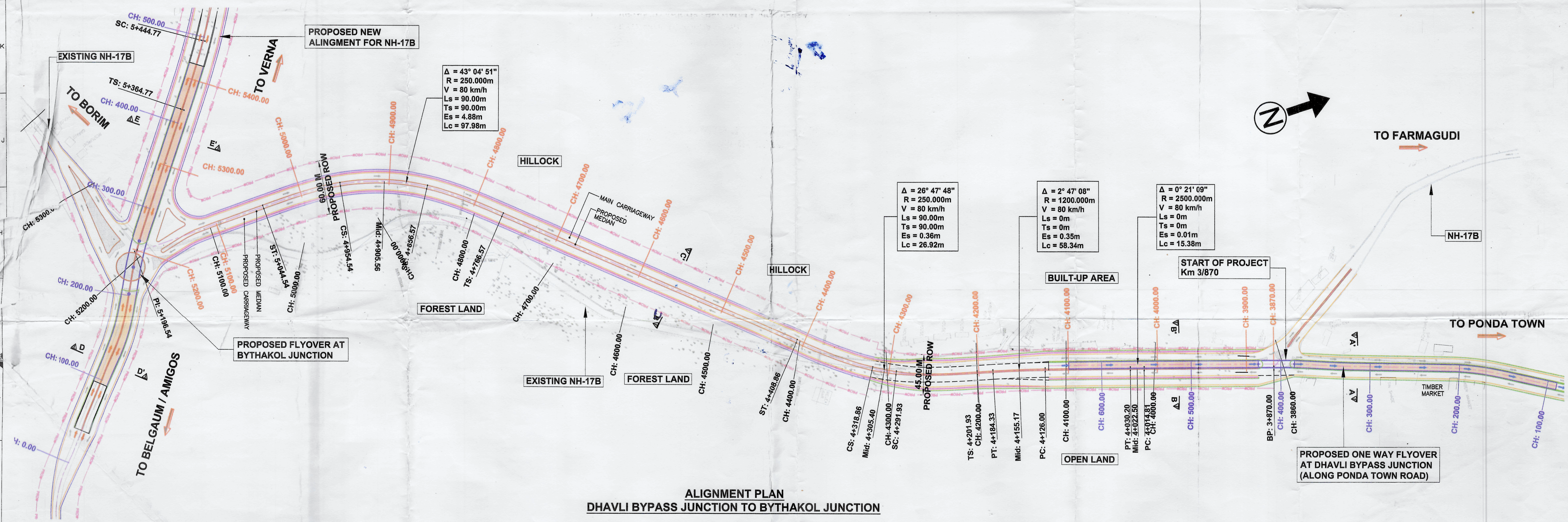
Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision
Operation of river training structures	Drainage congestion, soil erosion and siltation	• Undertake visual inspection of erosion on embankment of RTW slopes particularly due to rain-cut and formulate and implement erosion protection measures, such as grassing, structural drainage as found appropriate. • Regular monitoring of morphological changes of river at the bridge locations and along the RTW and formulate bank protection work immediately for implementation, particularly during monsoon.		O&M Contractor	PWD, GOA, MORT&H
C. Approach Roads					
Vehicular movement	Increase noise level because of enhanced traffic volume.	• Noise models suggest noise levels are within the standards during O&M. However, if any exceedance is noticed during O&M, construct noise barriers at sensitive locations such as health care units/hospitals. • Put signage for noise regulations at these locations with clear instructions of not using horns and running vehicles with limited/allowable speeds. • Maintain tree plantation on both sides of the roads	Included in Post-construction monitoring Budget	O&M Contractor	PWD, GOA, MORT&H

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision
		• Noise monitoring will be taken up during operation.			
	Deterioration in roadside ambient air quality that will affect the roadside human settlement, development	• Ensure that the road vehicles have appropriate road permit certificates to ensure that they do not pollute air • Carry out onsite testing for assessing emission levels of pollutants from vehicles running on road • Strictly adopt measures of vehicle inspections and ban those vehicles emitting excessive pollutants beyond the permissible limits		Traffic Police	PWD, GOA, MORT&H
	Drainage leading to water logging and impacting on surrounding lands	• Monitor drainage pattern after high down pouring and recession flood • Connect water pockets to the nearest drainage structures/canals by constructing roadside drainage canal	O&M Budget	O&M Contractor	PWD, GOA, MORT&H
	Soil and water contamination from accidental spillage of oils/fuels	• Emergency Response Plan to be prepared to address the accidental spillage of fuels and hazardous goods • Immediate collection of spilled oils/fuels/lubricants through collection of contaminated soils and sucking oils from surface water through appropriate technologies.	ERP O&M Budget	O&M Contractor	PWD, GOA, MORT&H

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision
	Road accidents	• An Emergency Response Plan to be prepared to address road accidents • Monitor road accidents in terms of frequency, location of occurrence, and analyse them to formulate additional measures to improve road safety. If accidents occur at same locations of road, insert structural speed breakers and/or speed breaking signage to improve road safety at those locations.	ERP O&M Budget	O&M Contractor	PWD, GOA, MORT&H
Drainage of runoff from roads into water bodies	Soil and water contamination into roadside ponds/water bodies due to Oils/grease being washed away with rainfall runoff from roads	• For repetitive problem at a particular location or at pond locations having potential fish-culture, build road-side drainage and divert the flow away from ponds/sensitive water bodies. • Regular cleaning of drains	O&M Budget	O&M Contractor	PWD, GOA, MORT&H
		•			
Tree plantation	Survival of Flora and fauna in the new environment	• Monitor survival of trees and its maintenance for first 2 years • Plantation of additional varieties of trees that supports roadside birds and sustains long-time and having high wood	Included in Tree Plantation Budget	NGO, Forest Department	PWD, GOA, MORT&H, Forest Department

Project Activities	Environmental Impacts	Mitigation/Compensation Measures	Mitigation Cost	Institutional Responsibility	
				Implementation	Supervision
		value • Undertake monitoring and maintenance efforts for ensuring survival of planted trees			
D. Induced Development					
Land use changes	Roadside development and rapid changes in land use	• Apply strict policy measures for use of roadside development including provision of cross-drainage structures and treatment of industrial effluents prior to disposal of wastes into lands/water bodies; • Prohibit roadside waste dumping • Land-use zones should be established supported by good land-use policy guideline and regular monitoring		MORT&H in coordination with the local administration	PWD, GOA, MORT&H

ANNEXURE - A - 2



ALIGNMENT PLAN
DHAVLI BYPASS JUNCTION TO BYTHAKOL JUNCTION

LEGEND:-

	TRAFFIC ALONG NH-17B (UP & DOWN)
1.	BYTHAKOL TO PONDA TOWN
2.	VERNA TO AMIGOS / BELGAUM & VICE VERSA
3.	TRAFFIC FROM BYTHAKOL / BORIM RIVER BRIDGE & LEADING TO MARGAO
4.	TRAFFIC FROM MARGAO & LEADING TO BYTHAKOL / BORIM
5.	TRAFFIC FROM LOUTULIM & LEADING TO VERNA VIA MISSING LINK
6.	TRAFFIC FROM MISSING LINK (VERNA) & LEADING TO LOUTULIM
7.	TRAFFIC FROM MARGAO / VERNA & LEADING TO BORIM / SHIRODA
8.	TRAFFIC FROM BORIM / SHIRODA & LEADING TO MARGAO / VERNA

REV.	DESCRIPTION	DRN BY	DATE	CHECKED BY	DATE	APRD BY	DATE
1	FOR ALIGNMENT REPORT	M.H.S.	25.09.17	S.V.S.	25.09.17		
0	FOR INCEPTION REPORT	M.H.S.	12.03.17	S.V.S.	12.03.17		

CONSULTANT
TECHNOGEM CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
101, A-B, DEV MILAN BUILDING,
OPP. RAHEJA GARDEN,
L.B.S. MARG, THANE (W) - 400 604.
TEL. NO. 67997145 (3 LINES)
FAX NO. 25814349

EMPLOYER:
GOVT. OF GOA
EXECUTIVE ENGINEER
WORK DIVISION - XV (NH)
PUBLIC WORK DEPARTMENT
PONDA, GOA

CLIENT:
MINISTRY OF ROAD TRANSPORT & HIGHWAYS
Government of India
Transport Bhavan, Parliament Street
New Delhi - 110 001

PROJECT:
CONSULTANCY SERVICES FOR THE PREPARATION OF DETAILED PROJECT REPORT AND BIDDING DOCUMENTS FOR THE "PROPOSED CONSTRUCTION OF HIGH LEVEL NEW BRIDGE ALONG WITH ITS APPROACHES ACROSS RIVER ZUARI AT BORIM ON NH-17B(NH-566) IN THE STATE OF GOA."

TITLE
ALIGNMENT PLAN
(SHEET 1 OF 2)

DRG NO.	PROJECT NO.	REV.	SCALE
869-ZB-PL-001	869	1	N.T.S.

Tcpl\draughtsmen\869- ZUARI-BORIM BRIDGE\ALIGNMENT REPORT-STAGE 2\869-ZB-PL-001-R1.dwg

Annex URE - A-3 698

0	FOR INCEPTION REPORT	M.H.S.	12.03.17	S.V.S.	12.03.17		
REV.	DESCRIPTION	DRN BY	DATE	CHECKED BY	DATE	APRD BY	DATE

CONSULTANT

TECHNOGEM CONSULTANTS PVT. LTD.
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TEL. NO. 67997145 (3 LINES)
FAX NO. 25814349

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GOVT. OF GOA EXECUTIVE ENGINEER WORK DIVISION - XV (NH)
PUBLIC WORK DEPARTMENT PONDA, GOA

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MINISTRY OF ROAD TRANSPORT & HIGHWAYS
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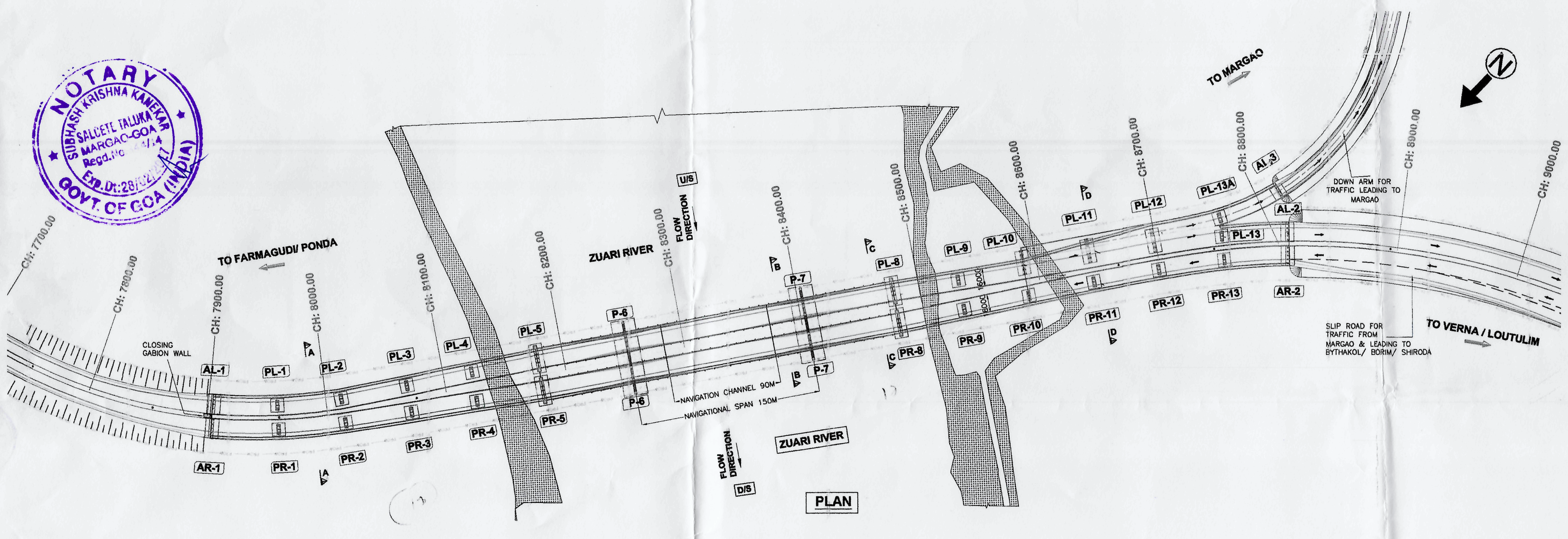
PROJECT
CONSULTANCY SERVICES FOR THE PREPARATION OF DETAILED PROJECT REPORT AND BIDDING DOCUMENTS FOR THE "PROPOSED CONSTRUCTION OF HIGH LEVEL NEW BRIDGE ALONG WITH ITS APPROACHES ACROSS RIVER ZUARI AT BORIM ON NH-17B(NH-566) IN THE STATE OF GOA."

TITLE
ALTERNATIVE ALIGNMENT NO. 7
(SHEET 2 OF 2)

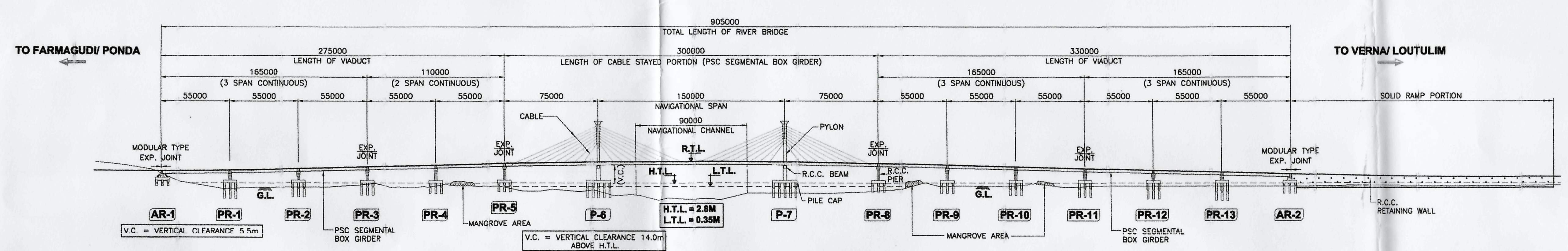
DRG NO.	PROJECT NO.	REV.	SCALE
869-ZB-PL-001	869	0	N.T.S.

3 Km

NOTARY SUBHASH KRISHNA KAMEKAR SALCETE TALUKA MARGAO-GOA Regd.No.344/14 Exp.Dt:28/02/2021 GOVT. OF GOA (INDIA)



PLAN

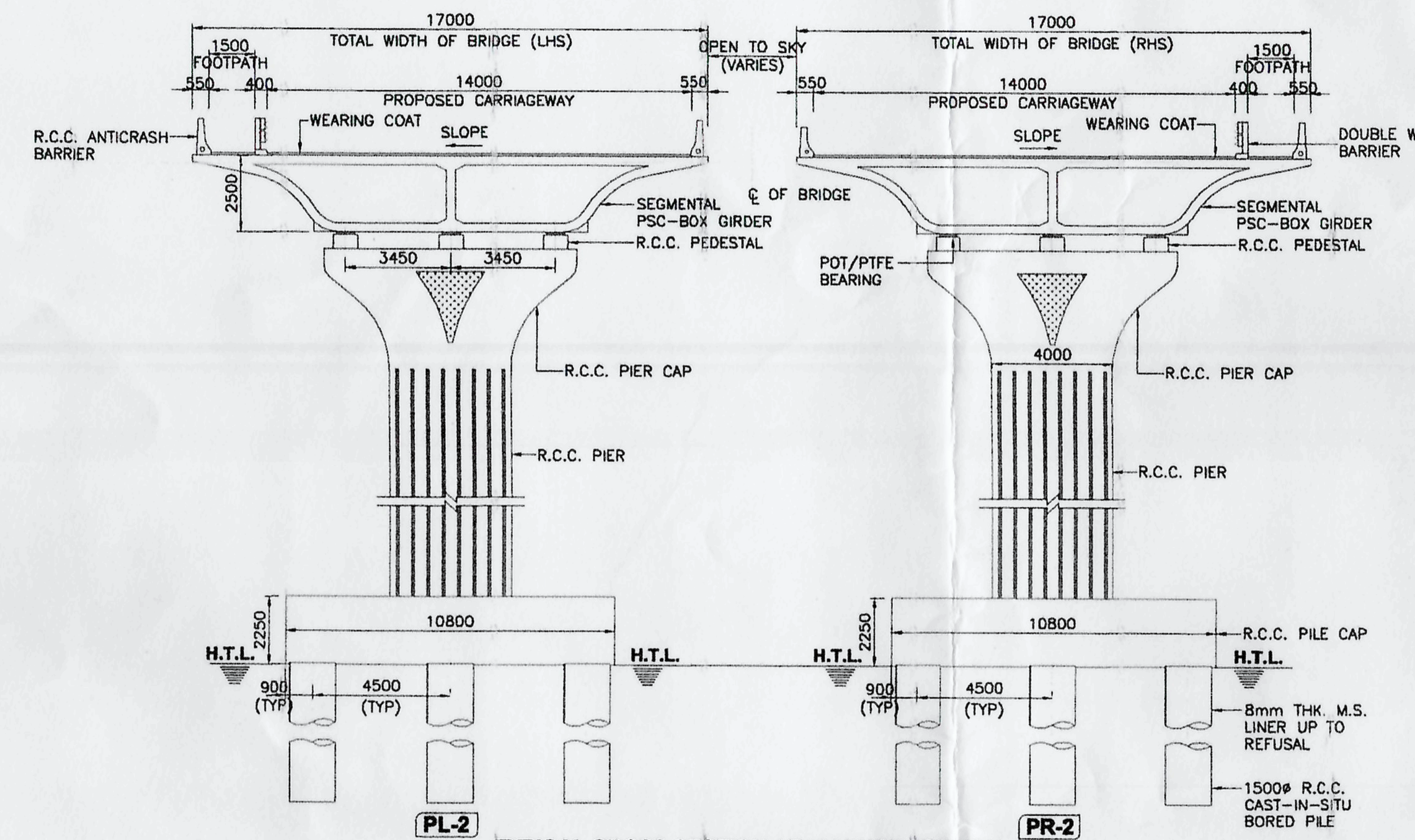


CHAINAGE	PROPOSED LEVELS	EXISTING LEVELS
7850.000	12.700	19.516
7860.000	12.700	18.747
7870.000	12.700	17.971
7880.000	12.700	16.461
7890.000	12.702	14.852
7900.000	12.723	12.463
7910.000	12.768	7.822
7920.000	12.837	3.899
7930.000	12.929	2.478
7940.000	13.046	0.744
7950.000	13.186	-1.005
7960.000	13.350	-1.338
7970.000	13.538	-0.924
7980.000	13.750	-0.594
7990.000	13.985	-0.595
8000.000	14.235	-0.596
8010.000	14.485	-0.598
8020.000	14.735	-0.600
8030.000	14.985	-0.601
8040.000	15.235	-0.609
8050.000	15.485	-0.621
8060.000	15.735	-0.634
8070.000	15.985	-0.646
8080.000	16.235	-0.659
8090.000	16.485	-0.619
8100.000	16.735	-0.428
8110.000	16.985	-0.434
8120.000	17.235	-0.127
8130.000	17.485	1.796
8140.000	17.735	0.853
8150.000	17.982	0.806
8160.000	18.217	-0.288
8170.000	18.438	-1.450
8180.000	18.646	-2.611
8190.000	18.840	-3.773
8200.000	19.021	-4.164
8210.000	19.188	-4.315
8220.000	19.342	-4.296
8230.000	19.482	-4.278
8240.000	19.608	-4.566
8250.000	19.721	-5.579
8260.000	19.821	-6.593
8270.000	19.907	-6.968
8280.000	19.979	-6.283
8290.000	20.038	-7.728
8300.000	20.084	-10.145
8310.000	20.116	-10.664
8320.000	20.134	-10.567
8330.000	20.139	-10.441
8340.000	20.131	-10.443
8350.000	20.109	-10.474
8360.000	20.073	-8.579
8370.000	20.024	-6.183
8380.000	19.962	-5.262
8390.000	19.885	-5.195
8400.000	19.796	-5.174
8410.000	19.693	-5.220
8420.000	19.576	-5.230
8430.000	19.446	-5.220
8440.000	19.302	-5.246
8450.000	19.145	-4.910
8460.000	18.974	-4.477
8470.000	18.790	-4.056
8480.000	18.592	-3.278
8490.000	18.381	-2.551
8500.000	18.156	-1.528
8510.000	17.918	1.241
8520.000	17.669	2.131
8530.000	17.419	0.043
8540.000	17.169	0.487
8550.000	16.919	0.472
8560.000	16.669	0.450
8570.000	16.419	0.073
8580.000	16.169	-0.002
8590.000	15.919	0.924
8600.000	15.669	2.008
8610.000	15.419	1.554
8620.000	15.169	0.373
8630.000	14.919	-0.494
8640.000	14.669	-0.105
8650.000	14.419	0.375
8660.000	14.169	0.505
8670.000	13.919	0.585
8680.000	13.669	0.492
8690.000	13.419	0.491
8700.000	13.169	0.520
8710.000	12.919	0.590
8720.000	12.669	0.586
8730.000	12.419	0.572
8740.000	12.169	0.551
8750.000	11.919	0.497
8760.000	11.669	0.447
8770.000	11.419	0.550
8780.000	11.169	0.550
8790.000	10.919	0.466
8800.000	10.669	0.522
8810.000	10.419	0.575
8820.000	10.169	0.572
8830.000	9.919	0.569
8840.000	9.669	0.566
8850.000	9.419	0.777
8860.000	9.169	1.026
8870.000	8.934	0.695
8880.000	8.723	0.444
8890.000	8.536	0.443
8900.000	8.372	0.635
8910.000	8.232	0.511
8920.000	8.116	0.472
8930.000	8.024	0.484
8940.000	7.956	0.688
8950.000	7.911	0.604
8960.000	7.891	0.503
8970.000	7.889	0.503
8980.000	7.889	0.582
8990.000	7.889	0.664
9000.000	7.889	0.745
9010.000	7.889	0.811
9020.000	7.889	0.871

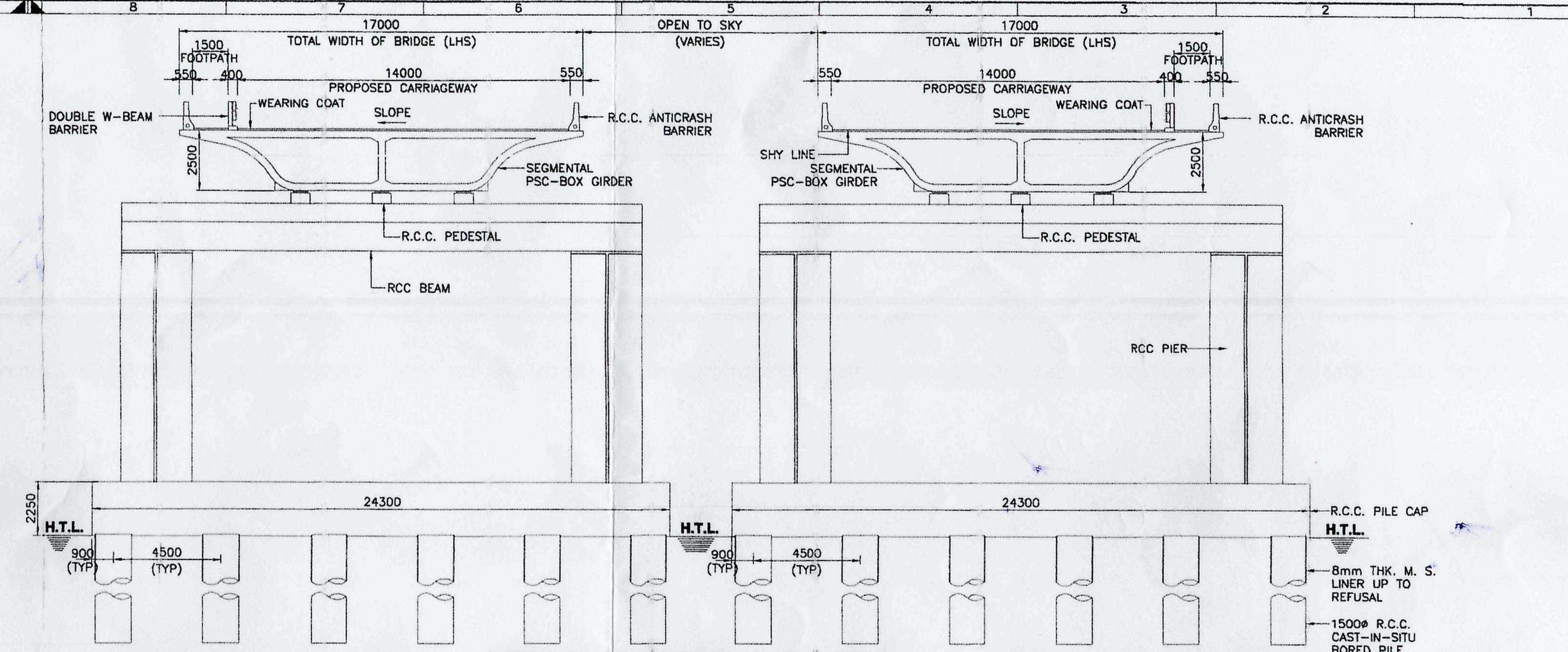
HORIZONTAL GEOMETRY: R: 420.000, L: 210.456 | L: 115.000 | 8074.703 | L =591.558 | 8666.261 | L: 80.000 | R: 600.000, L: 295.322

VERTICAL GEOMETRY: G =-0.000%, L =131.522 | 7886.095 | K =42.000, L =105.000 | 7991.095 | G =2.500%, L =152.580 | 8143.675 | K =74.000, L =370.000 | 8513.675 | G =-2.500%, L =345.018 | 8858.694 | K =42.000, L =105.000 | 8963.694 | G =0.000%, L =147.575

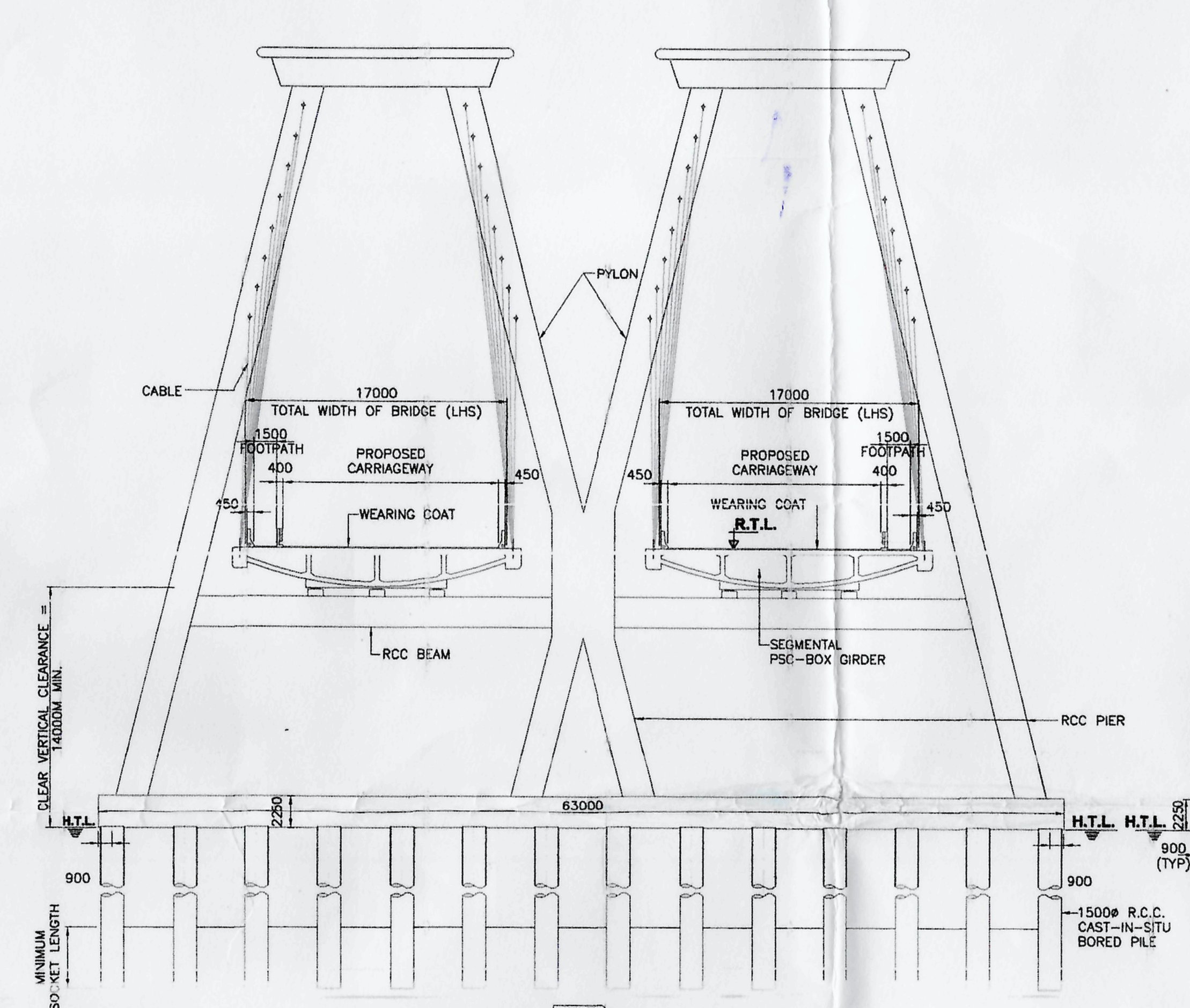
DEVELOPED ELEVATION OF PROPOSED RIVER BRIDGE



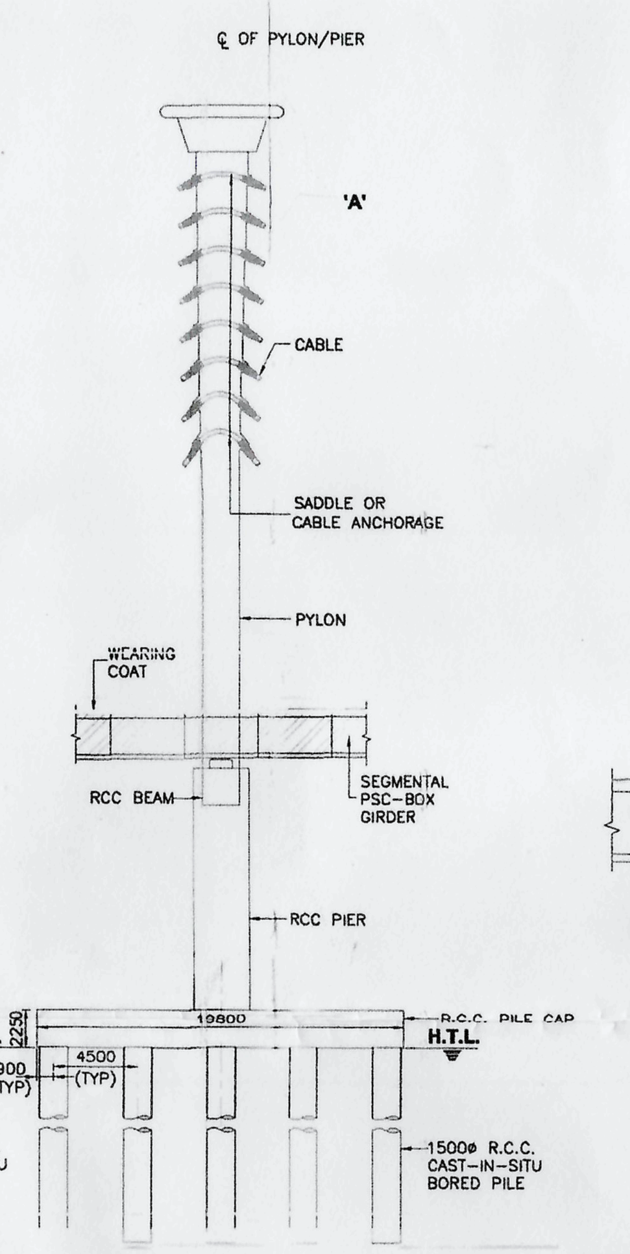
TYPICAL CROSS SECTION AT VIADUCT PORTION
SECTION A-A



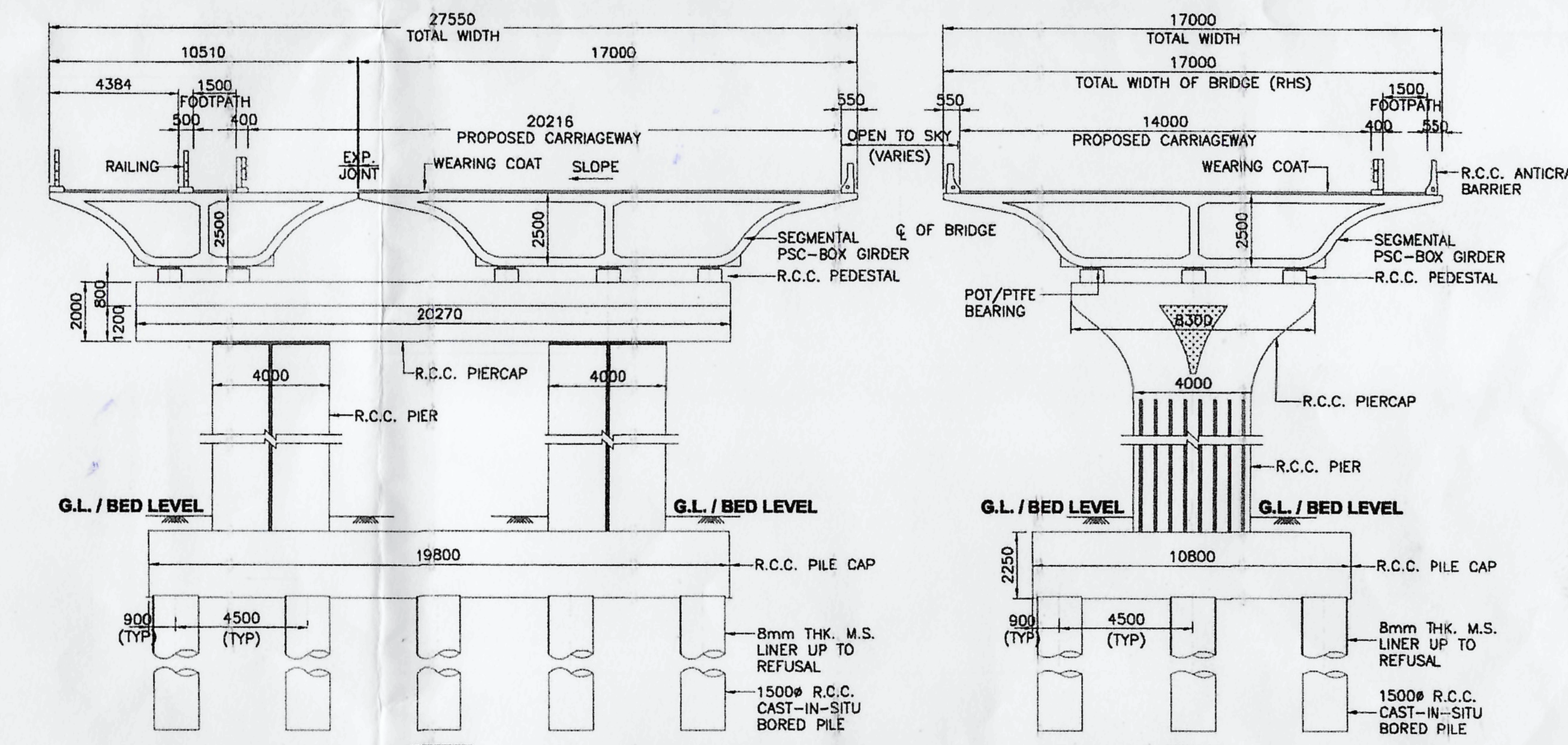
TYPICAL CROSS SECTION AT VIADUCT PORTION
SECTION C-C



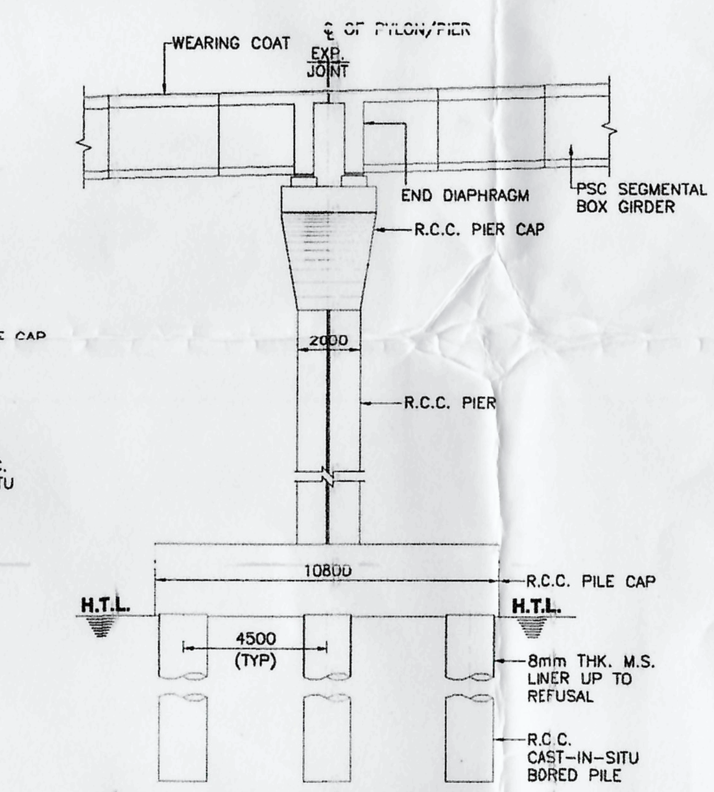
TYPICAL CROSS SECTION AT CABLE STAYED PORTION
SECTION B-B



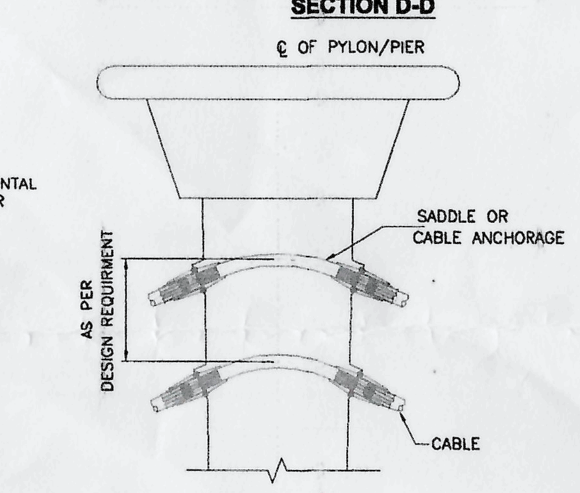
SIDE ELEVATION AT CABLE STAYED PORTION
(P-6 / P-7)



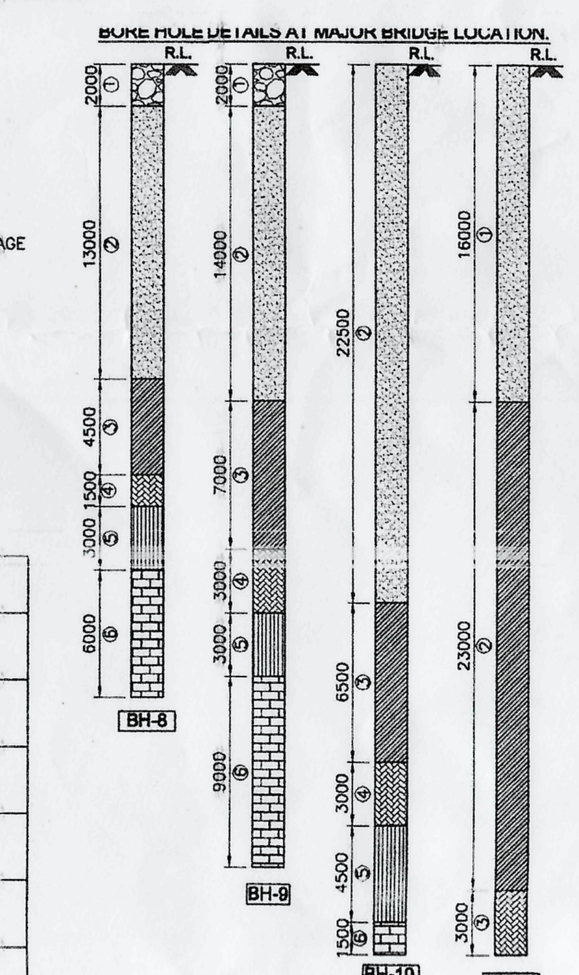
TYPICAL CROSS SECTION AT VIADUCT PORTION
SECTION D-D



SIDE ELEVATION AT DISCONTINUOUS PIER



DETAIL-'A'



DETAILS OF BORE HOLE

LEGEND:-

01.	FILLED UP SOIL WITH BOULDERS
02.	GRAYISH - BROWNISH MARINE CLAY
03.	BROWNISH SAND
04.	WHITISH - GRAYISH HIGHLY
05.	WHITISH - GRAYISH MODERATELY WEATHERED QUATZITE
06.	WHITISH - GRAYISH SLIGHTLY WEATHERED QUATZITE

NOTES:-

1. UNLESS SPECIFIED OTHERWISE ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS ARE IN METRES.
2. DIMENSIONS SHALL NOT BE SCALED FROM THE DRAWING ONLY WRITTEN DIMENSIONS TO BE FOLLOWED.
3. THE STRUCTURAL DIMENSIONS SHOWN ARE TENTATIVE & MAY CHANGE AS PER ACTUAL DESIGN.
4. DESIGN SPEED FOR RIVER BRIDGE = 80Kmph.
5. M. S. LINER OF 8mm THK UPTO SUITABLE DEPTH SHALL BE PROVIDED.
6. GRADE OF CONCRETE SHALL BE :-
   a) RCC PILE & RCC PILE CAP --- M40
   b) RCC PIER & PIER CAP --- M40 / M50
   c) RCC PYLON --- M60
   d) RCC COUNTERFORT --- M40
   e) PSC SEGMENTAL BOX GIRDER --- M60
   f) RCC ACB --- M40
7. GRADE OF STEEL SHALL BE Fe 500-D, CONFIRMING TO IS:1786.
8. MINIMUM CAPACITY OF PILE SHALL BE :-
   a) ø 1200mm PILE --- 550 MT
   b) ø 1500mm PILE --- 750 MT
   (PILE CAPACITY SHALL BE VERIFIED AT SITE BY CARRYING OUT PILE LOAD TEST)
9. FILTER MEDIA OF 600MM THK. SHALL BE PROVIDED BEHIND THE ABUTMENT & RETURN.
10. 100 ø WEEP HOLES AT 1000mm C/C BOTH HORIZONTALLY AND VERTICALLY STAGGERED SHALL BE PROVIDED IN THE BOX AND RETURN WALLS.
11. EXPOSURE CONDITION IS "SEVERE".
12. FOR DETAIL OF CAMBER/SUPER ELEVATION REFER LATEST PLAN AND PROFILE DRAWING.
13. ALL LEVELS SHOWN IN THIS DRAWING SHOULD BE VERIFIED AT SITE WITH RESPECT TO PLAN & PROFILE BEFORE EXECUTION OF WORK.
14. NAVIGABLE PORTION OF WATERWAY (i.e PIER P6-P7) SHALL BE DESIGN FOR BRIDGE COLLISION OR ADEQUATELY PROTECTED BY DESIGNED FENDERS OR OTHER SACRIFICIAL DEVICES AS PER CLAUSE NO. 220.1 NOTE NO. 07 OF IRC 6:2017.
15. WEARING COAT OF 65mm THICK CONSISTS OF 40mm THK DENSE BITUMINOUS CONCRETE LAIDOVER 25mm THK MASTIC ASPHALT. A WATERPROOFING COURSE OF 2mm THK MMA RESIN BASED, LIQUID, COLD, SPRAY APPLIED OVER BRIDGE DECK.

LEGEND

R.T.L.	-	ROAD TOP LEVEL
G.L.	-	GROUND LEVEL
H.F.L.	-	HIGH FLOOD LEVEL
H.T.L.	-	HIGH TIDE LEVEL
L.T.L.	-	LOW TIDE LEVEL
U/S	-	UP STREAM SIDE
D/S	-	DOWN STREAM SIDE
EXP. JT.	-	EXPANSION JOINT
℄	-	CENTER LINE

HYDRAULICS DATA :

1)	CATCHMENT AREA (A)	725 Sq. km
2)	TOTAL DISCHARGE (Q)	3343 Cumsec
3)	HIGH FLOOD LEVEL (HFL)	0.180 m
4)	HIGH TIDE LEVEL (HTL)	2.800 m
5)	LOW TIDE LEVEL (LTL)	0.350 m
6)	VELOCITY (V)	2.000 m/sec
7)	BED SLOPE	1 in 1800
8)	RUGOSITY COEFFICIENT	0.035 / 0.045
9)	AFFLUX	0.030 m
10)	FREE BOARD	1.500m / 14.000m*

* - VERTICAL CLEARANCE ABOVE HFL (NAVIGATION SPAN)

R	DESCRIPTION	DRN BY	DATE	CHECKED BY	DATE	APRD BY	DATE
0	FOR APPROVAL	S.N.P.	10.05.21	R.J.P.	10.05.21	U.S.K.	10.05.21

CONSULTANT
TECHNOGEM CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
101, A-B, DEV MILAN BUILDING,
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EMPLOYER:
EXECUTIVE ENGINEER, WORK DIVISION - XV (NH)
PUBLIC WORK DEPARTMENT PONDA, GOA

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MINISTRY OF ROAD TRANSPORT & HIGHWAYS
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PROJECT
CONSULTANCY SERVICES FOR THE PREPARATION OF DETAILED PROJECT REPORT AND BIDDING DOCUMENTS FOR THE "PROPOSED CONSTRUCTION OF HIGH LEVEL NEW BRIDGE ALONG WITH ITS APPROACHES ACROSS RIVER ZUARI AT BORIM ON NH-17B(NH-566) IN THE STATE OF GOA."

TITLE
GENERAL ARRANGEMENT DRAWING FOR PROPOSED HIGH LEVEL MAJOR BRIDGE ACROSS RIVER ZUARI AT CH: 8/330

DRG NO.	PROJECT NO.	REV.	SCALE
869-ZB-GAD-001	869	0	N.T.S.

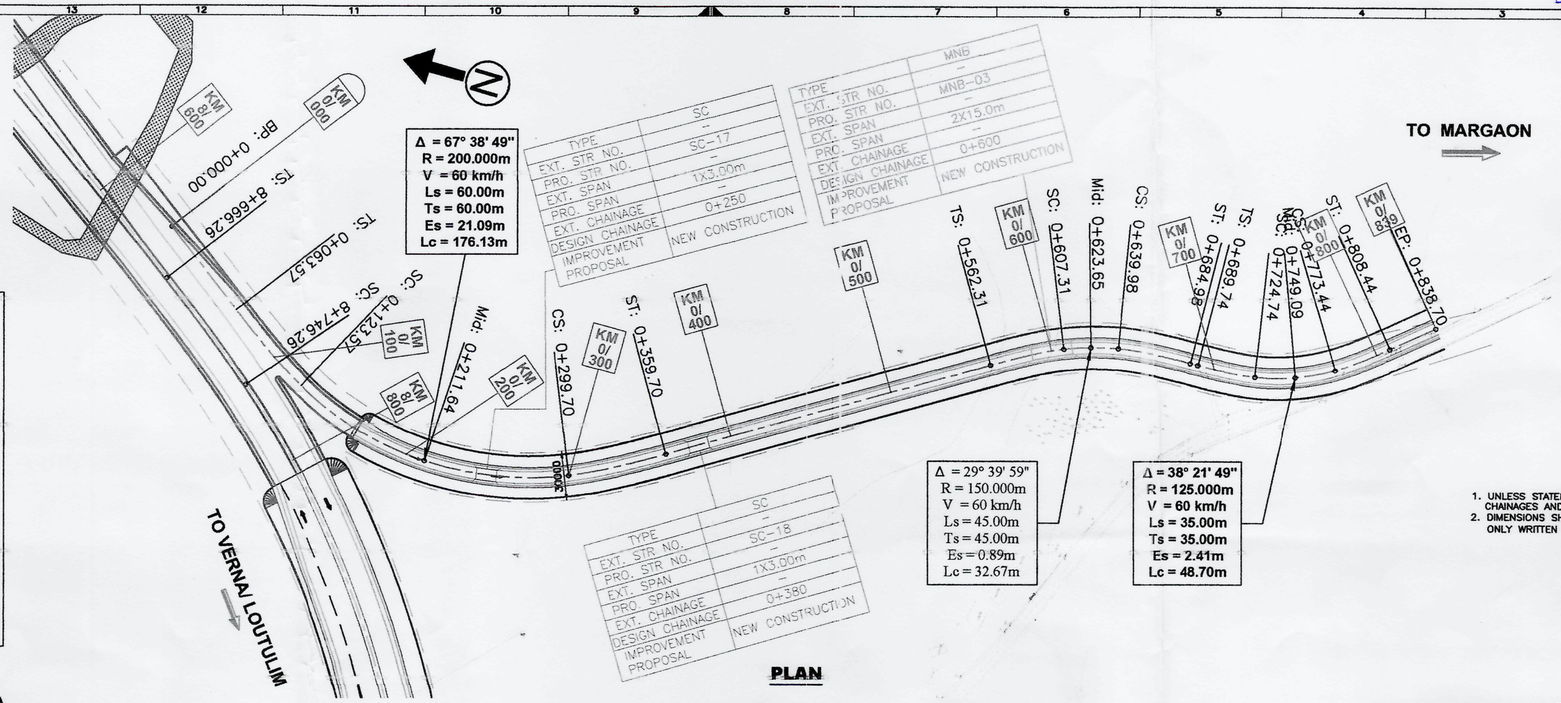
\\TCPL\Draughtsmen\869- ZUARI-BORIM BRIDGE\GAD OF BRIDGE\869-ZB-GAC-002-R0.dwg

ANNEXURE - A-5

700

LEGEND:-

- PROPOSED CENTER LINE
- PROPOSED MEDIAN
- PROPOSED CARRIAGEWAY
- PROPOSED PAVED SHOULDER
- PROPOSED EARTHEN SHOULDER
- PROPOSED KERB
- PROPOSED ROW
- KM 1/000 — PROPOSED CHAINAGE
- K.M 1/000 — EXISTING CHAINAGE

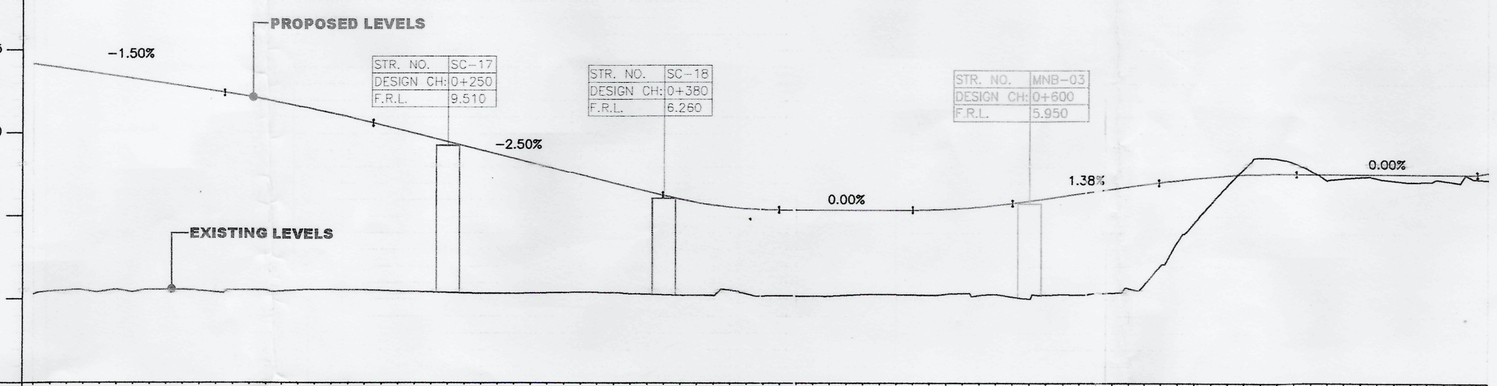


PLAN

1. UNLESS STATED OTHERWISE ALL DIMENSIONS, CHAINAGES AND LEVELS ARE IN METRES
2. DIMENSIONS SHALL NOT BE SCALED FROM THE DRAWING, ONLY WRITTEN DIMENSIONS SHALL BE FOLLOWED.

TO FARMAGUDI/ PONDA

TO MARGAON



DATUM=–5.00

CHAINAGE	HORIZONTAL GEOMETRY	VERTICAL GEOMETRY	EXISTING LEVELS	PROPOSED LEVELS
0.000	0.000	0.000 G =–1.498%	0.328	14.157
10.000		L =114.999	0.480	14.007
20.000			0.544	13.857
30.000			0.544	13.708
40.000			0.460	13.558
50.000			0.578	13.408
60.000			0.436	13.258
70.000			0.578	13.108
80.000			0.582	12.959
90.000			0.578	12.809
100.000			0.514	12.659
110.000	63.572	114.999	0.421	12.509
120.000	L: 60.000	K =89.817	0.552	12.358
130.000		L =90.000	0.567	12.197
140.000			0.530	12.025
150.000			0.494	11.842
160.000			0.539	11.648
170.000			0.576	11.442
180.000			0.573	11.226
190.000			0.558	10.998
200.000			0.547	10.759
204.999			0.517	10.510
210.000	R: 200.000		0.486	10.260
220.000	L: 176.132		0.461	10.010
230.000			0.435	9.760
240.000			0.408	9.510
250.000			0.381	9.260
260.000			0.365	9.010
270.000			0.365	8.760
280.000			0.365	8.510
290.000			0.380	8.260
300.000			0.399	8.010
310.000			0.414	7.760
320.000			0.426	7.510
330.000			0.419	7.260
340.000			0.407	7.010
350.000			0.344	6.760
359.704			0.305	6.510
360.000	L: 60.000		0.266	6.260
370.000			0.227	6.030
379.416		K =28.000	0.230	5.836
380.000		L =70.000	0.228	5.677
390.000			0.536	5.555
400.000			0.461	5.487
410.000			0.330	5.416
420.000			0.204	5.400
430.000			0.217	5.400
440.000			0.210	5.400
449.416		G =0.000%	0.187	5.400
450.000		L =80.584	0.200	5.400
460.000			0.257	5.400
470.000			0.314	5.400
480.000			0.323	5.400
490.000			0.303	5.400
500.000			0.282	5.400
510.000			0.254	5.411
520.000			0.333	5.446
530.000			0.381	5.503
530.666		K =43.628	0.257	5.583
540.000		L =60.000	0.312	5.687
550.000			0.168	5.813
560.000			0.024	5.950
562.314			0.291	6.088
570.000			0.336	6.225
580.000			0.323	6.363
590.000			0.415	6.500
596.000			0.433	6.638
600.000	R: 150.000	G =–1.575%	0.677	6.775
607.310	L: 32.666	L =88.712	0.966	6.913
610.000	L: 45.000		2.087	7.050
620.000			3.510	7.177
630.000			4.646	7.288
639.998			5.791	7.381
640.000			6.885	7.458
650.000			7.900	7.519
660.000			8.565	7.562
670.000			8.497	7.599
676.712			8.258	7.600
680.000			7.800	7.600
683.764	L: 45.000		7.241	7.600
690.000			7.353	7.600
700.000			7.423	7.600
710.000			7.327	7.600
720.000	R: 125.000	K =60.000	7.190	7.600
730.000	L: 48.696	L =82.516	7.106	7.600
740.000			7.144	7.600
749.090			7.223	7.600
750.000			7.125	7.600
760.000			7.313	7.600
761.227			7.288	7.600
770.000				7.600
780.000				7.600
790.000				7.600
800.000				7.600
803.440	L: 35.000	G =0.000%		7.600
810.000		L =108.773		7.600
820.000				7.600
830.000				7.600
838.700				7.600
840.000				7.600
850.000				7.600
860.000				7.600
870.000				7.600
876.421	L: 67.981	G =2.867%		7.313
880.000		L =30.000		7.288

PROPOSED L-SECTION

REV.	DATE	DESCRIPTION OF REVISIONS
0	11.05.21	FOR APPROVAL

CONSULTANT: TECHNOGEM CONSULTANTS PVT. LTD. CONSULTING ENGINEERS OFFICE NO. 803, 8th FLOOR, B WING, LODHA SUPREMUS II, ROAD NO. 22, NEAR NEW PASSPORT OFFICE, WAGLE ESTATE, THANE (W) - 400 604 TEL : 022 - 49747799 / 49749899

EMPLOYER: GOVT. OF GOA, EXECUTIVE ENGINEER, WORK DIVISION - XV (NH), PUBLIC WORK DEPARTMENT, PONDA, GOA

CLIENT: MINISTRY OF ROAD TRANSPORT & HIGHWAYS, Government of India, Transport Bhavan, Parliament Street, New Delhi - 110 001

PROJECT: CONSULTANCY SERVICES FOR THE PREPARATION OF DETAILED PROJECT REPORT AND BIDDING DOCUMENTS FOR THE "PROPOSED CONSTRUCTION OF HIGH LEVEL NEW BRIDGE ALONG WITH ITS APPROACHES ACROSS RIVER ZUARI AT BORIM ON NH-17B(NH-566) IN THE STATE OF GOA."

TITLE: PLAN & L-SECTION FOR MARGAON DOWN RAMP FROM (KM: 0/000 TO 0/870)

SCALE: HORIZONTAL (1:2500) 20 10 0 20 40 60 80; VERTICAL (1:250) 2 1 0 2 4 6 8

DRAWING NO:– 869-ZB-PL-001

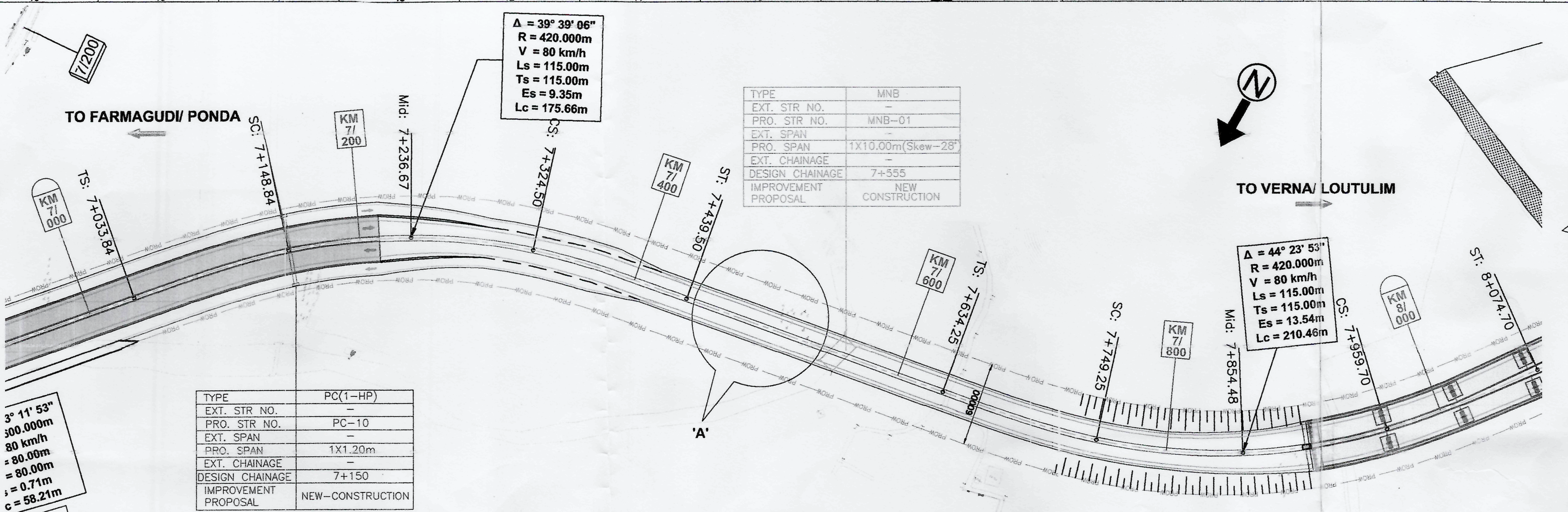
DATE:– 11.05.2021

REVISION: 0

DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY
O.B.P.	S.N.P.	S.V.S.	U.S.K.

\\TCPL\Draughtsmen\869 – ZUARI–BORIM BRIDGE\STAGE III SUBMISSION\PLAN & PROFILE\869–ZB–PL–001–R0.dwg

Annexure - A - 6 700 (A)



TYPE	PC(1-HP)
EXT. STR NO.	–
PRO. STR NO.	PC-10
EXT. SPAN	–
PRO. SPAN	1X1.20m
EXT. CHAINAGE	–
DESIGN CHAINAGE	7+150
IMPROVEMENT PROPOSAL	NEW-CONSTRUCTION

TYPE	MNB
EXT. STR NO.	–
PRO. STR NO.	MNB-01
EXT. SPAN	–
PRO. SPAN	1X10.00m(Skew-28°)
EXT. CHAINAGE	–
DESIGN CHAINAGE	7+555
IMPROVEMENT PROPOSAL	NEW CONSTRUCTION

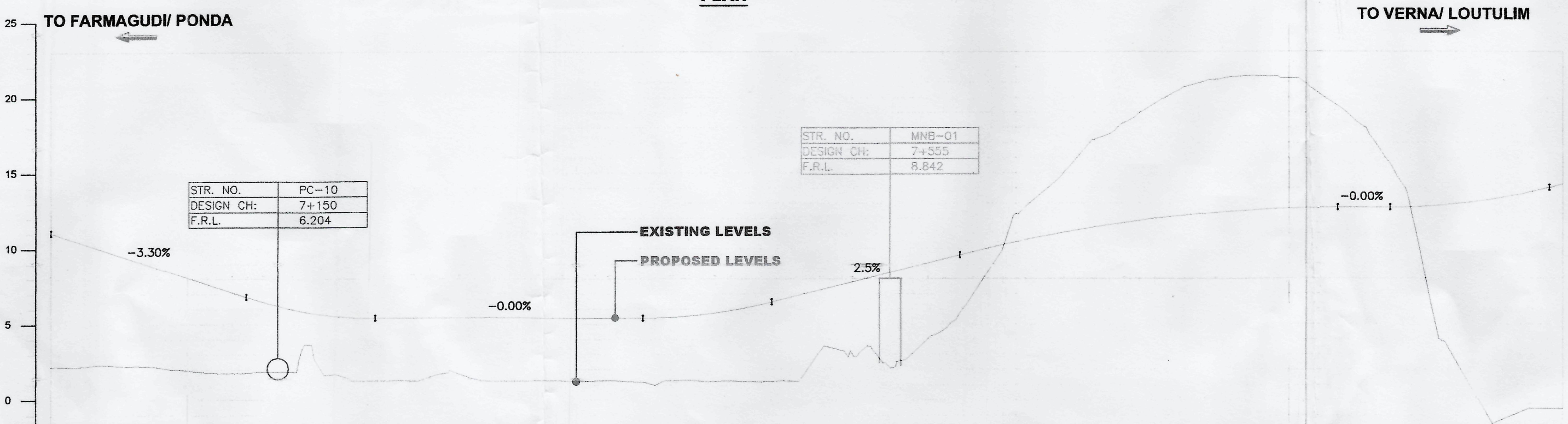
PLAN

DETAIL 'A'

- 60.0m PROPOSED ROW
- 1.5m PROPOSED EARTHEN SHOULDER
- 2.5m PROPOSED PAVED SHOULDER
- 7.5m PROPOSED CARRIAGEWAY
- 4.0mP ROPOSED MEDIAN
- ℄ OF CARRIAGEWAY

LEGEND:-

- PROPOSED CENTER LINE
- PROPOSED MEDIAN
- PROPOSED CARRIAGEWAY
- PROPOSED PAVED SHOULDER
- PROPOSED EARTHEN SHOULDER
- PROPOSED KERB
- PROPOSED ROW
- KM 1/ 000 — PROPOSED CHAINAGE
- K.M 1/000 — EXISTING CHAINAGE



CHAINAGE	PROPOSED LEVELS	EXISTING LEVELS
7000.000	11.071	2.206
7010.000	10.741	2.197
7020.000	10.411	2.220
7030.000	10.081	2.314
7040.000	9.751	2.290
7050.000	9.421	2.240
7060.000	9.091	2.237
7070.000	8.761	2.164
7080.000	8.431	2.027
7090.000	8.101	1.948
7100.000	7.771	1.851
7110.000	7.441	1.773
7120.000	7.111	1.760
7130.000	6.782	1.788
7140.000	6.473	1.856
7150.000	6.204	1.852
7160.000	5.974	1.856
7170.000	5.782	3.670
7180.000	5.629	1.731
7190.000	5.515	1.636
7200.000	5.440	1.289
7210.000	5.404	1.277
7220.000	5.400	1.283
7230.000	5.400	1.298
7240.000	5.400	1.270
7250.000	5.400	1.490
7260.000	5.400	1.740
7270.000	5.400	1.696
7280.000	5.400	1.362
7290.000	5.400	1.229
7300.000	5.400	1.227
7310.000	5.400	1.234
7320.000	5.400	1.251
7330.000	5.400	1.254
7340.000	5.400	1.237
7350.000	5.400	1.218
7360.000	5.400	1.242
7370.000	5.400	1.253
7380.000	5.400	1.203
7390.000	5.400	1.159
7400.000	5.410	0.973
7410.000	5.448	1.259
7420.000	5.516	1.284
7430.000	5.614	1.217
7440.000	5.741	1.202
7450.000	5.897	1.220
7460.000	6.083	1.205
7470.000	6.298	1.179
7480.000	6.541	1.213
7490.000	6.791	1.204
7500.000	7.041	1.904
7510.000	7.291	3.339
7520.000	7.541	3.307
7530.000	7.791	3.035
7540.000	8.041	3.556
7550.000	8.291	2.447
7560.000	8.541	2.513
7570.000	8.791	3.052
7580.000	9.041	4.002
7590.000	9.291	4.563
7600.000	9.541	5.510
7610.000	9.787	6.968
7620.000	10.024	8.480
7630.000	10.250	10.112
7640.000	10.466	12.287
7650.000	10.673	13.233
7660.000	10.869	14.059
7670.000	11.055	15.026
7680.000	11.232	16.183
7690.000	11.398	17.206
7700.000	11.554	17.564
7710.000	11.701	18.318
7720.000	11.837	18.951
7730.000	11.964	19.587
7740.000	12.080	20.171
7750.000	12.186	20.695
7760.000	12.283	20.977
7770.000	12.369	21.174
7780.000	12.445	21.338
7790.000	12.512	21.405
7800.000	12.568	21.408
7810.000	12.614	21.395
7820.000	12.651	21.241
7830.000	12.677	20.993
7840.000	12.694	20.194
7850.000	12.700	19.516
7860.000	12.700	18.747
7870.000	12.700	17.971
7880.000	12.700	16.461
7890.000	12.702	14.852
7900.000	12.723	12.463
7910.000	12.768	7.822
7920.000	12.837	3.899
7930.000	12.929	2.478
7940.000	13.046	0.744
7950.000	13.186	-1.005
7960.000	13.350	-1.338
7970.000	13.538	-0.924
7980.000	13.750	-0.594
7990.000	13.985	-0.595
8000.000	14.235	-0.596

HORIZONTAL GEOMETRY: 7033.837 | L: 115.000 | R: 420.000 L: 175.661 | L: 115.000 | 7439.498 | L =194.750 | 7634.248 | L: 115.000 | R: 420.000 L: 210.456 | L: 115.000

VERTICAL GEOMETRY: 7000.000 | G =-3.300% L =129.361 | 7129.361 | K =25.758 L =85.000 | 7214.361 | G =-0.000% L =177.500 | 7391.861 | K =34.00 L =85.000 | 7476.861 | G =2.50% L =124.50 | 7601.36 | K =100.000 L =250.000 | 7851.36 | G=-0.0% L=34.7 | 7886.095 | K =42.000 L =105.000 | 7991.095

SUPER ELEVATION: -2.5% | 0.0% -2.5% | -5% 5% | -5% 5% | 0.0% -2.5% | -2.5% -2.5% | -2.5% -2.5% | -2.5% 0.0% | -4% 4% | -4% 4%

PROPOSED L-SECTION

NOTES:-
1. UNLESS STATED OTHERWISE ALL DIMENSIONS, CHAINAGES AND LEVELS ARE IN METRES
2. DIMENSIONS SHALL NOT BE SCALED FROM THE DRAWING, ONLY WRITTEN DIMENSIONS SHALL BE FOLLOWED.

REV.	DATE	DESCRIPTION OF REVISIONS
1	26.02.21	FOR DPR
0	07.06.18	FOR APPROVAL

CONSULTANT: TECHNOGEM CONSULTANTS PVT. LTD. CONSULTING ENGINEERS, OFFICE NO. 803, 8th FLOOR, B WING, LODHA SUPREMUS II, ROAD NO. 22, NEAR NEW PASSPORT OFFICE, WAGLE ESTATE, THANE (W) - 400 604, TEL : 022 - 49747799 / 49749899

EMPLOYER: GOVT. OF GOA, EXECUTIVE ENGINEER, WORK DIVISION - XV (NH), PUBLIC WORK DEPARTMENT, PONDA, GOA

CLIENT: MINISTRY OF ROAD TRANSPORT & HIGHWAYS, Government of India, Transport Bhavan, Parliament Street, New Delhi - 110 001

PROJECT: CONSULTANCY SERVICES FOR THE PREPARATION OF DETAILED PROJECT REPORT AND BIDDING DOCUMENTS FOR THE "PROPOSED CONSTRUCTION OF HIGH LEVEL NEW BRIDGE ALONG WITH ITS APPROACHES ACROSS RIVER ZUARI AT BORIM ON NH-17B(NH-566) IN THE STATE OF GOA."

TITLE: PLAN & L-SECTION FROM (KM: 7/000 TO 8/000) (SHEET 7 OF 10)

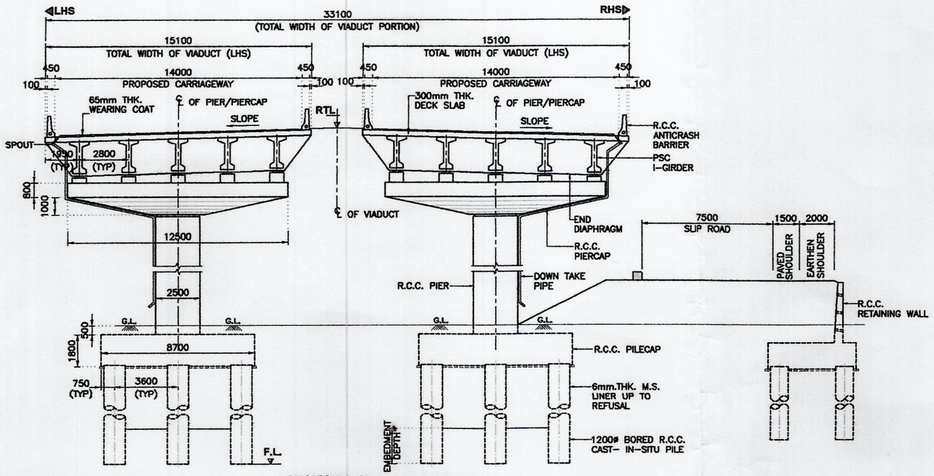
SCALE: HORIZONTAL (1:2500); VERTICAL (1:250)

DRAWING NO:-	869-ZB-PL-001		
DATE:-	26.02.2021	REVISION:	1
DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY
O.B.P.	S.N.P.	S.V.S.	U.S.K.

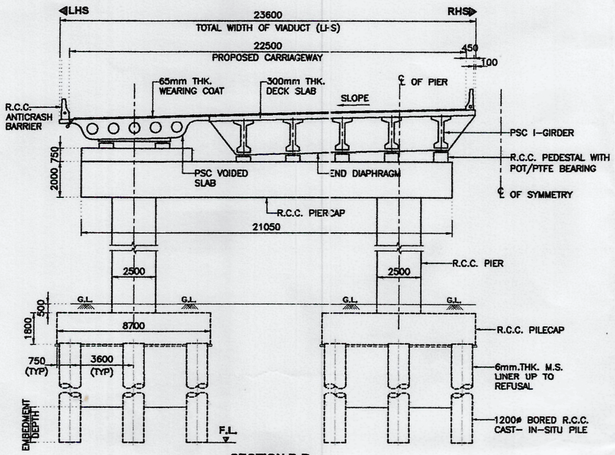
\\TCPL\DRAUGHTSMEN\869- ZUARI-BORIM BRIDGE\3.0 PLAN & PROFILE\869-ZB-PL-001-R1 (NEW).DWG

ANNEXURE - A-7

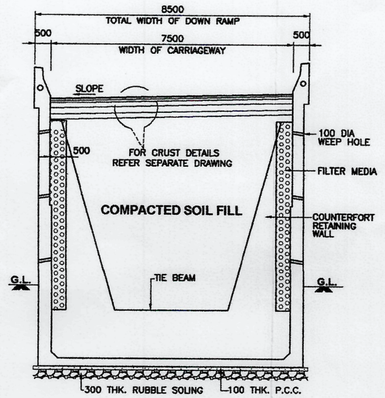
701



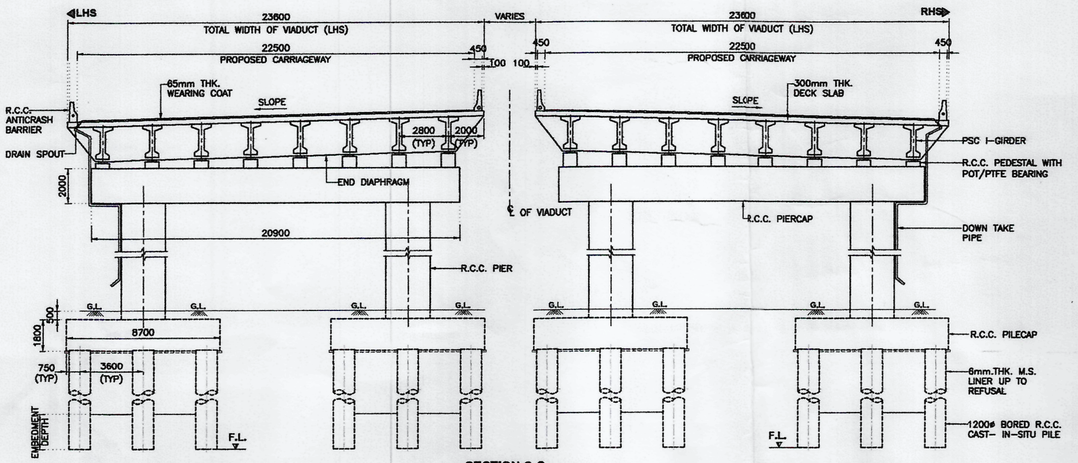
SECTION A-A



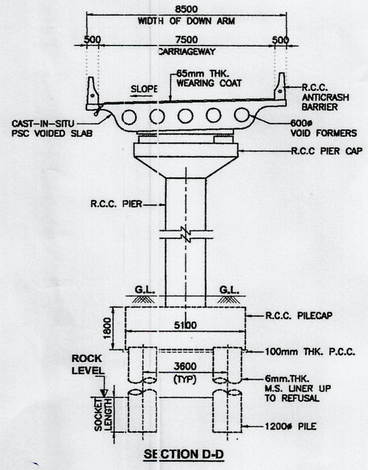
SECTION B-B



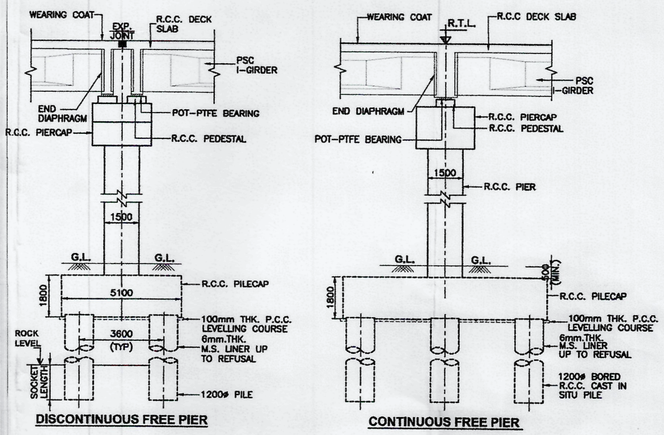
SECTION E-E



SECTION C-C

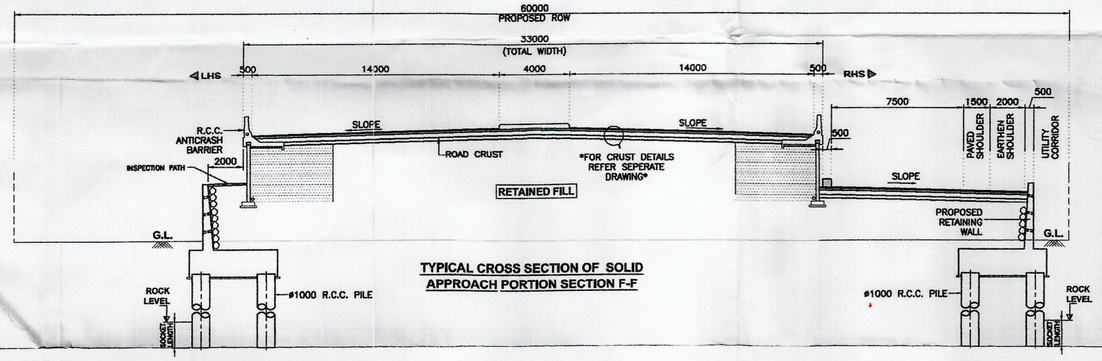


SECTION D-D

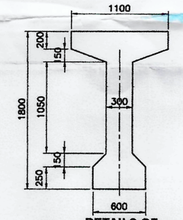


DISCONTINUOUS FREE PIER

CONTINUOUS FREE PIER



TYPICAL CROSS SECTION OF SOLID APPROACH PORTION SECTION F-F



DETAILS OF PSC I-GIRDER

NOTES:-

1. UNLESS SPECIFIED OTHERWISE ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS ARE IN METRES.
2. DIMENSIONS SHALL NOT BE SCALED FROM THE DRAWING ONLY WRITTEN DIMENSIONS TO BE FOLLOWED.
3. THIS DRAWING SHALL BE READ CONJUNCTION WITH
   a) 869-ZUA-GAD-VIADUCT-001 ---- GENERAL ARRANGEMENT DRAWING FOR PROPOSED VIADUCT BETWEEN PROJECT CHAINAGE 9+130 TO 9+580 & UP / DOWN RAMP (SH. 01 OF 03) & (SH. 02 OF 03) OF THIS DRAWING.

REV.	DESCRIPTION	DRN BY	DATE	CHECKED BY	DATE	APRD BY	DATE
0	FOR APPROVAL	M.H.S.	05.06.21	S.S.A.	05.06.21	U.S.K.	05.06.21

CONSULTANT
TECHNOGEM CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
OFFICE NO. 803, 8th FLOOR, B WING, LODHA SUPREMUS II
ROAD NO. 22, NEAR NEW PASSPORT OFFICE, WAGLE ESTATE, THANE (W) - 400 604
TEL : 022 - 49747799 / 49749899

EMPLOYER:
GOVT. OF GOA
EXECUTIVE ENGINEER
WORK DIVISION - XV (NH)
PUBLIC WORK DEPARTMENT
PONDA, GOA

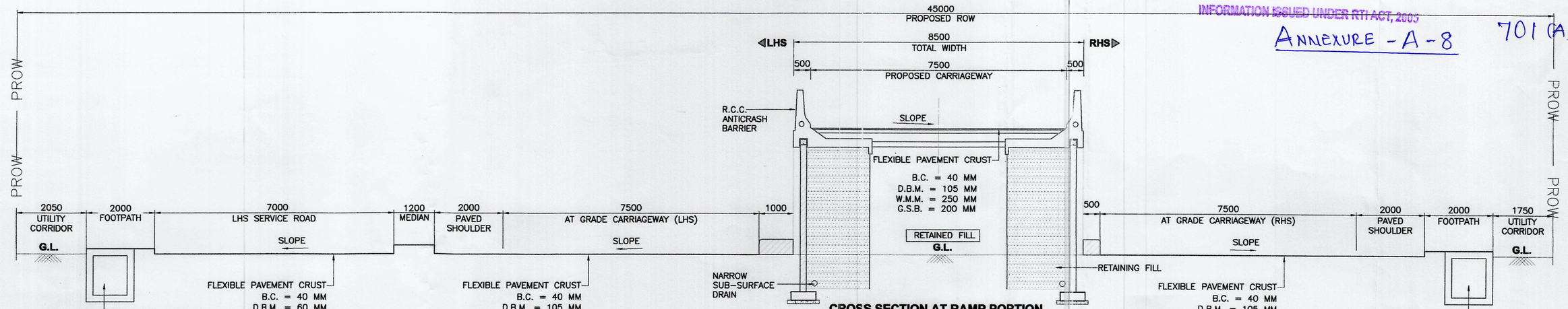
CLIENT:
MINISTRY OF ROAD TRANSPORT & HIGHWAYS
Government of India
Transport Bhavan, Parliament Street
New Delhi - 110 001

PROJECT:
CONSULTANCY SERVICES FOR THE PREPARATION OF DETAILED PROJECT REPORT AND BIDDING DOCUMENTS FOR THE "PROPOSED CONSTRUCTION OF HIGH LEVEL NEW BRIDGE ALONG WITH ITS APPROACHES ACROSS RIVER ZUARI AT BORIM ON NH-17B(NH-966) IN THE STATE OF GOA."

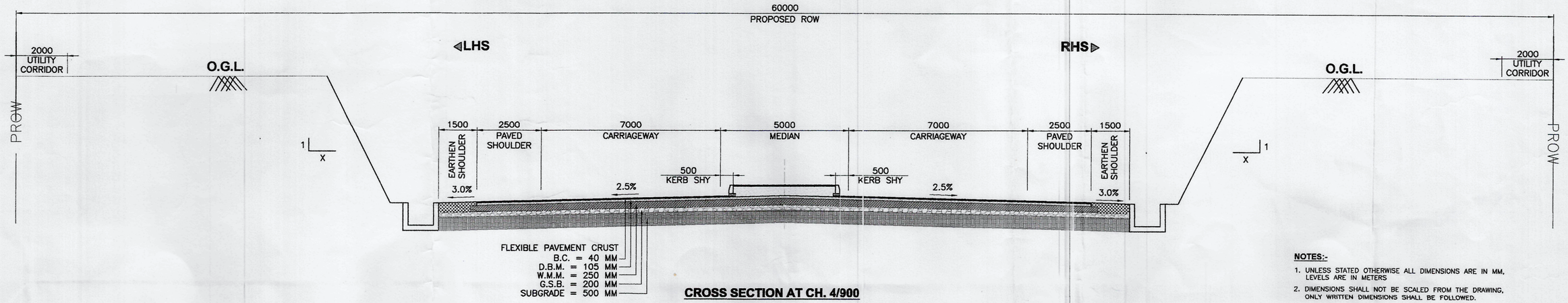
TITLE
GENERAL ARRANGEMENT DRAWING FOR PROPOSED VIADUCT BETWEEN PROJECT CHAINAGE 9+130 TO 9+580 & UP / DOWN RAMP (SH. 03 OF 03)

DRG NO.	PROJECT NO.	REV.	SCALE
869-ZUA-GAD-VIADUCT-FLY-001	869	0	N.T.S.

D:\DRAWINGS\869-ZUARI BRIDGE\869-ZUA-GAD-VIADUCT-001-R0.dwg



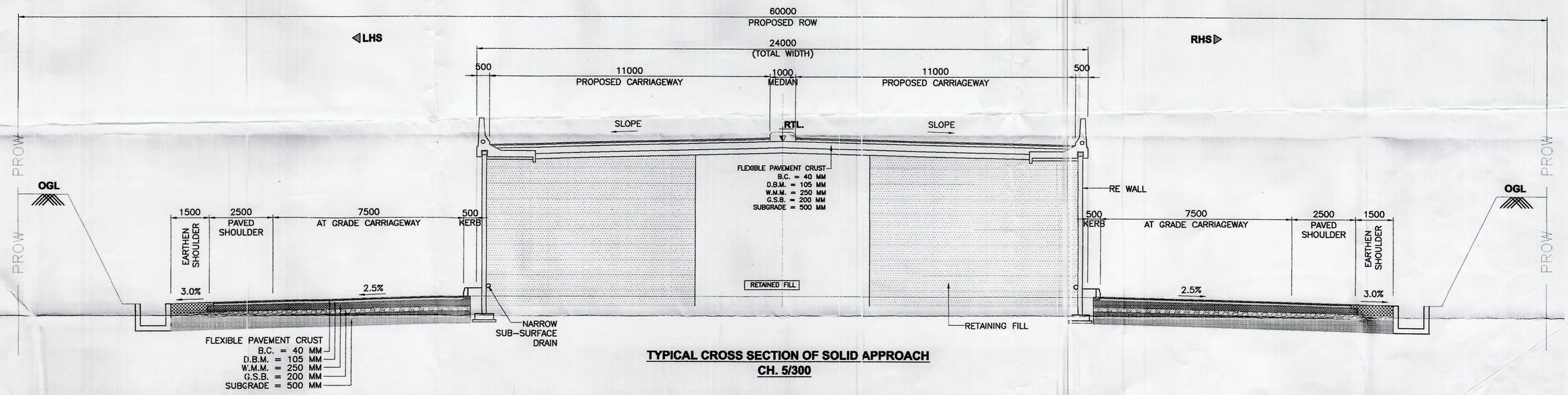
CROSS SECTION AT RAMP PORTION
CH. 0/400



CROSS SECTION AT CH. 4/900

NOTES:-

1. UNLESS STATED OTHERWISE ALL DIMENSIONS ARE IN MM, LEVELS ARE IN METERS
2. DIMENSIONS SHALL NOT BE SCALED FROM THE DRAWING, ONLY WRITTEN DIMENSIONS SHALL BE FOLLOWED.



TYPICAL CROSS SECTION OF SOLID APPROACH
CH. 5/300

REV.	DESCRIPTION	DRN BY	DATE	CHECKED BY	DATE	APRD BY	DATE
0	FOR APPROVAL	D.D.P.	05.01.21	S.V.S.	05.01.21		

CONSULTANT:
TECHNOGEM CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
OFFICE NO. 803, 8th FLOOR, B WING, LODHA SUPREMUS II, ROAD NO. 22, NEAR NEW PASSPORT OFFICE, WAGLE ESTATE, THANE (W) - 400 604
TEL : 022 - 49747799 / 49749899

EMPLOYER:
GOVT. OF GOA
EXECUTIVE ENGINEER
WORK DIVISION - XV (NH)
PUBLIC WORK DEPARTMENT
PONDA, GOA

CLIENT:
MINISTRY OF ROAD TRANSPORT & HIGHWAYS
Government of India
Transport Bhavan, Parliament Street
New Delhi - 110 001

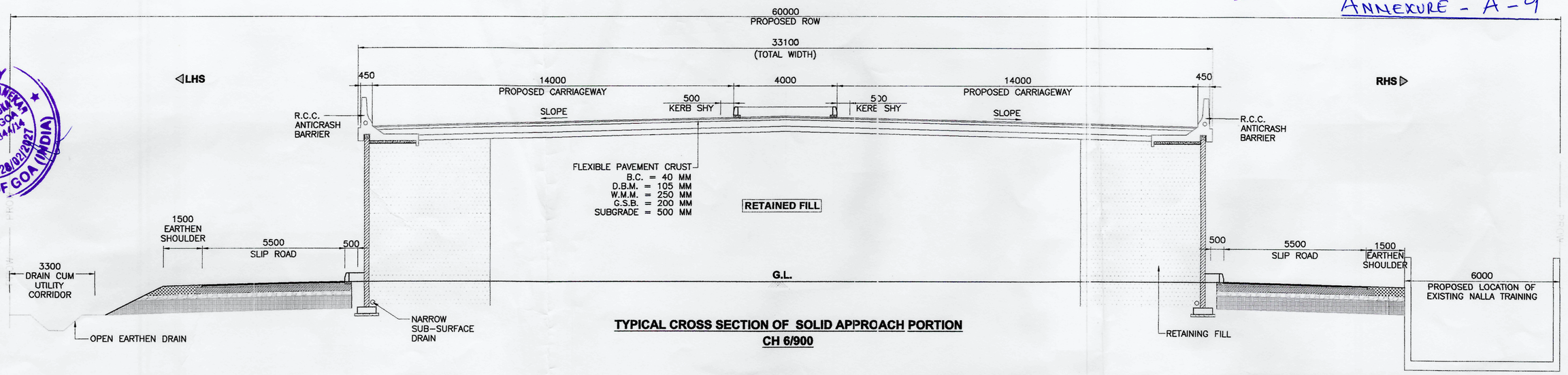
PROJECT:
CONSULTANCY SERVICES FOR THE PREPARATION OF DETAILED PROJECT REPORT AND BIDDING DOCUMENTS FOR THE "PROPOSED CONSTRUCTION OF HIGH LEVEL NEW BRIDGE ALONG WITH ITS APPROACHES ACROSS RIVER ZUARI AT BORIM ON NH-17B(NH-566) IN THE STATE OF GOA."

TITLE
TYPICAL CROSS SECTION (SHEET 1 OF 2)

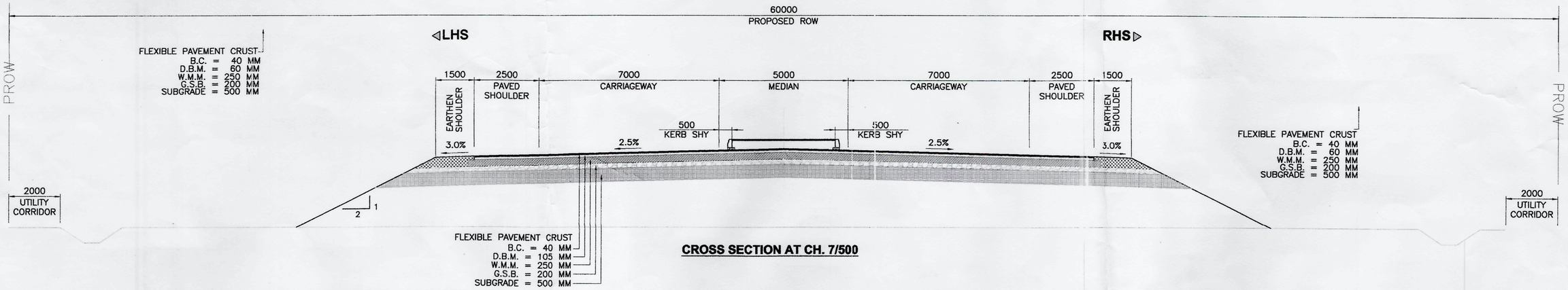
DRG NO.	PROJECT NO.	REV.
869-ZB-TCS-001	869	1

ANNEXURE - A-9

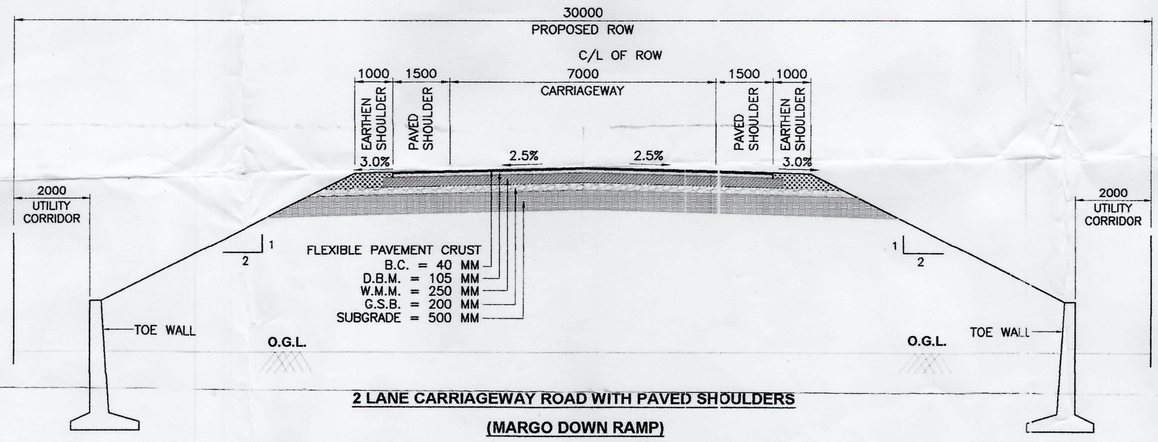
702



TYPICAL CROSS SECTION OF SOLID APPROACH PORTION
CH 6/900



CROSS SECTION AT CH. 7/500



2 LANE CARRIAGEWAY ROAD WITH PAVED SHOULDERS

(MARGO DOWN RAMP)

NOTES:-

1. UNLESS STATED OTHERWISE ALL DIMENSIONS ARE IN MM, LEVELS ARE IN METERS
2. DIMENSIONS SHALL NOT BE SCALED FROM THE DRAWING, ONLY WRITTEN DIMENSIONS SHALL BE FOLLOWED.
3. METAL BEAM CRASH BARRIER SHALL BE PROVIDED IN EARTHEN SHOULDER WHERE EMBANKMENT HEIGHT IS MORE THAN 3M.
4. STONE PITCHING SHALL BE PROVIDED ON EMBANKMENT SLOPE WHERE EMBANKMENT HEIGHT IS MORE THAN 6M.

REV.	DESCRIPTION	DRN BY	DATE	CHECKED BY	DATE	APRD BY	DATE
0	FOR APPROVAL	D.D.P.	05.01.21	S.V.S.	05.01.21		

CONSULTANT:
TECHNOGEM CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
OFFICE NO. 803, 8th FLOOR, B WING, LODHA SUPREMUS II, ROAD NO. 22, NEAR NEW PASSPORT OFFICE, WAGLE ESTATE, THANE (W) - 400 604
TEL : 022 - 49747799 / 49749899

EMPLOYER:
GOVT. OF GOA
EXECUTIVE ENGINEER
WORK DIVISION - XV (NH)
PUBLIC WORK DEPARTMENT
PONDA, GOA

CLIENT
MINISTRY OF ROAD TRANSPORT & HIGHWAYS
Government of India
Transport Bhavan, Parliament Street
New Delhi - 110 001

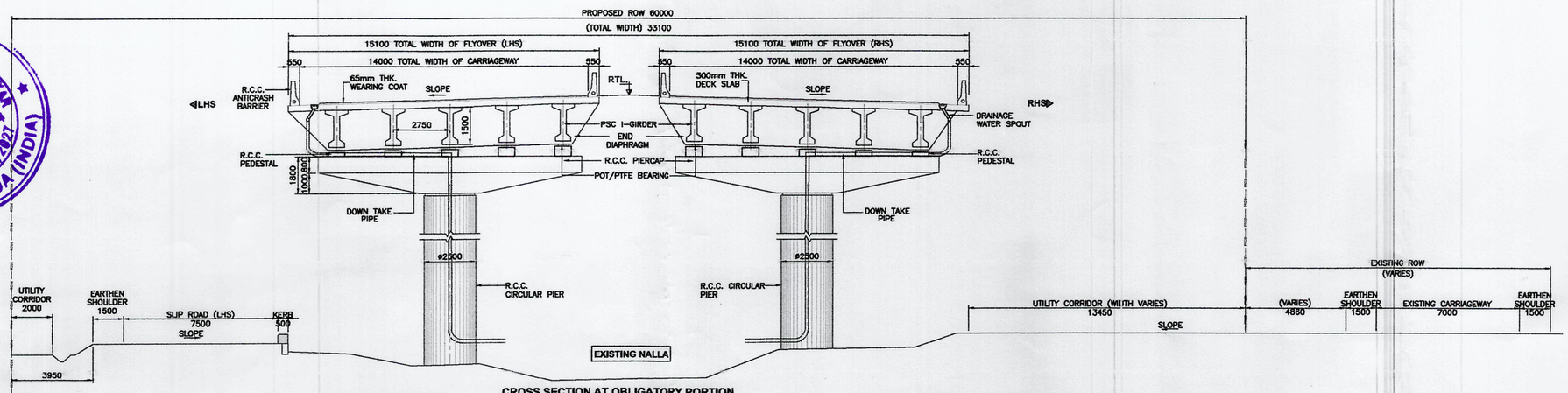
PROJECT:
CONSULTANCY SERVICES FOR THE PREPARATION OF DETAILED PROJECT REPORT AND BIDDING DOCUMENTS FOR THE "PROPOSED CONSTRUCTION OF HIGH LEVEL NEW BRIDGE ALONG WITH ITS APPROACHES ACROSS RIVER ZUARI AT BORIM ON NH-17B(NH 566) IN THE STATE OF GOA."

TITLE
TYPICAL CROSS SECTION (SHEET 2 OF 2)

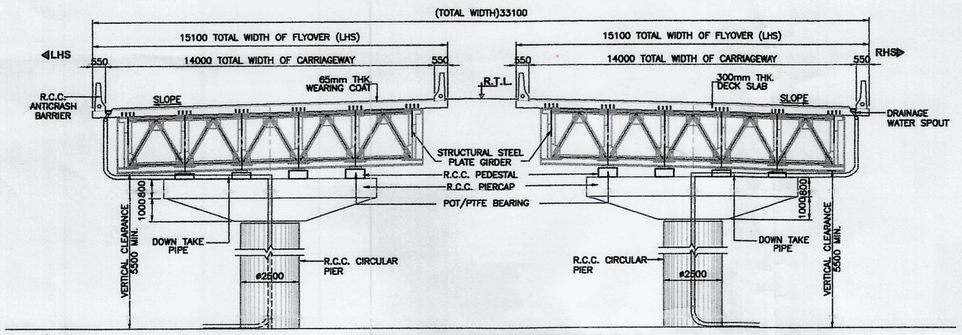
DRG NO.	PROJECT NO.	REV.	SCALE
869-ZB-TCS-001	869	1	N.T.S.

ANNEXURE - A - 10

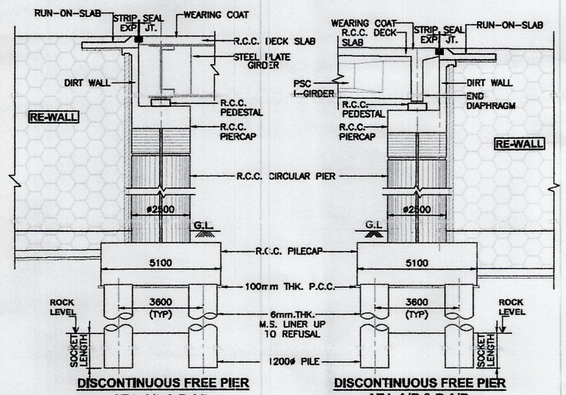
703



CROSS SECTION AT OBLIGATORY PORTION
SECTION A-A

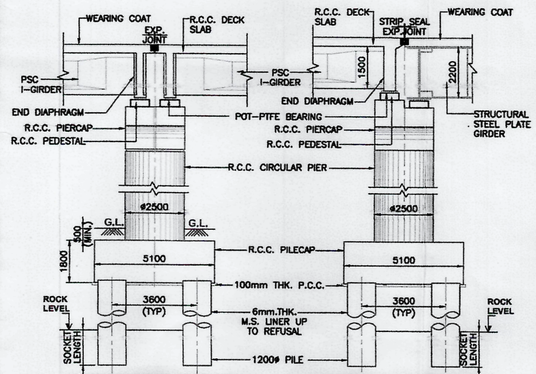


CROSS SECTION AT OBLIGATORY PORTION
SECTION B-B



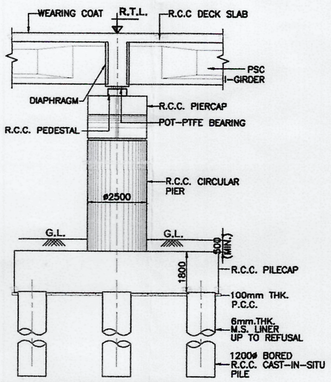
DISCONTINUOUS FREE PIER AT L A/L & R A/L.

DISCONTINUOUS FREE PIER AT L A/R & R A/R.

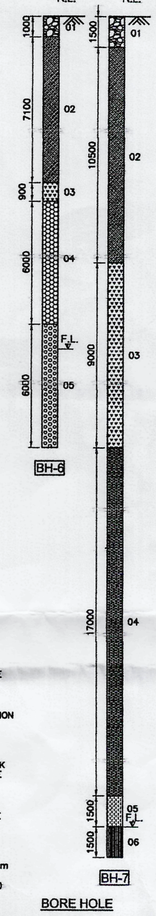


DISCONTINUOUS FREE PIER

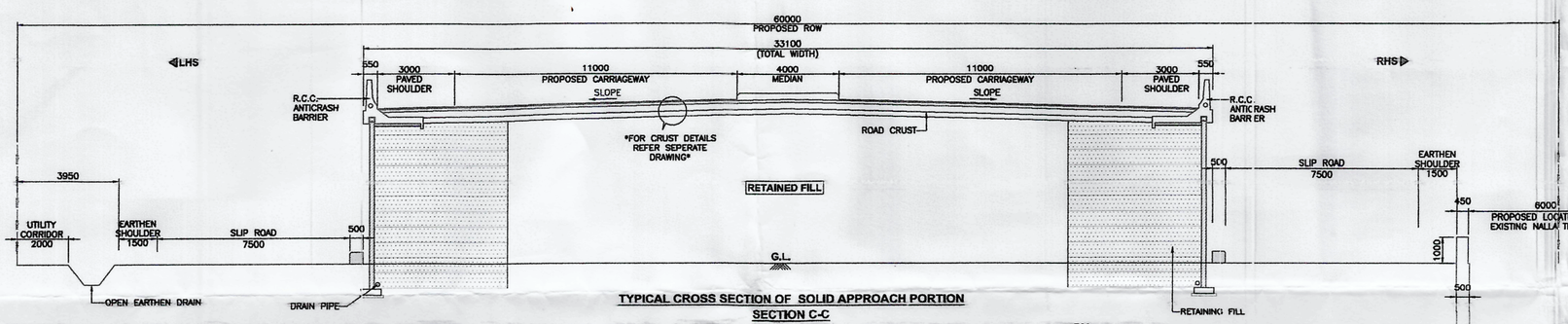
DISCONTINUOUS FREE PIER



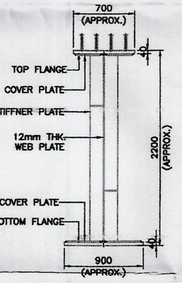
CONTINUOUS FREE PIER



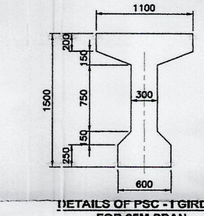
BORE HOLE



TYPICAL CROSS SECTION OF SOLID APPROACH PORTION
SECTION C-C



DETAILS OF STEEL PLATE GIRDER



DETAILS OF PSC - I GIRDER FOR 25M SPAN

LEGEND:-

01. FILLED UP SOIL WITH BOULDERS
02. YELLOWISH – BROWNISH COMPLETELY WEATHERED ROCK (MURRUM)
03. GRAYISH MODERATELY WEATHERED BASALT
04. GRAYISH SLIGHTLY WEATHERED BASALT
05. WHITISH – GRAYISH HIGHLY WEATHERED QUARTZITE
06. WHITISH – GRAYISH MODERATELY WEATHERED QUARTZITE
07. GRAYISH – BROWN MARINE CLAY
08. BROWNISH SAND

NOTES:-

1. UNLESS SPECIFIED OTHERWISE ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS ARE IN METRES.
2. DIMENSIONS SHALL NOT BE SCALED FROM THE DRAWING ONLY WRITTEN DIMENSIONS TO BE FOLLOWED.
3. GRADE OF CONCRETE SHALL BE :–
   a)DECK SLAB = M40
   b)PEDESTAL /PIER CAP/PIER = M40
   c)PILECAP & PILE = M35
   d)LEVELLING COURSE/ PCC BELOW PILE CAP = M15
   e)ANTI CRASH BARRIER & DIRT WALL = M40
   f)PSC I GIRDER = M45
   g)R.C.C. KERB = M30
4. MINIMUM CAPACITY OF PILE SHALL BE 400.0 MT. (PILE CAPACITY SHALL BE VERIFIED AT SITE BY CARRYING OUT PILE LOAD TEST)
5. STRUCTURAL DIMENSIONS SHOWN ON DRAWING ARE TENTATIVE.
6. STEEL USED SHALL BE H.Y.S.D. BARS CONFORMING TO I.S. 1786 OF Fe 500D GRADE.
7. THE CONTRACTOR SHALL APPOINT SPECIALISED AGENCY FOR DETAILED DESIGN & CONSTRUCTION OF REINFORCED EARTH WORK.
8. THE DESIGN OF REINFORCED EARTH WORK SHALL BE SUBMITTED AND GOT APPROVED FROM THE ENGINEER.
9. DRAIN SPOUT OF 150mm DIA @ 3000mm C/C SHALL BE PROVIDED.
10. ALL THE DIMENSIONS SHOWN SHOULD BE VERIFIED AT SITE BEFORE TAKING UP DESIGN WORK IN HAND. ANY DISCREPANCY NOTED SHOULD BE BROUGHT TO THE NOTICE OF DESIGN OFFICE IMMEDIATELY.
11. STRIP SEAL TYPE EXPANSION JOINT SHOULD BE PROVIDED AS PER LATEST MORTH/MOST REQUIREMENT. CONTRACTOR SHOULD FURNISH DESIGN/DRAWING OF EXPANSION JOINT FROM APPROVED MANUFACTURER BY MOST, AT VARIOUS RELEVANT AMBIENT TEMPERATURE TO SUITE CONDITION WITH THE APPROVAL OF
12. DRAINAGE SPOUTS SHALL BE PROVIDED AS PER MOST SPECIFICATIONS.
13. ANTI–CRASH BARRIERS TO BE PROVIDED AS PER APPROVED DRAWING OF MORTH STANDARD AND SHALL BE CAST–IN–SITU.
14. WEARING COAT SHALL CONSIST OF 40mm THICK BITUMINOUS CONCTERE OVERLAID WITH 25mm THICK BITUMEN MASTIC LAYER AS PER IRC SPECIFICATIONS.
15. THE MATERIAL FOR STEEL GIRDER SHALL BE OF SPECIFICATION GIVEN BELOW PLATES FE 450 CONFIRMING TO IS:2062–2011.
16. STUD SHEAR CORRECTOR SHALL CONFORM TO ISO 13918 (Fe 540).
17. STRUCTURAL STEEL ROLLED SECTION SUCH ANGLES, CHANNELS FOR BRACINGS SHALL BE CONFIRMING TO IS:2062 WITH YIELD STRENGTH OF 250 N/mm².
18. MINIMUM CLEAR COVER TO OUTER MOST REINFORCEMENT INCLUDING STIRRUPS SHALL BE
    a) FOUNDATION : 75mm
    b) SUBSTRUCTURE : 45mm
    c) SUPERSTRUCTURE : 45mm

REV.	DESCRIPTION	DRN BY	DATE	CHECKED BY	DATE	APRD BY	DATE
0	FOR APPROVAL	S.N.P.	10.05.21	R.J.P.	10.05.21	U.S.K.	10.05.21

CONSULTANT
TECHNOGEM CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
OFFICE NO. 803, 8th FLOOR, B WING, LODHA SUPREMUS II ROAD NO. 22, NEAR NEW PASSPORT OFFICE, WAGLE ESTATE, THANE (W) – 400 604
TEL : 022 – 49747799 / 49749899

EMPLOYER:
GOVT. OF GOA
EXECUTIVE ENGINEER
WORK DIVISION - XV (NH)
PUBLIC WORK DEPARTMENT
PONDA, GOA

CLIENT:
MINISTRY OF ROAD TRANSPORT & HIGHWAYS
Government of India
Transport Bhavan, Parliament Street
New Delhi - 110 001

PROJECT:
CONSULTANCY SERVICES FOR THE PREPARATION OF DETAILED PROJECT REPORT AND BIDDING DOCUMENTS FOR THE "PROPOSED CONSTRUCTION OF HIGH LEVEL NEW BRIDGE ALONG WITH ITS APPROACHES ACROSS RIVER ZUARI AT BORIM ON NH-17B(NH-566) IN THE STATE OF GOA."

TITLE
GENERAL ARRANGEMENT DRAWING FOR FLYOVER AT DURBHAT JUNCTION AT CH.6496.000 AND CH.6763.000 (SH. 02 OF 02)

DRG NO.	PROJECT NO.	REV.	SCALE
869-ZUA-GAD-DUR-FLY-001	869	0	N.T.S.

\\TCPL\Droughtsmen\869 - ZUARI - BORIM BRIDGE\FINAL DRAWINGS\GAD DURBHAT FLYOVER\869-ZUA-GAD-DUR-FLY-001-R0.dwg

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ANNEXURE - A-11

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CRZ SURVEY NOS AND AREA - NEW BORIM BRIDGE

The survey numbers and village names of all the lands which fall within CRZ as well as the project area are listed in the second column in the table below. The third column lists the area of the portion of the respective survey numbers that falls within both CRZ as well as the project area.

Sl No	Survey No(s) & village name	Area (sq m)
1	Sy No 232/5, Loutulim village	745
2	Sy No 232/6, Loutulim village	3,858
3	Sy No 232/7, Loutulim village	600
4	Sy No 232/8, Loutulim village	730
5	Sy No 232/9, Loutulim village	650
6	Sy No 232/10, Loutulim village	570
7	Sy No 232/11, Loutulim village	2,655
8	Sy No 232/12, Loutulim village	1,005
9	Sy No 232/13, Loutulim village	4,654
10	Sy No 232/14, Loutulim village	1,950
11	Sy No 232/15, Loutulim village	975
12	Sy No 232/16, Loutulim village	975

NOTARY SUBHASH KRISHNA KAMEKAR SALCETE TALUKA MARGAO-GOA Regd. No. 344/14 Exp. Dt: 28/02/2027 GOVT. OF GOA (INDIA)

13	Sy No 232/17, Loutulim village	3,575
14	Sy No 232/18, Loutulim village	1,975
15	Sy No 232/19, Loutulim village	10,705
16	Sy No 232/25, Loutulim village	1,310
17	Sy No 234/9, Loutulim village	230
18	Sy No 395/0, Loutulim village	5,555
19	Sy No 396/1, Loutulim village	1,045
20	Sy No 402/1, Loutulim village	30
21	Sy No 403/1, Loutulim village	300
22	Sy No 404/1, Loutulim village	315
23	Sy No 404/2, Loutulim village	60
24	Sy No 404/3, Loutulim village	3,640
25	Sy No 404/4, Loutulim village	380
26	Sy No 404/5, Loutulim village	535
27	Sy No 404/6, Loutulim village	485
28	Sy No 404/7, Loutulim village	700
29	Sy No 404/8, Loutulim village	375
30	Sy No 404/9, Loutulim village	335
31	Sy No 404/10, Loutulim village	355
32	Sy No 404/11, Loutulim village	520
33	Sy No 404/12, Loutulim village	481
34	Sy No 404/13, Loutulim village	378

NOTARY
SUBHASH KRISHNA KANEKAR
SALCETE TALUKA
MARGAO-GOA
Regd. No. 344/14
Exp. Ut: 28/02/2027
GOVT. OF GOA (INDIA)

35	Sy No 404/14, Loutulim village	265
36	Sy No 404/15, Loutulim village	355
37	Sy No 404/16, Loutulim village	412
38	Sy No 404/17, Loutulim village	370
39	Sy No 404/18, Loutulim village	440
40	Sy No 404/19, Loutulim village	404
41	Sy No 404/20, Loutulim village	570
42	Sy No 404/21, Loutulim village	623
43	Sy No 404/22, Loutulim village	405
44	Sy No 404/23, Loutulim village	420
45	Sy No 404/24, Loutulim village	380
46	Sy No 404/25, Loutulim village	680
47	Sy No 404/26, Loutulim village	580
48	Sy No 404/27, Loutulim village	1,070
49	Sy No 404/35, Loutulim village	190
50	Sy No 404/38, Loutulim village	60
51	Sy No 404/39, Loutulim village	75
52	Sy No 404/40, Loutulim village	90
53	Sy No 404/41, Loutulim village	80
54	Sy No 404/42, Loutulim village	270
55	Sy No 404/43, Loutulim village	35
56	Sy No 404/44, Loutulim village	35

NOTARY
SUBHASH KRISHNA KAMEKAR
SALCETE TALUKA
MARGAO-GOA
Regd. No. 344/14
Exp. Dt: 28/02/2027
GOVT. OF GOA (INDIA)

57	Sy No 415/7, Loutulim village	150
58	Sy No 415/8, Loutulim village	35
59	Sy No 417/0, Loutulim village	2,295
60	Sy No 425/0, Loutulim village	420
61	Sy No 426/1, Loutulim village	600
62	Sy No 427/5, Loutulim village	280
63	Sy No 430/1, Loutulim village	140
64	Sy No 430/2, Loutulim village	270
65	Sy No 430/3, Loutulim village	950
66	Sy No 430/4, Loutulim village	625
67	Sy No 430/5, Loutulim village	1,100
68	Sy No 430/6, Loutulim village	960
69	Sy No 430/7, Loutulim village	312
70	Sy No 430/8, Loutulim village	200
71	Sy No 430/9, Loutulim village	65
72	Sy No 430/10, Loutulim village	35
73	Sy No 431/2, Loutulim village	5
74	Sy No 431/3, Loutulim village	85
75	Sy No 431/4, Loutulim village	240
76	Sy No 431/5, Loutulim village	310
77	Sy No 431/6, Loutulim village	1,103
78	Sy No 431/7, Loutulim village	870

79	Sy No 431/8, Loutulim village	1,032
80	Sy No 431/9, Loutulim village	660
81	Sy No 431/10, Loutulim village	1,152
82	Sy No 432/1, Loutulim village	1,575
83	Sy No 432/2, Loutulim village	4,235
84	Sy No 432/3, Loutulim village	2,000
85	Sy No 432/4, Loutulim village	1,165
86	Sy No 432/5, Loutulim village	920
87	Sy No 432/6, Loutulim village	2,366
88	Sy No 432/7, Loutulim village	812
89	Sy No 432/8, Loutulim village	2,565
90	Sy No 432/9, Loutulim village	1,170
91	Sy No 432/10, Loutulim village	375
92	Sy No 432/11, Loutulim village	485
93	Sy No 432/12, Loutulim village	356
94	Sy No 432/13, Loutulim village	330
95	Sy No 432/14, Loutulim village	340
96	Sy No 432/15, Loutulim village	365
97	Sy No 432/16, Loutulim village	530
98	Sy No 433/1, Loutulim village	470
99	Sy No 433/2, Loutulim village	420
100	Sy No 433/3, Loutulim village	300

NOTARY
SUBHASH KRISHNA KAMEKAR
SALCETE TALUKA
MARGAO-GOA
Regd. NO:344/14
Exp.Dt:28/02/2027
GOVT. OF GOA (INDIA)

101	Sy No 433/4, Loutulim village	285
102	Sy No 433/5, Loutulim village	420
103	Sy No 433/6, Loutulim village	132
104	Sy No 433/7, Loutulim village	210
105	Sy No 433/8, Loutulim village	260
106	Sy No 433/9, Loutulim village	300
107	Sy No 433/10, Loutulim village	95
108	Sy No 433/11, Loutulim village	50
109	Sy No 433/12, Loutulim village	15
110	Sy No 438/1, Loutulim village	185
111	Sy No 438/2, Loutulim village	198
112	Sy No 438/3, Loutulim village	495
113	Sy No 438/4, Loutulim village	250
114	Sy No 438/5, Loutulim village	100
115	Sy No 438/6, Loutulim village	510
116	Sy No 438/7, Loutulim village	60
117	Sy No 438/8, Loutulim village	20
118	Sy No 439/15, Loutulim village	20
119	Sy No 439/16, Loutulim village	70
120	Sy No 439/17, Loutulim village	240
121	Sy No 440/2, Loutulim village	50
122	Sy No 441/1, Loutulim village	2,015

NOTARY SUBHASH KRISHNA KANEKAR SALCETE TALUKA MARGAO-GOA Regd. No. 34/14 Exp. On: 28/02/2 GOVT. OF GOA (IN

123	Sy No 441/2, Loutulim village	1,833
124	Sy No 222/1, Borim village	400
125	Sy No 222/2, Borim village	170
126	Sy No 222/4, Borim village	225
127	Sy No 223/2, Borim village	525
128	Sy No 223/3, Borim village	525
129	Sy No 225/24, Borim village	95
130	Sy No 225/25, Borim village	325
131	Sy No 225/26, Borim village	735
132	Sy No 225/27, Borim village	1,000
133	Sy No 225/28, Borim village	900
134	Sy No 225/29, Borim village	950
135	Sy No 225/30, Borim village	925
136	Sy No 225/31, Borim village	950
137	Sy No 225/32, Borim village	850
138	Sy No 225/33, Borim village	850
139	Sy No 225/34, Borim village	1,000
140	Sy No 225/35, Borim village	950
141	Sy No 225/36, Borim village	775
142	Sy No 225/37, Borim village	850
143	Sy No 225/38, Borim village	275
144	Sy No 225/39, Borim village	505

NOTARY
SUBHASH KRISHNA KANEKAR
SALCETE TALUKA
MARGAO-GOA
Regd.No.344/14
Exp.Dt:28/02/2021
GOVT. OF GOA (INDIA)

145	Sy No 225/40, Borim village	120
146	Sy No 226/1, Borim village	330
147	Sy No 226/2, Borim village	231
148	Sy No 226/3, Borim village	359
149	Sy No 226/4, Borim village	717
150	Sy No 226/5, Borim village	625
151	Sy No 226/6, Borim village	675
152	Sy No 226/7, Borim village	575
153	Sy No 226/8, Borim village	625
154	Sy No 226/9, Borim village	625
155	Sy No 226/10, Borim village	575
156	Sy No 226/11, Borim village	625
157	Sy No 226/12, Borim village	575
158	Sy No 226/13, Borim village	485
159	Sy No 226/14, Borim village	420
160	Sy No 226/15, Borim village	300
161	Sy No 226/16, Borim village	200
162	Sy No 226/17, Borim village	118
163	Sy No 226/18, Borim village	20
164	Sy No 226/19, Borim village	10
165	Sy No 242/1, Borim village	400
166	Sy No 242/2, Borim village	235

NOTARY
SUBHASH KRISHNA KAMEKAR
SALCETE TALUKA
MARGAO-GOA
Regd. No. 344/14
Exp. Dt: 28/02/2027
GOVT. OF GOA (INDIA)

167	Sy No 242/3, Borim village	1,029
168	Sy No 242/4, Borim village	376
169	Sy No 242/5, Borim village	425
170	Sy No 242/6, Borim village	406
171	Sy No 242/7, Borim village	414
172	Sy No 242/8, Borim village	420
173	Sy No 242/9, Borim village	445
174	Sy No 242/10, Borim village	450
175	Sy No 242/11, Borim village	431
176	Sy No 242/12, Borim village	378
177	Sy No 242/13, Borim village	382
178	Sy No 242/14, Borim village	450
179	Sy No 242/15, Borim village	472
180	Sy No 242/16, Borim village	418
181	Sy No 242/17, Borim village	420
182	Sy No 242/18, Borim village	410
183	Sy No 242/19, Borim village	396
184	Sy No 242/20, Borim village	360
185	Sy No 242/21, Borim village	371
186	Sy No 242/22, Borim village	317
187	Sy No 242/23, Borim village	318
188	Sy No 242/24, Borim village	513

NOTARY SUSHASH KRISHNA KANEKAR SALCETE TALUKA MARGAO-GOA Regd. No. 340/14 Exp. Dt: 28/02/2017 GOVT. OF GOA (INDIA)

189	Sy No 242/25, Borim village	494
190	Sy No 242/26, Borim village	820
191	Sy No 243/1, Borim village	655
192	Sy No 244/1, Borim village	150
193	Sy No 244/2, Borim village	810
194	Sy No 244/3, Borim village	875
195	Sy No 244/4, Borim village	615
196	Sy No 244/5, Borim village	345
197	Sy No 244/6, Borim village	341
198	Sy No 244/7, Borim village	630
199	Sy No 244/8, Borim village	75
200	Sy No 244/9, Borim village	340
201	Sy No 244/10, Borim village	360
202	Sy No 244/11, Borim village	816
203	Sy No 244/12, Borim village	1,030
204	Sy No 244/13, Borim village	700
205	Sy No 244/14, Borim village	475
206	Sy No 244/15, Borim village	420
207	Sy No 244/23, Borim village	280
208	Sy No 289/1, Borim village	155
209	Sy No 289/2, Borim village	4,640
210	Sy No 290/27, Borim village	20

NOTARY
SUBHASH KRISHNA KAMEKAR
SALCETE TALUKA
MARGAO-GOA
Regd.No 344/14
Exp.Dt:28/02/2021
GOVT. OF GOA (INDIA)

211	Sy No 290/28, Borim village	125
212	Sy No 290/29, Borim village	210
213	Sy No 290/30, Borim village	250
214	Sy No 290/31, Borim village	305
215	Sy No 290/32, Borim village	350
216	Sy No 290/33, Borim village	325
217	Sy No 290/34, Borim village	450
218	Sy No 290/35, Borim village	375
219	Sy No 290/36, Borim village	375
220	Sy No 290/37, Borim village	475
221	Sy No 290/38, Borim village	375
222	Sy No 290/39, Borim village	325
223	Sy No 290/40, Borim village	425
224	Sy No 290/41, Borim village	325
225	Sy No 290/42, Borim village	350
226	Sy No 290/43, Borim village	375
227	Sy No 290/44, Borim village	375
228	Sy No 290/45, Borim village	400
229	Sy No 290/46, Borim village	350
230	Sy No 290/47, Borim village	300
231	Sy No 290/48, Borim village	325
232	Sy No 290/49, Borim village	300

NOTARY
SUBHASH KRISHNA KAMERKAR
SALCETE TALUKA
MARGAO-GOA
Regd. No. 344/14
Exp. Dt: 28/02/2027
GOVT. OF GOA (INDIA)

233	Sy No 290/50, Borim village	200
234	Sy No 290/51, Borim village	200
235	Sy No 290/52, Borim village	80
236	Sy No 290/53, Borim village	50
237	Sy No 290/54, Borim village	10
238	Sy No 291/4, Borim village	3,895
239	Sy No 291/5, Borim village	
240	Sy No 291/6, Borim village	
Total Area of project within CRZ (sq m)		1,62,118

ANNEXURE - A-12

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MINUTES OF 401st MEETING OF THE GOA COASTAL ZONE MANAGEMENT AUTHORITY (GCZMA) HELD ON 28/05/2024 at 3.30 PM. IN THE CONFERENCE HALL, FOURTH FLOOR, DEMPO TOWER, PATTO-PANAJI-GOA.

The 401ST Meeting of the Goa Coastal Zone Management Authority (GCZMA) was held under the Chairmanship of the Secretary (Environment), on 28/05/2024 at 03.30 p.m. in the conference hall, fourth floor, Patto-Panaji –Goa.

The following members were present for the meeting on 28/05/2024

1. **Secretary, Environment & Climate Change /Chairman(GCZMA)**
2. **Representative on behalf of Principal Conservator of Forest, Panaji Goa.**
3. **Representative of on behalf of Director, Directorate of Panchayat, Panaji Goa.**
4. **Representative of on behalf of Director, Directorate of Tourism**
5. **Representative on behalf of Principal Chief Engineer, PWD, Panaji Goa**
6. **Representative on behalf of Principal Chief Engineer, WRD, Panaji Goa**
7. **Mr Ganesh Velip, Expert Member,(GCZMA)**
8. **Ms. Radha Rao, Expert Member, (GCZMA)**
9. **Dr Sushant Naik, Expert Member(GCZMA)**
10. **Director, Environment & Climate Change /Member Secretary, (GCZMA)**

NOTARY SUBHASH KRISHNA KANEKAR SALCETE TALUKA MARGAO-GOA Regd. No. 344/14 Exp. Dt: 28/02/2027 GOVT. OF GOA (INDIA)

Item No.1

Case No.1.

TO DECIDE ON ANJUNA MATTERS PURSUANT TO THE DIRECTIONS OF THE HON'BLE HIGH COURT OF BOMBAY AT GOA

Background: The Goa Coastal Zone Management Authority (hereinafter referred to as 'the GCZMA' in short) has been constituted by the Ministry of Environment & Forests (MoEF), Government of India pursuant to the directions of the Hon'ble Supreme Court of India to deal, inter alia, with violation of the Coastal Regulation Zone (CRZ) Notification 2011 and implementation of the CRZ Notification.

A complaint letter dated 22/08/2022 was filed by Ramesh Mazumdar to this Authority regarding illegal construction of structure on sea shore of Anjuna beach by Agusta D'souza.

A Writ Petition bearing no.2148/2022 (f) was filed by the Ramesh Mazumdar interalia stating inaction on part various authorities on his complaint regarding said illegal construction.

The Hon'ble High Court of Bombay after hearing the matter vide order dated 4/10/2022 directed this authority along with Police Inspector Anjuna Police Station to conduct site inspection and submit status of construction at site. A site

- DSLR Survey Plan
- Form I and XIV

Site Photographs

Decision: The Authority after detailed discussion decided to reject the proposal as no Ground+1 structures are permissible in NDZ areas as per CRZ Notification, 2011.

Case No.2.3

Land acquisition for construction of high level new Borim bridge along with approaches across river Zuari along with bypass to Borim bridge between km 4/00 to km 12/00 (Proposed bypass length = 5.73km) on NH-566 in the state of Goa

The office of GCZMA is in receipt of an application from The Executive Engineer XV (NH), PWD, Ponda Goa dated 16/11/2023 with regards to the Land acquisition for construction of high level new Borim bridge along with approaches across river Zuari along with bypass to Borim bridge between km 4/00 to km 12/00 (Proposed bypass length = 5.73km) on NH-566 in the state of Goa.

The proposal is basically put up as there is a major commercial traffic along the NH-566. The traffic also has increased in many folds along the stretch and the existing two lane bridge is over burdened.

Accordingly, a site inspection was scheduled on 15/12/2023 and the same was attended by following officials:

- Mr. Ganesh Velip (Expert Member, GCZMA)
- Mr. Nehal Devidas (Engg, GCZMA),
- Ms. Siddhi Morajkar (F.S, GCZMA)
- Mr. Amjad Lashkarwale (J.E., PWD)

NOTARY SUBHASH KRISHNA KANEKAR SALCETE TALUKA MARGAO-GOA Regd.No. 33/14 Exp.Dt:28/02/2027 GOVT. OF GOA (INDIA)

Location of Proposals:

The bridge is proposed to connect Borim village in Ponda taluka and Loutlim village of Salcete taluka. The village boundary of Borim village and that of Loutulim village is passing approximately through the centre of the river width. Thus the river Zuari is being the village boundary. The bridge is proposed across river Zuari and be a connecting link from Ponda to Verna, Vasco and Madgaon.As submitted by the applicants, the following survey nos. will be effected by the proposal. Details of survey nos. as effected by CZMP 2011 is tabulated as follows:

Table 1.0

Sr. No.	Village	Survey No.	CRZ Classification
1	Loutolim	395/0	Mangroves, Mangroves buffer, Khazan, River NDZ
2		396/1	Water Body, Mangrove Buffer, Mangroves, Khazan
3		431/1 to 431/10	Khazan
4		432/4 to 432/16	Partly Mangroves buffer, Khazan
5		432/1 to 432/3	Khazan
6		430/1 to 430/9	Khazan
7		425/0	Khazan

8		404/4 to 404/27	Khazan
9		404/3	Khazan, River NDZ, Mangroves Buffer
10		232/25	Water Body, Mangrove, River NDZ
11		232/23, 24	River NDZ, Mangroves Buffer
12		417/0	Khazan
13		441/1, 2	Khazan
14		440/2	Khazan
15		438/1 to 438/8	Water Body, Khazan
16		433/1 to 433/12	Khazan
17		432/6 to 432/16	Khazan
18	Borim	289/2	Mangroves, Mangroves buffer, Khazan, River NDZ
19		290/45 to 290/65	Mangroves, Mangroves buffer, Khazan, River NDZ
20		291/4 to 291/6	Boat Parking / Met mending Area, Fisherman community complex
21		226/1 to 226/14	Khazan
22		225/22 to 225/24	Khazan
23		242/1 to 242/26	Khazan
24		244/1 to 244/15, 244/23	Khazan

NOTARY SUBHASH KRISHNA KANEKAR SALCETE TALUKA MARGAO-GOA Regd. No. 344/14 Exp. Dt: 28/02/2027 GOVT. OF GOA (INDIA)

Details of Proposal:

The proposal is a concrete bridge along with its approaches. The total span of bridge including the approaches is approx. 8kms. The ROW (Right of Way) of proposed road is varying from 10m to 12m from Dhavli Junction to Margao Junction and from Margao Junction to Loutulim Junction the ROW is 20m.

In the revenue village of Loutulim, as per the drawings submitted there are total 17nos of piers proposed. Whereas, for the revenue village Borim, in total 13nos of piers are proposed. Each piers on the landward sides are equally spaced at a distance of 55m whereas the piers that lie in the water body are spaced at distance of 75m from the last pier on the landward side. Also, the applicant has left a navigation span of 15m with vertical clearance being 14m above the HTL. Further, along the landward side the vertical clearance is 5m above the HTL. Also, at the locations where the proposed bridge is crossing the existing road spans at the lower levels, the applicant has proposed the span of bridge to be constructed using MS steel sections with a minimum vertical clearance of 5m.

Further, the approach in the revenue village of Loutulim is approx. 3.75km with a slope gradient of 3.30%. The maximum raise at the approach end along the river bank is approx. 10.7m and that on the landward side is approx. 4.1m. The approach in the revenue village of Borim is approx. 2.47km with a slope gradient of 0.03%. The maximum raise at the approach end along the river bank is approx. 10.3m and that on the landward side is approx. 0.2m. The approach is proposed to be made using the Re-wall solid ramp.

Details of Environmental Impact Assessment / Environmental Management Plan:

The project proponent has produced an EIA report based on the standard TOR given by the Public Works Department, Work Division XV (NH), P.W.D., Panaji, Goa. The EIA study is carried out considering likely potential impacts on physical, biological, socioeconomic and cultural resources within approx. 100m each side of the project. The EIA study was also conducted on ecological sensitive area upto 10km from the project road as there is potential chances of impact on area beyond 100m.

At the local level, the proposed project is going to effect market of the villages such as Dhavali, Borim, Loutulim and few others. In these villages along the existing road there exits few local vendors selling vegetables and other vital items. Also, as per the study it was observed that the noise pollution is some times higher in peak hours of urban stretches for the road due to the traffic movement. Also, there will be air pollution caused due to construction of road.

Project Demands in terms of land, water and soil:

- The total estimated land required for the project is 40.3 ha and most of the private land under acquisition is agricultural.
- The average water demand is 200 cum/day and the peak demand is 265 cum/day. The water requirement is proposed to be met through canal and other surface water sources.
- The total soil requirement for the project is 750000 cum out of which 498000 cum is proposed to be taken from cutting locations and 252000 cum will be taken from borrow areas.

The applicant is also in need of the following units[#]:

1. Hot mix plants, Crushers and Batch mix plants
2. Storage, Handling and transport of Hazardous materials
3. Workers camp, Equipment and storage yards
4. Discharges from Labour Camp

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 # The applicant has not produced any plans indicating the locations of above mentioned units.

The air quality was measured during the month of March 2017 at two locations and the result shows that all the parameters are well below the National Ambient Air Quality Standards, 2009. Also, the same process was repeated for the Noise levels and the noise levels are within the National Ambient Air quality standard w.r.t. Noise, 2000. The project corridor has significant amount of tree plantation. Approximately 4875 nos of trees needs to be cut with the current alignment[##] of project which is the least possible.

Anticipated Environmental Impacts & Mitigation Measures:

- Erosion:

The soil along the proposed roads is sandy clam loam in texture. The erosion factor of the present soil is less. The two important eroding agents are the run-off water and the wind. The run-off dynamics are affected by the degree of slope,

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extent if deforestation and the amount of water stored for irrigation. Grasses and other herbaceous plant limit the surface erosion effectively.

The potential impact includes,

- The ROW of the proposed road is covered by wide range of plantation at few places. Even in the area of high embankment the slopes are stable due to vegetation and other physio- chemical features. The degree of soil erosion is noted to be less.
- Once trees are removed and the herbal cover is cleared on the proposed road, the problem of soil erosion during construction is going to be there.
- Excavations of soil borrow areas may lead to higher degree of erosion.

The following mitigation measures needs to be taken:

- Cutting of required trees in phases and replanting the same now wherever possible.
- Taking advantage of the period of monsoon.
- Developing not too high and steep slopes.
- Improving drainage.
- Turfing of the new embankment.

- Contamination of Soil:

The contamination of soil is negligible as there is no use of hazardous material which can contaminate the soil. However, at the material storage site, interceptor / HDPE sheets shall be provided to avoid any such scope of contamination.

- Impacts on Flora, Fauna and Ecosystem

- the mangroves located at the bank of the river Zuari needs to be cut which are of varying width of 25m to 125m approx.
- there will be loss of herbal cover which will be long lasting and it will lead to soil erosion. However, the soil type at major part of location of project is stable, erosion will be drastically low. The herbal cover can be re-planted as a turf.

##An alternative of 7 alignments were submitted to the MORTH and PWD (NH) Goa. Out of the 7 options, the current alignment is most feasible and economical.

Conclusion:

a. The area effected by the project is Loutulim Village of Salcete Taluka and Borim Village of Ponda Taluka. The details of each village survey nos. wise is tabulated in **Table 1.0** as per CRZ classification as stated in CZMP 2011.
b. As per CRZ notification 2011, the construction of bridge is not prohibited activity under clause 3.0, sub clause iv (a) and (b). Under clause 8.0, sub clause I, (ii), (b) construction of bridge is a permissible activity in CRZ I-A. Under clause 8.0, sub clause III, (iii), (j) construction of bridge is a permissible activity in CRZ III (NDZ).

Recommendation:

➢ The proposed construction should be carried out strictly as per the provisions of CRZ notification, 2011 (as amended from time to time) and guidelines / clarifications given by MoEF from time to time.

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- Construction debris shall not be disposed in the CRZ area.
- Proposed bridge should not obstruct tidal free flow water.
- Environment Management Plan (EMP) shall be implemented effectively.
- All other mandatory permissions from different Departments / Authorities should be obtained prior to the commencement of work.
- The PWD is required to carry out Mangrove plantation in consultation with the Bio- Diversity Board and the Forest Department.
- Existing storm water drains if any flowing through the project land shall not be stopped. They shall be integrated in the project drainage network design in such a way that flooding in the surrounding does not occur due to upcoming of the project.
- The temporary Cofferdams erected by the Project proponent should not hamper the flow of water in any way and the same should be removed immediately after 30 days upon completion of the proposed work.
- The Gangway constructed for free movement of the manpower engaged in the construction work and any platforms constructed in the river for construction work has to be remvoed within 3 months of the completion of the work.
- A colony for the workers with adequate houses and allied common infrastructure such as medical dispensary, creche, primary school, training centre for the workers etc. shall be provided during the construction phase.
- All required sanitary and hygienic measures including sewage treatment plant and mobile toilets shall be provided during the construction phase.
- The construction site shall be provided with adequately barricades of at least 3m height on its periphery with adequate signage.
- Adequate dispensary with all first aid facilities and ambulance service shall be provided at the site during construction phase.
- Adequate drinking water, sanitation and other amenities shall be provided at the site for construction workers. The safe disposal of waste water and solid wastes generated during the construction phase should be ensured.
- Provision should be made for the supply of fuel (Kerosene or cooking Gas), utensils such as pressure cookers etc. to the laborers during construction phase.
- Adequate personal protective equipment shall be provided to the construction workers to ensure their safety and the project proponent shall insure its usage by the laborers.
- Monitoring of Ambient Air Quality, Noise Level monitoring, ground and surface water monitoring throughout the construction phase of the project shall

be carried out and the results shall be prominently displayed at the site. The location of the Ambient Air Quality monitoring stations and its frequency shall be decided in consultation with Goa State Pollution Control Board.

- Environment Management Cell shall be formed, which will supervise and monitor the environment related aspects of the project during construction and operational phases and maintains all the records.
- Disposal of debris including the excavated material during construction phase shall not create adverse effect on neighbouring communities and shall be disposed off within the project site with the approval of the competent authority after taking the necessary precautions for general safety and health aspects.
- Use of diesel generator sets during construction phase should be enclosed type and confirm to EPA rules for air and noise emission standards.
- Vehicles hired for bringing construction material at site should be in good conditions and confirm to applicable air and noise emission standards.
- Ambient noise levels should confirm to residential standards both during day and night. Incremental pollution load on the ambient air and noise quality should be closely monitored during construction phase.
- Structural design aspects in accordance to the seismic zone shall be strictly adhered to National and International standards / codes shall be practiced for the structural safety of the bridges.
- The construction materials and debris shall be properly stored and handled to avoid negative impacts such as air pollution and public nuisances by blocking the roads and the public passages. Appropriate barricading shall be done and signboards shall be put at such sites.
- A detailed Disaster Management Plan for preparedness to meet with all types of disasters and unforeseen conditions shall be prepared before commencing the construction activities.
- Traffic congestion on the roads approaching to the proposed project site and nearby highways (main roads) must be avoided by taking appropriate measures including the road signage, online / automatic displays, etc.
- Post monitoring on the Morphological checks has to be carried out by the PWD for a period of one year.
- In the event of any change in the project profile, a fresh reference shall be made to the GCZMA.
- The Mangroves, if any, on the sire should not be disturbed in any way.
- The GCZMA or any other competent Authority may stipulate any additional conditions subsequently, if deemed necessary, for environmental protection, which shall be complied with.

- The environmental safeguard measures should be implemented in letter and spirit.
- Quarterly monitoring reports should be submitted to the GCZMA in soft and print format.

Decision: The Authority after seeing the presentation called upon the Project Proponent for clarification on 09/07/2024 at 4.30p.m.

Case No.2.4
NOC for Permission for development in the interest of Tourism within the premises of Baga parking

The office of GCZMA is in receipt of an application dated 15/05/2023 from General Manager (Finance & Properties), GTDC, with regards to NOC for permission for development in the interest of Tourism within the premises of Baga Parking.

Site Inspection Report: The said site was inspected by Mr. Austin Barretto, (Engineer GCZMA) and Mr. Raunat Desai (F.S., GCZMA).

1. **Name of the Applicant:** General Manager (Finance & Properties), GTDC
2. **Date of the Application:** 15/05/2023
3. **Application for:** NOC for permission for development in the interest of Tourism within the premises of Baga parking
4. **Date of construction based on the documents:** N.A.
5. **Date of Inspection:** 30/10/2023
6. **Name of the Official/Expert Member, GCZMA:**
   1. Dr. Sushant S. Naik (Expert member GCZMA)
   ii. Mr. Keshav Naik (Engg. GCZMA)
   iii. Mr. Vighnesh Naik (F.S. GCZMA)
7. **Name of the Parties Present:** Mr. Kundan Naik (Deputy GM GTDC) Mr. Gopinath Ghadi (LDC GTDC)
8. **Location of the alleged violation:**

Sy. No. 281/3 **Village:** Calangute **Taluka:** Bardez

9. **Accessibility:** by PWD road.
10. **Distance from the HTL of River/Sea:** The plot is at a distance of 180.5m from HTL as per CZMP 2011

ANNEXURE - A-13

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Date: 14/06/2024

From,
Residents of Loutulim village,
c/o Xavier Fernandes,
House No. 149, Rassaim,
Loutulim, Salcete, Goa
Tel: 7776877686

14/06/2024

O/o Member Secretary
Goa Coastal Zone Management Authority
C/o Department of Environment & Climate Change
Dempo Tower 4th Floor,
Patto Plaza Panjim-Goa. 403001

To
The Member Secretary,
Goa Coastal Zone Management Authority,
4th Floor, Dempo Towers, Patto Plaza, Panaji, Goa

NOTARY
SUBHASH KRISHNA KANEKAR
SALCETE TALUKA
MARGAO-GOA
Regd. No. 344/14
Exp. Dt: 28/02/2027
GOVT. OF GOA (INDIA)

SUB: URGENT ! URGENT ! URGENT !

REQUEST TO REJECT PROPOSED ILLEGAL CRZ CLEARANCE OF HUGE KHAZAN LANDS & CRZ AREAS AT LOUTULIM AND BORIM VILLAGES FOR CONSTRUCTION OF NEW BORIM BRIDGE

Dear Sir,

The villagers of Loutulim village, Salcete taluka strongly object to the grant of any CRZ Clearances in Loutulim and Borim villages for construction of High Level New Borim Bridge along with Approaches across Zuari River along with Bypass to Borim Bridge Between Km 4/00 To 12/00, on the following grounds:

1. **PROPOSED DEVELOPMENT IS IMPERMISSIBLE UNDER CRZ NOTIFICATION 2011**
   a. As detailed in the following paragraphs and as proved by the ~~extracts of~~ approved CZMP 2011 for Goa ~~and google earth images attached~~, over 1,57,000 sq m

(almost 40%) of the lands proposed to be acquired are khazan lands, in which no development is permissible as per CRZ Notification 2011. The CRZ Notification 2011 states under para 8, sub-para V (Areas requiring special consideration), sub-para 3 (CRZ of Goa), sub-para (v), "*the mangroves along such as khazan land shall be protected and a management plan for the khazan land prepared and* ***no developmental activities shall be permitted in the khazan land***;". It is thus clear that khazan lands come under a special category distinct from CRZ-I to CRZ-IV, and that no developmental activities can be permitted in khazan lands. While permissible activities are listed in CRZ Notification 2011 for CRZ-I to CRZ-IV, no permissible activities are listed for khazan lands.

2. PROPOSED DEVELOPMENT IS CONTRARY TO THE OBJECTIVES OF CRZ NOTIFICATION 2011

a. The CRZ Notification 2011 states,

Now, therefore, in exercise of the powers conferred by sub-section (1) and clause (v) of sub-section (2) of section 3 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government, ***with a view to ensure livelihood security to the fisher communities and other local communities, living in the coastal areas, to conserve and protect coastal stretches, its unique environment and its marine area*** *and to promote development through sustainable manner based on scientific principles taking into account the dangers of natural hazards in the coastal areas, sea level rise due to global warming, does hereby, declare the coastal*

stretches of the country and the water area upto its territorial water limit, excluding the islands of Andaman and Nicobar and Lakshadweep and the marine areas surrounding these islands upto its territorial limit, as Coastal Regulation Zone (hereinafter referred to as the CRZ) and restricts the setting up and expansion of any industry, operations or processes and manufacture or handling or storage or disposal of hazardous substances as specified in the Hazardous Substances (Handling, Management and Transboundary Movement) Rules, 2009 in the aforesaid CRZ.

b. It is clear from the above that the objectives of the Notification are:

i. Firstly, *to ensure livelihood security to the fisher communities and other local communities, living in the coastal areas,*

ii. Secondly, *to conserve and protect coastal stretches, its unique environment and its marine area*

iii. Thirdly, *to promote development through sustainable manner based on scientific principles taking into account the dangers of natural hazards in the coastal areas, sea level rise due to global warming*

c. Khazans are the most important lands for livelihood security of the fisher communities and other local communities, and have unrivalled environmental, economic, historical, scientific and cultural value (see paras 4, 5 and 6 below). Seen in the light of the first objective of the CRZ Notification 2011 to *ensure livelihood security to the fisher communities and*

other local communities, the special protection afforded to these unique CRZ areas of Goa under para 8, V, 3, (v) of CRZ Notification 2011, whereby no developmental activities can be permitted in khazans, is fully justified.

3. CATASTROPHIC SCALE AND SIZE OF DESTRUCTION WITHIN CRZ

a. The subject proposal involves the destruction of over 1.5 lakh sq m of CRZ area, which is unprecedented in terms of scale and size of the proposed destruction within the CRZ of Goa. It is submitted that such massive destruction of CRZ areas in tiny Goa is not permissible just on the sole basis of the area involved. Further, the project proponent has admitted that his proposal is based on complete ignorance of the existence of CRZ lands within his proposed project. It is submitted that the entire proposal is based on the false premise that only 5,555 sq m of CRZ area is involved, and the destruction of over 1.5 lakh sq m of CRZ area is not even considered by the project proponent. This is sufficient reason to refuse to grant any CRZ Clearances and ask the project proponent to reconsider the project on the basis of the factual situation, so that CRZ areas affected are avoided by selecting the least destructive alternative, only after realistic cost versus benefit analyses and EIA studies are carried out.

4. CATASTROPHIC SCALE OF COMMUNITY DISPLACEMENT, IRREVERSIBLE LOSS OF HERITAGE, CULTURE & ECONOMY

a. The khazans of Loutulim village are an unrivalled, unique Agro-Pisciculture system created by our indigenous communities about 4,000 years ago, which deserve World Heritage recognition and conservation. Our traditional organic rice cultivation, fish cultivation, biodiversity, wetlands, and livelihoods are dependent on these khazans, which must be protected and conserved for the survival of our indigenous communities, and for the future generations. The destruction of any part of these khazans will not only destroy the khazan lands within the project area, but will also interfere with the water movement needed for the survival of paddy and fish crops in adjoining khazan lands, making it impossible to cultivate any of the remaining khazan fields. The rich fisheries of our khazans will be destroyed, and the entire economic production of our khazans will be lost, if the proposed alignment of the high level New Borim bridge along with approaches across Zuari river is not changed.

b. Among all the khazans of Goa, the khazans of Loutulim are the finest example of a fully functional khazan system, maintained and used in the traditional way even today. While most khazans of Goa are not cultivated due to Government apathy and lack of support, all the khazans of Loutulim are fully cultivated. In addition to the organic cultivation of traditional varieties of rice by over 4,000 indigenous residents, the auctions of fishing rights by the seven tenants associations itself generates crores of rupees every year. In view of the need to conserve the fast-

dying khazan system of Goa, it is essential that the fully functional and traditionally maintained khazans of Loutulim are not interfered with, for which the subject proposal must be rejected.

c. There are 7 Tenants Associations cultivating the khazans of Loutulim, including directly affected Carbot Cantor Mascasana and Bebdo Tenants Association, Deorbhatt and Tamxell Tenants Association, and Atliom Khazan Tenants Association. While the proposed construction will completely destroy about 15 hectares of khazans of Carbot Cantor Mascasana and Bebdo Tenants Association, the khazans of the remaining six Tenants Associations will also be gravely affected, making it financially unviable to cultivate these fields. Over 4,000 indigenous residents, who are fully dependent on these khazans for their survival, will perish unless this proposal is rejected.

5. SITE INSPECTION REPORT (PROPOSAL) IS PREPARED WITHOUT APPLICATION OF MIND

a. We have obtained from your office (under RTI) copies of the contents of the file with regards to the subject proposal, including correspondence, drawings, and the Site Inspection Report (Proposal). We are alarmed to see that the Site Inspection Report (Proposal), which will be the basis of the consideration and processing of the proposal, is completely arbitrary, false and contrary to the requirements of CRZ Notification 2011 and principles of Administrative Law, as stated below:

i. The subject proposal falsely assumes that the massive khazan lands involved are plain agricultural lands, and are neither khazans nor within CRZ. The project proponent is required to first consider the facts with regards to the khazan lands and CRZ areas involved, and to select the least destructive alternative solution. The failure to consider these basic facts renders the entire proposal invalid. The selection of the preferred alternative solution has to be done on the basis of actual facts, and therefore the project proponent is required to be instructed to redo the design and selection process taking into account the CRZ areas involved and the environmental and socio-economic impacts.

ii. The Site Inspection Report (Proposal) wrongly assumes that the proposal is put up "*as there is a major commercial traffic along the NH-566. The traffic also increased in many folds along the stretch and the existing two lane bridge is over burdened.*" This is completely false, as is proved by the following facts:

1. Traffic along NH-566 is minimal and the existing road and bridge are more than sufficient for future growth for many decades. The traffic studies carried out by the project proponent in 2016 (no studies are carried out post 2016) also showed that the traffic on

NH-566 is extremely low (only 30% of the traffic is on NH-566 while about 70% is on Ponda-Margao road). A copy of the relevant page of traffic studies carried out by the project proponent in 2016 is attached as **Exhibit A**.

2. We have studied present traffic on NH-566 and the results show that there is no increase in traffic at all in the last 8 years. A copy of the CCTV footage of traffic recorded over a week in May 2024 is sent by email on goacoastalzone@mail.com (cannot be attached here due to size of the video files). Even a cursory viewing of these videos will prove beyond doubt the absolute lack of necessity of this project.

3. The project proponent has initiated this proposal on the basis that the existing two-lane bridge is beyond repairs and will not be functional in the future. This is reflected in the introduction to the Consultant's reports. However, works have been recently approved to repair the existing bridge with a design life of 20 years and a cost of Rs 20 crores. A copy of an extract from the Consultant's Report indicating that the new bridge is proposed in place of the old bridge is attached as **Exhibit B**. A copy of recent documents recording that the repairs of

the existing bridge with a life of 20 years are imminent is attached as **Exhibit C**.

iii. The complete inadequacy of the Site Inspection Report (Proposal) and the total absence of application of mind by the expert member and other members of the inspection team are obvious if one reviews the Table 1.0 of the Report, which lists the sy nos affected by CZMP 2021 and which are also affected by the project. It is seen that the list of sy nos affected by CZMP 2021 is full of mistakes, as listed below:

1. Sy nos in the project area which are within CZMP 2021, but are not listed in the Site Inspection Report (Proposal):
    - **a.** Sy nos 232/5 to 19, Loutulim village
    - **b.** Sy no 234/9, Loutulim village
    - **c.** Sy no 402/1, Loutulim village
    - **d.** Sy no 403/1, Loutulim village
    - **e.** Sy nos 404/1, 2, Loutulim village
    - **f.** Sy nos 404/35, 38 to 44, Loutulim village
    - **g.** Sy no 426/1, Loutulim village
    - **h.** Sy no 427/5, Loutulim village
    - **i.** Sy no 430/10, Loutulim village
    - **j.** Sy nos 439/15, 16 & 17, Loutulim village
    - **k.** Sy nos 222/1, 2, 4, Borim village
    - **l.** Sy nos 223/2, 3, Borim village

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m. Sy nos 225/25 to 40, Borim village

n. Sy nos 226/15 to 19, Borim village

o. Sy no 243/1, Borim village

p. Sy no 289/1, Borim village

q. Sy nos 290/27 to 44, Borim village

2. Sy nos which are either not within in the project area, or are not within CZMP 2021, but are listed in the Site Inspection Report (Proposal):

a. Sy nos 232/23, 24, Loutulim village

b. Sy no 431/1, Loutulim village

c. Sy nos 225/22, 23, Borim village

d. Sy nos 290/55 to 65, Borim village

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iv. The Site Inspection Report (Proposal) states under "Details of Proposal", "*The ROW (Right of Way) of proposed road is varying from 10m to 12m from Dhavali Junction to Margao Junction to Loutulim Junction the ROW is 20m*". This is completely false and misleading, since the actual ROW is 60 m or more for most of the length of the land acquisition. As a result of this misrepresentation of 60 m width as 10 to 20 m width, the impact has been completely misunderstood by the expert member and other members of the inspection team.

v. The EIA report submitted by the project proponent, based on which the Site Inspection Report (Proposal) is prepared, is completely false and unacceptable, as detailed in the following paragraph numbered 6. The EIA report needs to be first redone on the basis of the facts of the matter taking into account the CRZ aeras involved and the environmental and socio-economic impacts.

vi. The Site Inspection Report (Proposal) fails to consider whether the environmental impacts of project have been studied and listed in the EIA/EMP Report. The Site Inspection Report (Proposal) fails to even consider that the CRZ areas are not even acknowledged in the EIA/EMP Report. Since the CRZ areas are not even considered in the EIA/EMP Report, the Site Inspection Report (Proposal) should have rejected the EIA/EMP Report.

vii. The Site Inspection Report (Proposal) states under the heading "Project Demands in terms of land, water and soil" that "*most of the private land under acquisition is agricultural*". This is shocking, coming from experts of GCZMA, when a whopping 15 hectares, and more, lies within CRZ.

viii. The Site Inspection Report (Proposal) completely fails to consider impacts of the proposal on the CRZ environment. The khazan lands are home to large numbers of

migratory and resident birds, including protected species like lesser adjutant storks, greater spotted eagles, numerous species of ducks and waterfowl, etc. They are also home to a large number of species of fish, amphibians, reptiles, mammals and micro fauna, including endangered species like otters and various types of frogs, fish, shell fish, snakes, and invertebrates. The project also threatens various species of fish and shell of commercial importance, which thrive in the khazans. However, no impact is considered on any of the fauna found in the project area, or on the environment.

ix. The Site Inspection Report (Proposal) completely fails to consider impacts of the proposal on the people and their economies. Over 4,000 indigenous community members are totally dependent on the khazans for their livelihood and survival. The local residents produce huge quantities of rice and fish in these fertile khazans, which sustains their lives. As these local residents have no other means of survival, they will certainly perish unless the subject project is stopped. However, no impact is considered on the people or their economies.

x. The Site Inspection Report (Proposal) states under the heading "Conclusion" that construction of bridge is a permissible activity in CRZ I-A and CRZ III. The Site

Inspection Report (Proposal) thus blindly recommends the project to be allowed, without any application of mind, especially to the following issues that had to be considered by the experts:

1. That the project is mostly within khazan lands, where no developmental activities of any kind are permissible as per CRZ Notification 2011, para 8, sub-para V (Areas requiring special consideration), sub-para 3 (CRZ of Goa), sub-para (v).
2. That there is no need for the project, since there is hardly any traffic on the NH-566, and since the existing bridge is now to be repaired with a design life of 20 additional years.
3. That there are other alternatives that can prevent or reduce destruction of CRZ areas.
4. That the ROW of 60 m is definitely unnecessary and can be reduced substantially to reduce impact on CRZ, and that it is the responsibility of the site inspection team to do its utmost to prevent, or at least minimize, destruction of CRZ areas.

xi. The Site Inspection was carried out without any intimation to the Village Panchayats of Loutulim and Borim, or the local residents. This is totally unacceptable, especially when

over 4,000 local residents from indigenous communities will lose their livelihoods and will perish.

xii. The site inspection could have been carried out only by entering the private bandhs of the khazan lands, which amounts to criminal trespass, as it was carried out without any intimation to the tenants and occupants of the khazans. The project proponent has all the names and addresses of the affected persons, as they are available in public records, and also since over a hundred individual objections have been filed by some the affected persons with all their personal details.

6. EIA/EMP REPORT IS FALSE AND UNACCEPTABLE

a. The EIA/EMP Report is completely false and inadequate, and some of the false submissions and inadequacies are pointed out below:

b. The EIA Report is dated August 2020, which is much after the alignment was selected on 04/05/2017 (see para 7, c, ii below, and Exhibit E).

c. The EIA/EMP report states under para 2.5,

i. "*There is no critical issue in the natural environment except cutting of trees which can be minimized by concentric widening within existing ROW.*"

ii. "*The proposed project falls in CRZ areas and mangroves may be present in the vicinity of*

the project, however, the CRZ areas will be identified after the preparation of the CRZ maps from the approved MOEF&CC recognized agencies."

d. The statements made under para 2.5 show that CRZ areas were not even identified for carrying out the study or for preparation of the report.

e. The statements made under para 2.5 show that no visits have been made by any consultants to the project location and the consultants have even failed to consider draft CZMPs and other data available at that time in public domain.

f. The EIA/EMP Report fails to consider whether there is any necessity for the project and for the ROW of 60 m proposed. See paragraph 7 below for the facts in this regard, which reveal that there is no necessity for the proposed destruction of CRZ areas.

g. The EIA/EMP Report fails to consider whether the evaluation and selection of alternatives is properly done, which is essential in view of the massive, unprecedented scale of CRZ areas affected. Chapter 6 simply states that the project proponent's consultant studied 7 alternatives and submitted an Alignment Option cum Inception Report, but it fails to consider the facts and assess whether the process of selection was proper, and whether environmental impacts were considered. See paragraph 7 below for the facts in this regard, which reveal that the selection of alternatives is arbitrary and without knowledge of material facts.

h. The EIA/EMP Report wrongly states under paras 2.3 & 2.8 that Environmental Clearance is not applicable

for this project. As decided by the Principal Bench of NGT on 02/11/2020 in OA No 69/2019 (WZ) and upheld by Apex Court in CA 1777/2021 on 09/07/2021, this project is within the ambit of EIA Notification 2006 under entry 8(b) of its Schedule, and therefore requires an Environmental Clearance. Copies of both the orders dated 02/11/2020 and 09/07/2021 are attached as **Exhibit D**.

i. The EIA/EMP Report states under para 2.4.1, "*The existing ROW varies from 10 to 20 m. Land acquisition is proposed only where the tow line is going beyond the existing ROW. The total requirement for the project is 40.3 ha. Most of the private land is agricultural.*" The above statement is completely false and shows that the Report is fraudulent since it is prepared in gross ignorance (or concealment) of the nature of the project, which is proposed with a completely new alignment (not existing alignment as suggested), largely through virgin, impeccably maintained khazans, the finest example of the World heritage khazans of Goa.

j. The EIA/EMP Report states under para 2.9, "*The Public Consultation in this project is done by field-testing of questionnaires for various environmental / socio-economic parameters /wild life and interviews with Project Affected Persons / Forest Guard / Road Users.*" This statement is patently false, since no Project Affected Person or local resident was consulted, interviewed, or approached by the consultants. The contents of pages numbered CH.8/5, 8/6, and 8/7 reveal that the consultant claims to have

consulted only 14 persons, whose names reveal that none of them are from the localities where acquisition is proposed in villages of Borim and Loutulim. No Public consultation has been carried out and the 14 persons claimed to have been consulted are strangers having no knowledge of the lands affected directly by the project, which amounts to an eyewash only.

k. Chapter 4 of the EIA/EMP Report entitled "Description of Environment" is required to contain details of the environment and biodiversity of the study area, but is completely barren and inadequate, as described below:

i. There is almost no mention of any species of flora and fauna in the entire chapter. The project area includes, and threatens to permanently destroy, habitats supporting almost 400 varieties of birds including protected species such as Lesser Adjutant Storks, Peregrine Falcon, greater spotted eagles, black-capped and collared kingfishers, grey headed bulbul, and numerous species of ducks and waterfowl, over 40 species of mammals including protected species such as bison, leopard, otters, pangolins, etc, about 100 species of amphibians, 200 species of butterflies, 50 species each of fish and reptiles, various species of marine and estuarine fauna, each of which includes numerous protected species. There is no awareness or

documentation of the rich biodiversity of these eco-sensitive lands.

ii. The khazan lands and their economic and social importance is not even mentioned. Over 4,000 indigenous community members stand to lose all their means for survival and will perish, but there is no mention or study of these affected persons from indigenous communities, their families, and their rich economies, community knowledge, culture, society and heritage, which are fully dependent on the lands affected. The khazans include highly productive fish breeding areas in the 'kholyo' (water bodies in the khazans), traditional organic rice cultivation in the khazan fields, vegetable and fruit cultivation on the bandhs, richest biodiversity, important wetlands for migratory waterfowl, flood water retention and prevention of floods, creation of fertile soil, pollution removal, and numerous other ecological services, but nothing is studied. As an indication of the economic dependence of local communities, the annual fishing rights auctions by seven tenants associations of Loutulim earn these associations annual revenue amounting to crores of rupees, but no study is done of the economic services provided.

iii. There are no studies of the flooding that will take place due to the filling of khazan lands that retain flood waters of Loutulim village.

Bandhs are most susceptible to being washed out due to floods. Rice crops will be lost due to floods, forcing other farmers also to give up cultivation.

iv. Chapter 4 is filled with totally irrelevant or general data, which has no significance or use in understanding the impact of the project on the environment, the people and their livelihoods,

l. Chapter 5 of the EIA/EMP Report entitled "Anticipated Environmental Impact & Mitigation Measures" is required to contain details of the impacts on the environment and biodiversity of the study area, but is completely barren and inadequate, as described below:

i. There is no mention of the impact upon khazans, their biodiversity and environment, and the economies, livelihoods and survival of thousands of local families.

ii. There is no mention of the impact upon protected species, flora and fauna, or biodiversity of the khazans and forests affected.

iii. There is no mention of the impact upon the adjoining khazans, which are certain to be gravely affected by the project.

iv. The khazan fields are highly sensitive flooded areas that are carefully engineered to ensure flow of the tidal waters in a manner to sustain the rice and fish production. The subject project will cause huge obstructions

to flow of water in the carefully engineered khazans, destroying all rice and fish cultivation in all the adjoining khazans.

v. Highly productive fisheries and fish breeding areas of not just the directly affected khazans, but also of all the neighbouring khazans and of River Zuari, will be destroyed, but this is not even considered.

vi. The biggest impact of the proposed project, which is also not considered, is that the finest living example of a fully functional khazan system of Goa, maintained and used in the traditional way even today, along with the community knowledge and scientific traditions of local communities, will be lost forever. The khazans of Goa are under tremendous pressures due to Government apathy and most of the khazans of Goa are no longer fully functional. Due to loss of the community knowledge and scientific traditions of local communities of Loutulim khazans, which is the last properly preserved knowledge system related to khazans and their upkeep, this project will surely ring the death knell for all khazans of Goa.

7. FLAWED EVALUATION OF NECESSITY & ALTERNATIVES

a. There is no necessity for the proposed project, since there is very little traffic on NH-566, as proved by Exhibit A and the CCTV footage sent by email.

b. The Inception Report and traffic studies reveal that the project is proposed based on absolutely false facts, since:

i. Traffic studies were carried out in 2016 when the bridge at NH-17 was closed and the entire traffic of this major route was diverted to NH-566. Traffic studies should have been carried out after the NH-17 bridge has been opened to traffic in 2022, since this has reduced the traffic on this route substantially. The traffic on NH-566 today is minimal, as proved by Exhibits A and the CCTV footage sent by email.

ii. The project is proposed on the assumption that the existing bridge is so dilapidated that it will not be usable in the near future. However, there has been subsequent preparation and approval of work of repair of the existing bride at a cost of Rs 20 Crores and with a design life of 20 years.

iii. In view of the fundamental changes in facts related to the existing bridge and the actual traffic after opening of the NH-17 bridge, there is no justification in processing this proposal, and a fresh study needs to be carried out to evaluate and establish the requirements, if any, based on the actual facts today.

iv. Village Panchayat of Loutulim and affected communities were never informed or

consulted about the necessity of the project or the alignment selection.

c. The alternative solutions can be identified only be done after a fresh study is carried out to evaluate and establish the additional road requirements, if any. It is however pertinent to point out the flawed process of selection of alternatives by the project proponent as follows:

i. The selection of the alternatives was done in 2017, when the consultant had not even prepared any DPR or EIA/EMP Report, and in complete ignorance of the CRZ areas and implications.

ii. The 7 alternatives were evaluated by the consultant in his Inception Report, where he recommended alternative 3 as the best option. However, the Chief Engineer (NH, R & B), PWD wrote to the Chief Engineer (P-6), MORTH on 04/05/2017 suggesting alternative 7 for approval stating, "*The various aspects including that of the missing link at Loutulim at ch.12/00 (i.e. end of the proposed Borim Bridge alignment which is already under construction* ***and considering that the shortest distance for traffic on NH-17B leading to Mormugao Port and its priority****) the alternative 7 is recommended for approval.*" Thus, it is clear that the Chief Engineer (NH, R & B), PWD's arbitrary intervention in the decision-making process, and his complete abandonment of the factors

that were to be considered, is responsible for the selection of alternative 7 over other alternatives. Copies of the relevant extract of the Inception Report and the Chief Engineer (NH, R & B), PWD's letter dated 04/05/2017 letter are attached as **Exhibit E**.

iii. The Inception Report has no assessment of the amount of CRZ areas that are going to be affected if alternative 7 is pursued. The entire area under acquisition in Loutulim village is within CRZ while a large part of the area in Borim village along River Zuari is also within CRZ, but there is no mention of these massive CRZ areas. If this fact was considered, alternative 7 would have never been selected.

In view of the above facts and arguments, we request you to kindly:

A. Reject the faulty and inadequate Site Inspection Report (Proposal) and refrain from granting any CRZ Clearances until requests made under prayers B to D below are carried out;

B. Ask the project proponent to carry out fresh traffic studies based on the present traffic (after the opening of the bridge at NH-17), and to prepare a fresh Inception Report and suitable alternatives, in consultation with the local communities, considering the repair of the existing bridge,

the factual traffic figures, and aiming to prevent or minimize the impact upon CRZ areas and its inhabitants;

C. Ask the project proponent to carry out a proper EIA/EMP study and prepare a Report considering the CRZ areas involved in the project with the aim to minimize the impact on CRZ areas;

D. Ensure that the representatives of the 4,000 odd khazan farmers of Loutulim and Borim are heard in all future proceedings before GCZMA in this matter.

NOTARY SUBHASH KRISHNA KANEKAR SALCETE TALUKA MARGAO-GOA Regd.No.344/14 Exp.Dt:28/02/2027 GOVT. OF GOA (INDIA)

Thanking you,

Fernands

Yours sincerely,

TENANT ASSOCIATIONS

1) Albert Pinheiro
Chairman Conhot Cantor Mascarenhas & Rebelo
Tenants association Loutolim

2) Agnelo Fernandes
Chairman of Deorbhatt and Tamxell
Tenants Association

[redacted]

3) Paul D'sa
Chairman of Socorro & Cordalem
Tenant association

4) Anthony Fernandes
Aldar Tenant-association
Loutolim

VATLAIM TENANTS ASSO Salce LOUTULIM

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Remedios Xavier Fernandes	Carvoli Loutulim	Fernandes.
Joaquim C F Gracias	Vanxem, Loutulim	
Sebastiao A. Alves.	—do—	
Santan Cabe fernandes	Carvoli - Loutulim	
MERCIANA FERNANDES	VANXEM - LOUTULIM.	- Fdes.
Regina Rodrigues	" "	Rodrigues
martina NORONHA	" "	
CANDOLINA MENDES	" "	
Valentin Fdes	Angdi Loutulim	
Joao. fernandes	Carvota	
Pascoal Costa	Vanxem	Costa
Salvador Alves	Vanxem	
FRANCISCO RODRIGUES	VANXEM	

NOTARY
SUBHASH KRISHNA KANEKAR
SALCETE TALUKA
MARGAO-GOA
Regd.No. 344/14
Exp.Dt:28/02/2027
GOVT. OF GOA (INDIA)

ANNEXURE A - 14

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स्वच्छ भारत
एक कदम स्वच्छता की ओर

O/C

Government of Goa
Office of the Executive Engineer
Work Division XV(NH)
Public Works Department
Ponda – Goa

Email id:- ee15-pwd.goa @nic.in
Website:-www.pwd.goa.gov.in

No.F. 7057/PWD/WDXV (NH)/ ASW/2023-24/493 Dated:- 15/03/2024

To,
The Dy.Conservator of Forest,
Forest Department (North),
Ponda Goa.

Sub.: Preparation of Detailed Project Report for the "Proposed Construction of High Level New Bridge along with its approaches across River Zuari at Borim on NH-17B (NH-566) in the State of Goa".

Reg.: NOC - private forest land.

Sir,

The above mentioned Land Acquisition proposal is sanctioned by MORT&H vide Job No. NH-566-GOA-2022-23-02 dt.09.02.2023. The project work includes construction of new high – level cable stayed bridge along with its approaches across River Zuari at Borim. The project road alignment starts at Km.3/860 and ends at Km.9/600 of NH-17B (NH-566) in the state of Goa. The '3A' for the said project work was already published in Gazette of India vide S.O.4589(E) on 19/10/2023.

The proposed alignment which passes through the Quela, Bandora & Borim villages of Ponda Taluka & Loutolim of Salcete Taluka of South Goa District. The survey number, plan of proposed road alignment & the private forest village list published vide notification: Series II dated 22nd September 2022 is enclosed herewith.

ATTESTED

ASSISTANT ENGINEER
Sub. Div. II, W.D. XV(NH)
P.W.D. PONDA-GOA

RECEIVED
Dy. Conservator of Forests
North Goa Division,
Ponda-Goa.

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The notification record shows that the proposed alignment is passing through survey no.357/part 1 of village Borim, which is demarcated as part private forest. As per available land record of the said survey no. & alignment plan, is to state that the proposed alignment is not affecting the demarcated private forest land.

In view of above, it is kindly requested to issue NOC.

Kindly treat this as most urgent as the work of publication of Section 3D is under process.

Yours faithfully,

EXECUTIVE ENGINEER-XV(NH)
P.W.D. Ponda Goa

Copy to.:

1. The Assistant Engineer, S.D. II, W.D.XV(NH), P.W.D., Ponda – Goa.
2. M/s Technogem Consultants Pvt Ltd. Consulting Engineers, 803, 8th Floor, B wing, Lodha Supremus II,Road No.22, Near New Passport Office, Wagle Estate, Thane(W)-400604,

ATTESTED

ASSISTANT ENGINEER
Sub. Div. II, W.D. XV(NH)
P W.D. PONDA-GOA