West Bengal Tourism Development Corporation Limited

(A Govt.of West Bengal Undertaking)
DG Block, Sector II , Salt Lake, Kolkata 700091
Telephone No. 033-2358-5189/Fax No. 2359-8292
Website :- www.wbtdc.gov.in

No. 2536 /WBTDC Dated:27 .02.2019

REQUEST FOR PROPOSAL

Design competition is invited by West Bengal Tourism Development Corporation Ltd from renowned Architect/ Architectural Firms approved by Council of Architecture for preparation of detailed plan and tentative estimate for Proposed Convention Centre located on South of Asian Highway 2 in between Bagdogra Airport and University of North Bengal, Siliguri at a distance of appx. 5 km from Bagdogra Airport. in Darjeeling district having land area of about 130800 Sq. ft. or 12156.13 Sq.m. (i.e. appx. 3.00Acre).

Tentative requirements of the Projects –

i) Convention Halls for various seminars, committees, meetings etc. the seating capacity are 200 pax.
ii) One Art Gallery/Exhibition Hall
iii) One Banquet Hall/Multi Cuisine Restaurant and a modular kitchen.
iv) Public Toilets for Gents, Ladies and disabled persons.
v) Separate entry and Lift for VIPs.
vi) Controlled entry manned by security personnel with DFMDs and baggage scanners.
vii) One small Committee Room.
viii) Lift for vertical movement.
ix) AHUs & Electrical Room.
x) Reception, Electrical services, Admin. Office, Linen Store, House Keeping, Dormitory for 8 persons, Biswa Bangla.
xi) Banquet , Dining/Restaurant & Bar, Kitchen, Toilets facilities for gents and ladies.
xii) Guest rooms and attached toilet with each room.
xiii) audio – video system, public address system and CCTV cameras. Public address system and CCTV cameras shall also be in Green Rooms, AV Rooms, parking and services in 75:25 ratios.

a. Landscaping
b. To provide STP and rainwater harvesting system
c. Provisions for firefighting arrangement
d. 100% power backup

Documents to be submitted as Technical bid submission procedure.

A. List of work experience –Annexure-I
(Enclose copies of experience certificate / credentials)
B. One sealed envelope containing a concept proposal of the project which consist of
1) Hard copy one opaque sheet of key plans, elevation, sections, at least one color 3D perspective drawing of the building of minimum A3 size sheet.
2) A concept note on the design idea including methodology to be adopted for the works.

3) One soft copy (in DVD) containing the entire above document for power point presentation.
4) Concept design with all relevant and required documents as mentioned under technical bid will have to be submitted in a sealed envelope indicating Technical bid along with hard copies of drawings in a sealed envelope roll/packet, mentioning "Technical Bid" for the project. Soft copies of the concept design with drawings are also to be submitted with preliminary cost estimate including cost of fittings , fixtures and furniture.
5) LAST DATE , TIME AND PLACE OF SUBMISSION : All the technical and financial bid are to be submitted to the Technical Adviser, WBTDCL, 1st floor, Udayachal Tourist Lodge , DG Block, Sector-II, Salt Lake, Kolkata-91 within 3.00PM on 20.03.2019
   Any submission after stipulated date any submission after stipulated date and time will summarily be rejected.

6) SELECTION /EVALUTION PROCEDURE
   Technical evolution committee will evaluate technical bid as per following procedure.
   1) Concept plan presentation -80 marks.
   2) Credential of similar nature of work-20 marks
   Total-100 marks

To qualify the participations will have to get minimum 70 marks. If adequate number of participants does not qualify in technical evolution, second call of R.F.P may be invited. The participant will be called upon for detailed demonstration to the Technical Evolution Committee after opening of Technical bids.

Site plan, soil report and Topographical survey plan are enclosed for reference.

CANVASING IN ANY FORM WILL DISQUALIFY THE BIDDER FROM THE COMPETETION.

27/2/19

Executive Engineer
West Bengal Tourism Development Corporation Ltd

REPORT
ON
SUB-SOIL INVESTIGATION

FOR

BAGDOGRA(MICE)

CLIENT

WEST BENGAL TOURISM DEVELOPMENT CORPORATION LIMITED

PROSENJIT DAS

NONA ,ULUBERIA,HOWRAH-711315

C O N T E N T S

1. Introduction

Soil exploration, investigation and testing of soil samples for Bagdogra(Mice). The objective was to ascertain the subsoil characteristics and stratification and other necessary data of soil condition of the site for the proposed Tourist Lodge at Bagdogra(Mice). The field work involved in the investigation including boring, recovery of samples and in-situ tests were carried on 02nd August to 08th August, 2018.

The scope of the work comprised of sinking ten boreholes. It included advancing the boreholes by auger and rotary equipment. The boreholes were of 150 mm in diameter. The scope also included conducting standard penetration tests (SPT), collecting disturbed samples at regular intervals for identification and logging purposes, collecting undisturbed tube samples at suitable intervals or at change of strata whichever is earlier and testing these in the laboratory.

Based on the above, this report presents the subsoil profile and laboratory and field test results. On the basis of field tests and laboratory test results and their analysis thereof, the most suitable type of foundation with it's safe bearing capacity is suggested. The field profile was sometimes modified in the light of laboratory test results.

2. Scope of Soil Investigation Work

The objective of the present Soil Investigation work was to study the engineering properties and parameters of subsoil deposits encountered within the depth of exploration for recommending suitable foundations for the specified location.

The scope of the soil investigation work consisted of the following operations:

(a) *Mobilization of Plant & machinery to identified location, and sinking of 150 mm dia. bore hole in all kinds of soil up to a maximum depth of 10 m below the existing ground level .*

(b) *During sinking of bore hole, soil samples both in disturbed and undisturbed conditions were to be collected for laboratory tests. Standard Penetration Tests at specified depths within the bore holes were to be conducted. Recording Ground Water Table in Borehole was required. .*

(c) *Conducting laboratory tests on various soil samples strictly as per relevant IS Codes, for recommending all relevant subsoil design parameters.*

(d) *Preparation & submission of Geotechnical Investigation Report containing all the field investigation and various laboratory tests results, graphs, charts, tables etc, along with relevant recommendations on foundation system with safe load carrying capacity etc*

3. Field Exploration

Geotechnical Investigation was envisaged in an attempt for optimization in the design of foundation for the proposed structures to be constructed at this site. The entire Investigation programme had been divided mainly into two parts, I) Field works & II) Laboratory tests.

I) Field works unfold the sub-surface deposit types and their characteristics

II) Laboratory tests part would help determining the relevant physical and geotechnical properties of the sub-surface deposits leading to finalization of foundation depths of the structures and the bearing capacity with particular reference to the sub-surface types and their strength parameters and settlement potentials at the site.

3.1 Boring

The bore holes of 150 mm diameter were explored with the help of Auger and Shell operated by mechanized winch as per IS 1892 - 1979. Here the auger was turned in the bottom of the hole through auger pipes. Due to this the soil cuttings were held in the auger and were drawn to the surface by pulling the auger out of the hole each time the auger was filled. In continuation to auger boring shell was used which is a 140mm diameter steel cylinder with a cutting edge at the bottom and was fitted with a hinged one-way flap valve at the bottom. The bore hole was advanced by raising the shell up to a height and allowing it to fall and this was repeated several times till sufficient amount of soil enters the shell. When the shell gets nearly filled with soil, it was lifted out of the bore hole and emptied. Undisturbed soil samples were collected at suitable intervals or at change of strata whichever is met earlier

by open drive sampling method since it was intended to ascertain the subsoil characteristics. The standing water table in each borehole was determined at least 24 hours after the termination of boring work

3.2 Sampling

Nominal 100 mm diameter undisturbed samples were recovered. The sampling equipment used consists of a two-tier assembly of sample tubes 400 mm in length fitted at its lower end. The sampling assembly was driven by means of a jarring link to its full length or as far down as was found practicable. After withdrawal the ends of the tubes were sealed with wax at both ends and capped before transmission to the laboratory. At close intervals in depth, disturbed samples were collected both from split spoon sampler after the standard penetration test and from cutting edge for identification and logging purpose. These were tagged and packed in polythene packets and transported to the laboratory. The depth wise locations of all the undisturbed and disturbed samples were used in the preparation of borehole log data and for general identification and classification purposes. The details of boring are presented in the Appendix in the form of bore log sheets.

3.3 Standard Penetration Test

Standard Penetration Tests were conducted in the boreholes at suitable intervals as per IS: 2131-1963 using a split spoon sampler. The split spoon sampler used is of a standard design having an outer diameter of 50.8 mm and inner diameter of 35 mm, driving with a monkey weighing 63.5 kg, falling freely from a height of 75 cm. A record of the number of blows required to penetrate every 15 cm to a maximum depth of 45 cm was made. The first 15 cm of drive was considered to be seating drive and was neglected. The total blows required to effect each 15 cm of penetration was recorded. The "N" values were obtained by counting the number of blows required to drive the spoon from 15 cm to 45 cm. On completion of a test, the split spoon sampler was opened and soil specimens were preserved in polythene bags for logging purpose.

All the boreholes were sunk with winch. However, raising of hammer for SPT was done manually. Hence there will not be any inertia loss and the efficiency of hammer blows should be considered as 100%.

3.4 Measurement of Water Table

Level of water was noted when struck in. This is termed as observed water level. Standing water level was noted during initial stages of boring, intermediate stage of boring and after 24 hours of removal of casing was also noted and shown in the profile.

4. Laboratory Testing

For proper identification and classification of the sub-soil deposits and for deriving adequate information regarding its relevant physical and geotechnical properties at the site under investigation, the soil samples from the 10 cm diameter sampling tubes were extracted in the laboratory by pushing out the core by using the extractor frame. The core was jacked out in a direction that corresponded with the soil movement within the tube during sampling. In general, the following laboratory tests were conducted on the soil samples collected from the exploratory bore holes:

a) Grain size distribution (Sieve as well as Hydrometer).
b) Determination of Atterberg Limits.
c) Determination of Natural Moisture Content.
d) Determination of Specific Gravity.
e) Determination of Bulk & Dry Unit Weight.
f) Strength determination by Triaxial Unconsolidated Undrained Test (UU).
g) Strength Determination of Unconfined Compression Test on (UC)
h) Direct Shear Test (DS)
i) One-dimensional Consolidation Test for determining settlement potentiality.

The triaxial tests/unconfined compression test 38 mm diameter x 76 mm long specimens were obtained by jacking out the soil core into thin-walled brass

tubes. The inside of the tubs was coated with a thin layer of silicon oil. Self-explanatory test results are presented in the Appendix.

To obtain specimens for consolidation test the odeometer ring was placed on the trimmed horizontal face of the soil within the 10 cm sampling tube and the soil around the cutting edge was gradually removed with a spatula as the ring was gently pushed into the soil. The ring with the soil was then removed by cutting across the soil core with the help of a piano wire saw.

The laboratory tests were done to ascertain the engineering properties of the subsoil and to obtain the necessary data required to design the foundation. These are detailed below. Summary of all the test results are given in a tabular form in Table -1.

4.1 Atterberg Limits and Natural Water Content

Liquid limit, plastic limit and natural water content of the silty clay/clayey silt samples were determined (a) to classify the soil by the IS classification system and (b) to qualitatively assess their consistency and compressibility.

4.2 Bulk density

These were determined by measuring the weight and dimension of triaxial/unconfined compression test samples.

4.3 Undrained Triaxial Test/ Unconfined Compression Test

These were run on the clay/ clayey silt samples to determine their shear strength. The cell pressures employed in triaxial tests were 0.5, 1.0 and 1.5 kg/cm^2. The samples were tested under quick condition at the rate of 1.25 mm/min and were loaded upto a maximum of 20% of axial strain.

4.4 Grain Size Analysis

The grain-size distributions of a quantity of representative samples were determined from sieve analysis/combined sieve analysis and hydrometer analysis. The results are plotted in the Appendix.

4.5 Specific Gravity Test

The specific gravity of different minerals present in subsoils may vary. Specific gravity as such does not indicate the behaviour of soil mass under external loads, but it is an important factor, which is used in computing other properties of soil. The specific gravity of soil samples were determined in the laboratory as per IS : 2720 (Part-3).

4.6 Consolidation Test

Consolidation tests were run in floating ring type odeometers, in an eight unit consolidation frame under standard load increment ratio of one, starting from ¼ kg/cm^2 and going upto 8 kg/cm^2. The e vs. $\log_{10}$p curves are given in the Appendix.

5. *Generalization of Soil Profile and Properties*

Based on visual classification and results of field and laboratory tests on the samples recovered the proposed site may be divided into the following major soil strata as described below:

Layer Details				*Average Field N-Value*	*Bulk Density (t/m3)*	*C0-efficient of Volume Compressibility*	*Shear strength Parameters*
Stratum No.	*Description*	*Depth below EGL (m)*					
		From	*To*				
I	Very Stiff, Brownish grey silty clay traces of mica & siltystone	0.00	1.50	23	1.88	$M_{V=}$ 0.010 cm^2/kg	C=7.1t/m^2, ϕ =2 deg
II	Dense to Very Dense, Whitish Grey sitly sand mixed with mica & found gravel in the deposite.	1.50	10.00	38 to >100	2.03*	-	C= - t/m^2, ϕ =33 deg

*Suggest

A profile through the boreholes and the distribution of field N Value with depth .

6. *Hydrogeology*

The ground water table at the site was found to exist at 0.00m to 0.00m below the ground level for the boreholes explored during the time of investigation work.

7. *Calculations*

7.1 Shallow Foundation

Bearing Capacity

For a shallow foundation resting on cohesive deposit, the following bearing capacity relations may be used as specified by IS: 6403-1981.

The net ultimate baring capacity –

$q_{net\ ultimate} = C_u . N_c . S_c . d_c . i_c + q.(N_q-1). S_q . d_q . i_q + 0.5.B.\gamma. N_\gamma . S_\gamma . d_\gamma . i_\gamma . W'$

The net safe bearing capacity is calculated as

$q_{net\ safe} = q_{net\ ultimate} / FOS$

where, C_u = undrained cohesion of the soil

N_c, N_q, N_γ = bearing capacity factors

S_c, S_q, S_γ = shape factor

d_c, d_q, d_γ = depth factor

i_c, i_q, i_γ = inclination factor

q = effective surcharge at the base level of the foundation

W' = correction factor for water table location

B = least width of the foundation

γ = bulk unit weight of foundation soil

FOS = factor of safety

Settlement

The foundation settlement occurs for cohesive layers of soil which are stressed due to the superstructure loads. The settlements may be computed using the following relations following Is: 8009(Part-I)-1976.

Immediate settlement $\rho_i = \{q_{net} \,.\, B.(1-\nu^2).I_p.\}/E$

Consolidation settlement

$$S_c = \frac{H}{1+e_0} C_c \log_{10} \frac{p_0 + \Delta p}{p_0} \qquad \text{OR} \qquad S_c = \Sigma\, \lambda \,.\, H.\, m_v \,.\, \Delta p \,.\, \beta$$

where, q_{net} = net pressure on soil

B = least width of the foundation

E = modulus of elasticity of soil

ν = Poisson's ratio

I_p = Influence factor

m_v = co-efficient of volume compressibility

H = Thickness of compressible layer

Δp = effective overburden pressure at the center of the corresponding layer

p_0 = initial effective overburden pressure

λ = a factor related to pore pressure parameter, may be taken as 0.70

β = rigidity factor, may be taken as 0.80

C_c = Compression Index, e_0 = initial void ratio,

TYPICAL CALCULATION (SQUARE FOOTING)
Square footing (2.0mx2.0m) founded at 2.0m depth

Design parameters of founding strata are
Cohesion C = - t/m^2 below footing,
Angle of Internal Friction $\phi = 33^0$,
Nq =27.34 Nγ =37.77 ,

γ = 1.88 t/m^2(Layer-I,), γ = 2.03 t/m^2 (Layer-II). Φ for Sand = 33^0

and assuming Strip Footing of (B) = 2.0 m
and depth of foundation D_f = 2.0 m
q= (1.5 x 0.88 + 0.5 x 1.03) =1.84 t/m^2

Q_{safe} for Sand Layer = 1/3 (q(Nq -1) S_q d_q i_q + 0.5 B γ N_γ S_γ d_γ i_γw')
= 1/ 3(1.84(27.34-1)x1.2 x1.18 x1+ 0.5x2.0x2.03x37.77x0.8x1.18x1x0.5)
= 34.93 t/m^2
Therefore, for factor of safety of 3.0

Say 34.0 t/m^2

SETTLEMENT

Settlement for Sand Layer:-

For N_{avg}=50 Corresponding Φ=33, B=2.0m, factor for settlement=0.0039.
Settlement= (0.0039x 1000 x 3.4)= 13.26 mm

S_{total} = 13.26 mm < 75 mm

Hence recommend Safe Bearing Capacity of 34.0 t/m^2(Say 31.00 t/m^2) for a calculated settlement of 13.26 mm for (2.0m x 2.0 m) Square footing founded at depth of 1.5m below EGL .

TYPICAL CALCULATION (STRIP FOOTING)

Strip footing 2.5m wide founded at 2.0m depth

Design parameters of founding strata are

Cohesion C = - t/m^2 below footing,

Angle of Internal Friction $\phi = 33^0$,

Nq =27.34 Nγ =37.77 ,

γ = 1.88 t/m^2(Layer-I,), γ = 2.03 t/m^2 (Layer-II). Φ for Sand = 33^0

and assuming Strip Footing of (B) = 2.5 m

and depth of foundation D_f = 2.0 m

q= (1.5 x 0.88 + 0.5 x 1.03) =1.84 t/m^2

Q_{safe} for Sand Layer = 1/3 (q(Nq -1) S_q d_q i_q + 0.5 B γ N_γ S_γ d_γ i_γw')

= 1/ 3(1.84(27.34-1)x1.0 x1.15 x1+ 0.5x2.5x2.03x37.77x1.0x1.15x1x0.5)

= 36.94 t/m^2

Therefore, for factor of safety of 3.0

Say 36.0 t/m^2

SETTLEMENT

Settlement for Sand Layer:-

For N=50 Corresponding Φ=33, B=2.5m, factor for settlement=0.004.
Settlement= (0.004x 1000 x 3.6)= 14.4 mm

S_{total} = 14.4 mm <75 mm

Hence recommend Safe Bearing Capacity of 36 t/m^2(Say 33.0 t/m^2) for a calculated settlement of 14.4 mm for 2.5m Strip footing founded at depth of 2.0m below EGL .

8. *Discussions on Foundation*

In view of the sub-soil formation encountered in the area of Bagdogra(Mice), open foundation in the form of Isolated footing & Strip footing. The bearing capacity of isolated & strip footing along with settlement are tabulated below.

Bearing Capacity of Soil.

Without Sand Cushion BED

Foundation Type	Foundation size(BxL)	Depth of foundation	Safe bearing capacity (t/m^2)	Recommended Safe bearing capacity(t/m^2)	Estimated settlement (mm)
Isolated footing	2.0m x 2.0m	2.0 m	34.93	31.00	13.26<50
Isolated footing	2.5m x 2.5m	2.0 m	36.98	33.00	14.40<50
This settlement with in the permissible settlement, So this S.B.C is SAFE					

Without Sand Cushion BED

Foundation Type	Foundation size(B)	Depth of foundation	Safe bearing capacity (t/m^2)	Recommended Safe bearing capacity(t/m^2)	Estimated settlement (mm)
Strip footing	2.0m	2.0 m	34.14	31.00	13.26<75
Strip footing	2.5m	2.0 m	36.94	33.00	14.40<75
Strip footing	3.0m	2.0 m	39.56	35.00	16.38<75
This settlement with in the permissible settlement, So this S.B.C is SAFE					

9. Conclusion and Recommendations

- *The subsoil characteristic for proposed Construction of Tourist Lodge, Project for Bagdogra(Mice) was determined from soil exploration with Ten boreholes.*
- *Foundation in the form of strip & isolated for the proposed structure may be provided. The proposed foundation shall be placed at 2.0m below existing ground level. Bearing capacities for such foundation shall be governed as suggested in* ***section 8.0.***
- *However, actual depth of foundation shall be decided by the designer depending on the Type, Size & other considerations for this structure.*
- *The final decision regarding the foundation will depend on the judgment of the engineer concerned.*

For PROSENJIT DAS
Approved by

Prosenjit Das
M.E, MIGS, MIRC,AMIE
MIPHE, MISCA, AIV
Chartered Engineer & APPROVED VALUERS

<u>Raft footing (12.0m X 20m) founded at 2.5m depth</u>

Design parameters of founding strata are

Cohesion C = - t/m^2 below footing,

Angle of Internal Friction $\phi = 33^0$,

Nq =27.34 Nγ =37.77 ,

γ = 1.88 t/m^2(Layer-I,), γ = 2.03 t/m^2 (Layer-II). Φ for Sand = 33^0

and assuming Strip Footing of (B) = 12.0 m

and depth of foundation D_f = 2.5 m

q= (1.5 x 0.88 + 1.0 x 1.03) = 2.35 t/m^2

Q_{safe} = 1/ 3.0 (q(Nq -1) S_q d_q i_q + 0.5 B γ N_γ S_γ d_γ i_γw')

= 1/ 3.0(2.35(27.34-1)x1.0 x1.04 x1+ 0.5x12x1.94x37.77x1.0x1.04x1x0.5)

= 97.66 t/m^2

Therefore, for factor of safety of 3.0

<u>CHECK FOR SETTLEMENT</u>

SBC = 0.14 (N-3){(B+0.3)/2B}^{2} R´$_w$ C_D S_a t/m^2

Where,

N = Corrected N value

B = Width of footing in m

R´$_w$ = Water table correction factor

C_D = Depth correction factor = (1 + D/B) restricted to a maximum of 2

S_a = Permissible settlement in mm

D = Depth of foundation in m

Here,

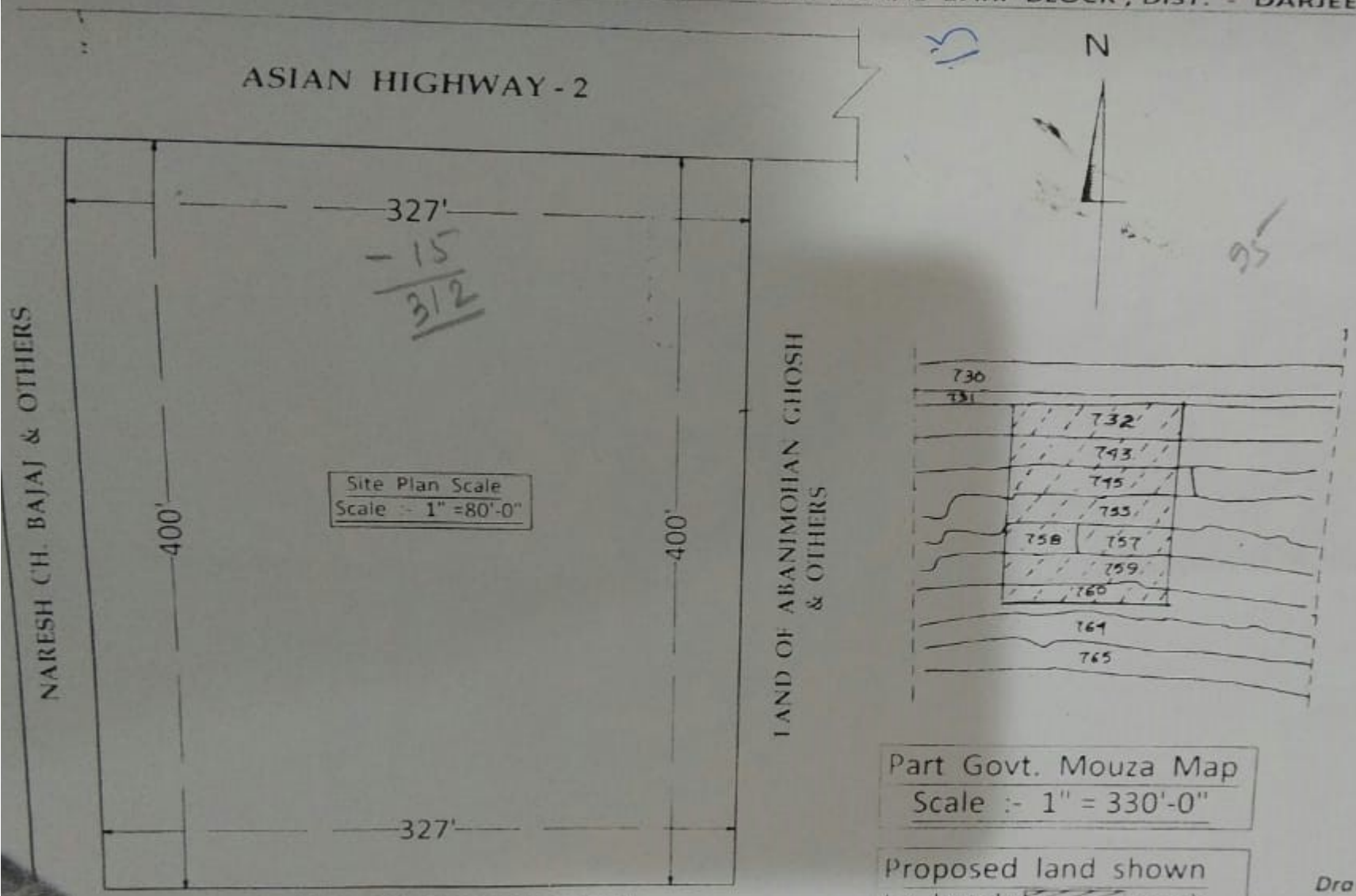
N_{avg} = 40, B = 18 m, R´$_w$ = 0.5, S_a = 50 mm, D = 4.5 m, C_D = 1+ 2.5/12 = 1.21

 SBC = *0.14 x 37 x (12.3/24)^2 x 0.5 x 1.21 x 50* = 41.15 t/m^2

Hence recommend Safe Bearing Capacity of 41.15 t/m^2 (Say 38.0 t/m^2) for founded at depth of 2.5m below EGL .

Foundation Type	Foundation size.	Depth of foundation	Safe bearing capacity (t/m^2)	Recommended Safe bearing capacity(t/m^2)
Raft footing	(12 x 20)m	2.5 m	41.15	38.0

SITE PLAN MAP SHOWING THE ACQUIRED LAND PROPOSED FOR TOURIST CAMP UNDER THE TOURISM DEPERTMENT OF WEST BENGAL GOVT. AT MOUZA RUPSINGH, J.L. NO. 95, UNDER NAXAL BARI BLOCK, DIST. - DARJEELING.



SCHEDULE OF LAN

Mouza	:	Rup S
J.L. No.	:	95
P.S.	:	Bagdo
Dist.	:	Darjee
Kh. No.	:	1
Total Area	:	3 Acre.

R.S. Plot No.	L.R. Plot No.	Area Decim
652/714	732	49
652	743	44
654	745	41
657	755	48
658	757	25
658	758	17
659	759	48
660	760	28
Total Area =		300 Dec

Drawn By

Countersigned

Block Land and Land Reforms Office