

छत्तीसगढ़ अंतरिक्ष उपयोग केन्द्र
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Chhattisgarh Council of Science and Technology
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No. F7-14/2013/12
Government of Chhattisgarh

DGPS SURVEY CARRIED OUT
For

Chief Engineer (Civil-Proj.-I)
C.S.P.G.C.L., RAIPUR

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Office of The Director General
C.G. Council of Science & Technology
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1. INTRODUCTION

Ministry of Environment and Forests, Govt. of India vide their circular No.F.No.-11-9/98-FC, dated 08-07-2011 have stipulated that to ensure accurate delineation of forest area proposed to be diverted for non-forestry purposes under Section-2 of Forest Conservation Act, 1980 the diversion proposal under Forest Conservation Act shall be accompanied by DGPS/ETS surveyed reports of the forest patches proposed for diversion as per guidelines laid down in the circular issued by ministry of forest and Environment, Government of India from time to time. While submitting proposal for diversion of forest patches for non forest purpose, the user agency has to submit the georeferenced boundary, using DGPS in shape file containing maps along with hard copy authenticated by Divisional Forest Officer (DFO) concerned. The conventional methods of survey to delineate and demarcate the forest patches with reference to the earlier Cadastral/Forest Compartment are time consuming. Further, the conventional surveys are “Un projected” Surveys, hence linking them to geospatial domain is a challenging task. The modern survey technique using Differential Global positioning system (DGPS) with georeferenced high resolution satellite image bring efficacy in survey in shorter time span compared to old method of survey and record preparation.

In view of above M/S CSPGCL allotted the task vide work order no. 04-02/GPIII-57/288Raipur, Dated 06/06/2019 to undertake DGPS survey for single route having area of 0.993 hectare protected forest patches along the approach road for coal transportation to Gharghoda railway siding for which forest clearance is to be applied. DGPS survey repeat for the above mentioned work was submitted to CSPGCL on under letter No.262/CCOST/2019/15/7/2019. M/S CSPGCL further requested task to CCOST vide work order no 04-02/GP-III-57/1398 Raipur dated 21-01-2020 for verification of earlier surveyed route along with DGPS survey for identifying suitable two additional suitable alternative routes for identifying comparatively most viable route falling in protected

Forest Compartment No. 1235P. DGPS was done on 03-03-2020 in the presence of CSPGCL and forest officials for identifying comparatively most viable route among the three alternative proposed routes, to connect Gharghoda railway siding from Gharghoda-Chhal main road.

2. SCOPE OF WORK

- Carrying out survey work using DGPS (UTM coordinates) for demarcation of forest boundary in protected forest area for three alternative routes to connect Gharghoda Railway siding from Gharghoda-Chhal main road.
- Computation of forest patches area of three alternative routes through digitization and comparison with area indicates in forest land schedule.
- Processing of DGPS observation for final coordinates and generation of geo-reference shape files of the forest patches.
- Preparation of Geo-referenced boundary map of forest patches.
- Submission of Report with recommendation /Maps/KML and Shape files.

3. LOCATION OF FOREST AREA APPROACH ROAD

Three alternative DGPS surveyed routes, fall in Protected Forest 1235P covering an area Route-I (0.971Ha), Route-II (0.988 Ha) and Route-III (0.956 Ha.) for transportation of coal via approach road to Gharghoda railway siding from Gare-Palma sector-III coal mining project is located at Gharghoda village. Distance is about 2 km from Gharghoda village. Approach road to railway siding Gharghoda and Protected forest patches have been identified which are falling in the survey of India Toposheet No. 64N/08.

The minimum and maximum coordinates along the road is

Upper Right corner: - 22° 10' 4.275" N, 83° 19' 57.640" E

Lower Left corner: - 22° 9' 47.261" N, 83° 19' 30.480" E

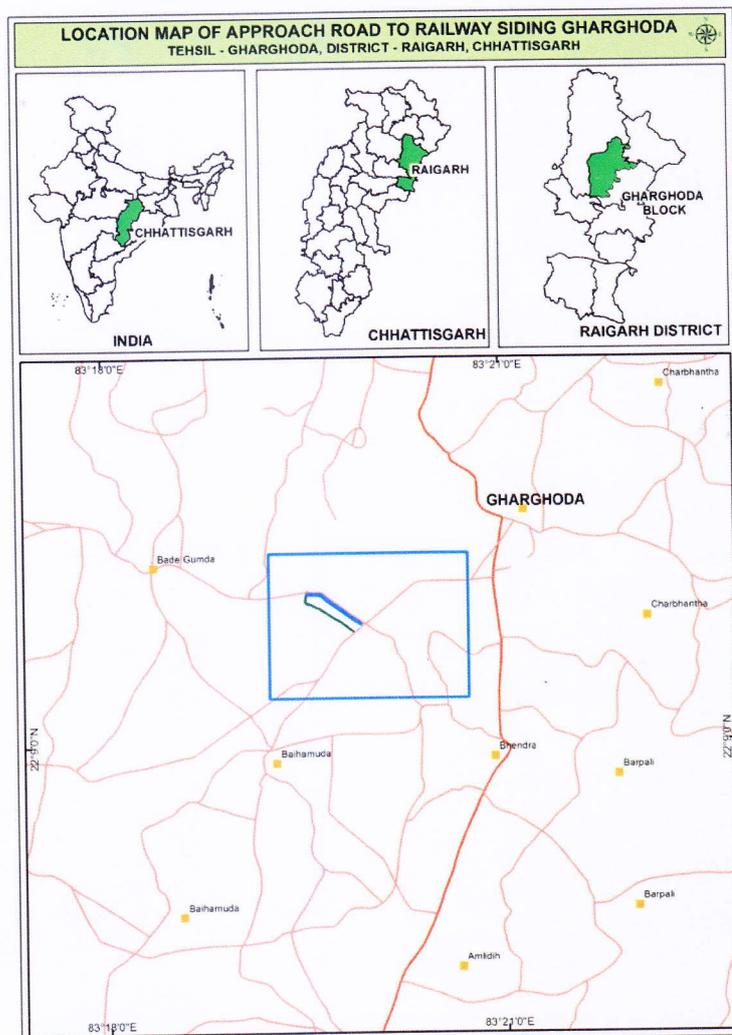


Figure 1: Location map of the area

4. DATA SETS USED

4.1. The Satellite Imagery:

High resolution Cartosat-I data with panchromatic images of 2.5 m resolution and multispectral images of Resourcesat-2 (LISS-IV) with 5.8 m resolution of date 2014-15 was acquired through National Remote Sensing Centre, Hyderabad used for study as reference.

4.2. Forest Map:

Forest map of proposed approach road for coal transportation to railway siding Gharghoda was provided by CSPGCL for demarcation of affecting protected forest patches to be diverted. Forest map was geo-referenced and overlaid on the satellite imagery for further analyses.

4.3. DGPS Data:

Leica DGPS with CS/GS12 Raw Data Logging License for Viva CS field controller, which enables logging of GNSS raw data with a GS12 receiver and GS12 GNSS Smart Antenna, Geodetic 120 channel GNSS receiver was used for GCPs collection.

5. DGPS SYSTEM

DGPS system consist a reference receiver located on a known position that has been previously surveyed, and one or more receivers, the antenna, differential correction processing system and data link equipment. Both the reference receiver and user receiver collect and store data for later processing. DGPS system is based on the principle that receiver in the same vicinity will simultaneously experience common error on a particular satellite ranging signal. In the user receiver, measurements are taken from the reference receiver to remove common errors. Based on this principle, the user receiver must use the same set of satellite as the reference station then the DGPS equation is formulated to remove the common error get cancel. The common errors are signal path delay through atmosphere and satellite clock.

6. PROCEDURE FOR SURVEY

To assess the present position of the Forest compartment maps of the approach road area through which the alignment is passing, the survey has been carried out by dual frequency DGPS (Leica) to first transfer the established Ground Control Points (GCP) along the approach road area and precise

geo-coordinates of forest patches to be diverted for construction of approach road has been taken at identified interval using dual frequency DGPS in RTK (Real Time Kinematic) mode.

6.1. Digitization and geo-referencing of Forest maps

Forest map of approach road for coal transportation provided by CSPGCL digitized and geo-referenced with the image taking the junctions, roads, etc. of the nearby area.

6.2. GIS Analysis

DGPS observation were recorded after identification of alignment pillars on record maps and on the ground subsequently observation were spotted on the record map and correlation was made between identified alignment and DGPS drawn alignment with recorded observation. Based on the proper superimposition final area statistics were generated using ArcGIS software (10.0), area calculated and statistics of area was generated for three alternative proposed routes. As per observation recorded on ground the total length of three alternative approach routes length (route-I(882.88 Mtr), (route-II (902.126Mtr) and (route-III(869.77 Mtr), considering 5.5 m width both side of centre line, the area is 0.971 Ha, 0.988Ha and 0.956Ha respectively excluding the length 20meter from railway bridge which is already diverted to railway.

Out of three alternative Routes for approach road to Gharghoda railway siding from Gharghoda-Chhal main road, Route No III is the shortest as preferred comparatively safer being straight route in which minimum forest (newly planted area) cutting (newly planted area) would be required if route is proposed for coal transportation .

7. INPUT DATA

- Survey of India Toposheet No. 64 N/08 (1:50000 Scale).
- Forest map of approach road area.
- BHUVAN-satellite by bhuvan3.nrsc.gov.in
- Leica GS12 Base and Rover Dual Frequency RTK / Post Processing Differential Global Positioning System

8. EQUIPMENT SPECIFICATIONS

S. No.	DGPS EQUIPMENT SPECIFICATIONS
1.	DESCRIPTION BASE AND ROVER
	GS12 GNSS Smart Antenna, Geodetic 120 channel GNSS receiver, includes GPS L1 + L2, 1 Hz position rate, (e.g. Glonass, Gallileo, GPS L5, Network RTK, Raw data logging ...)
	GS12 GLONASS License for the Viva CS10 field controller, which enables use of GLONASS with a GS12 receiver.
	GS12 Raw Data Logging License for Viva CS10 field controller, which enables logging of GNSS raw data with a GS12 receiver.
	GS12 5Hz License for Viva CS10 field controller, which enables to compute 5 Hz positions with a GS12 receiver.
	GS12 RTK Reference Station License key for Viva CS10 field controller, which enables the GS12 to be used as an RTK base station.
	CS10 Field Controller. Ruggedized WinCE field controller with full VGA touch display, 1GB NAND Flash Memory, 512MB SDRAM, CF/SD card slot and 2MP camera. Includes Bluetooth, virtual numeric keypad, stylus.
2.	RTK BASE AND ROVER RADIO
	HPR2, Sateline-EASY Pro 35W high power radio, 403-473 Mhz RX/TX radio. 5 Meter Mast for Base, Gainflex antenna, CGR10, 403-470 Mhz RXO radio for controllers. ProCom Unity Gain Antenna, GLS13 telescopic aluminum pole
3.	FIELD SOFTWARE
	SmartWorx Viva Software (with CS LT license)
4.	DATA PROCESSING SOFTWARE
	Leica Geo Office GNSS-PP Bundle (Node locked). Includes LandXML Import/Export, COGO calculations, L1/L2 GNSS processing, GLONASS, RINEX Import and Datum & Map., LGO Design & Adjustment 3D
5.	MEASUREMENT PERFORMANCE & ACCURACY
	Accuracy (rms) Code differential with DGPS / RTCM2
	DGPS / RTCM
	Accuracy (rms) with Real-Time (RTK)²
	DGPS equipment Specifications

	Standard of compliance	
	Rapid static (phase) Static mode agree initialization	
	Kinematic (phase) Moving mode after initialization	
	Accuracy (rms) with Post Processing²	
	Static (phase) with long observations	Typically 25 cm (rms)
	Static and rapid static (phase)	
	Kinematic (phase)	Compliance with ISO17123-8
	On the Fly (OTF) Initialization	Horizontal: 5 mm + 0.5 ppm (rms) Vertical: 10 mm + 0.5 ppm (rms)
	RTK technology	Horizontal: 10 mm + 1 ppm (rms) Vertical: 20 mm + 1 ppm (rms)
	Reliability of OTF initialization	
	Time of initialization	Horizontal: 3 mm + 0.1 ppm (rms) Vertical: 3.5 mm + 0.4 ppm (rms)
	ORF range	Horizontal: 5 mm + 0.5 ppm (rms) / Vertical: 10 mm + 0.5 ppm (rms)
	Network RTK	Horizontal: 10 mm + 1 ppm (rms) / Vertical: 20 mm + 1 ppm (rms)
	Network technology	
	Supported RTK network solutions	Leica SmartCheck+ technology
	Supported RTK network standards	Better than 99.99% ²

9. LAND SCHEDULE DETAILS

Table 1: Details of Protected forest

S. No.	COMPARTMENT No.	FOREST RANGE	LAND TYPE	AREA (In Ha.)	Route no
1	1235P	GHARGHODA	PROTECTED FOREST	0.971	I
2	1235P	GHARGHODA	PROTECTED FOREST	0.988	II
3	1235P	GHARGHODA	PROTECTED FOREST	0.956	III

Table 2: Centre line pillar coordinates of Route-I Approach road to Railway Siding Gharghoda

DGPS SURVEY COORDINATES OF ROUTE -I					
S No	Survey Id	Latitude	Longitude	Northing	Easting
1	A1	22° 9' 49.99540" N	83° 19' 57.30031" E	2452815.09378	740541.46067
2	A2	22° 9' 50.26534" N	83° 19' 56.86686" E	2452823.20766	740528.91174
3	A3	22° 9' 51.12626" N	83° 19' 55.45512" E	2452849.07223	740488.04943
4	A4	22° 9' 52.06378" N	83° 19' 53.98146" E	2452877.26644	740445.37661
5	A5	22° 9' 53.35319" N	83° 19' 51.96070" E	2452916.04587	740386.85952
6	A6	22° 9' 54.82088" N	83° 19' 49.59007" E	2452960.15622	740318.23292
7	A7	22° 9' 56.32386" N	83° 19' 47.23561" E	2453005.35974	740250.05335
8	A8	22° 9' 57.31525" N	83° 19' 45.72891" E	2453035.19711	740206.40902
9	A9	22° 9' 58.65991" N	83° 19' 43.72883" E	2453075.68599	740148.45993
10	A10	22° 9' 59.79393" N	83° 19' 42.25855" E	2453109.92791	740105.79257
11	A11	22° 10' 0.67417" N	83° 19' 41.02279" E	2453136.46531	740069.96522
12	A12	22° 10' 1.39278" N	83° 19' 40.04954" E	2453158.14542	740041.73686
13	A13	22° 10' 2.04089" N	83° 19' 39.35214" E	2453177.77790	740021.44657
14	A14	22° 10' 2.40831" N	83° 19' 38.83596" E	2453188.85481	740006.48162
15	A15	22° 10' 2.67819" N	83° 19' 38.34853" E	2453196.94343	739992.38663
16	A16	22° 10' 2.88732" N	83° 19' 37.83511" E	2453203.15178	739977.57560
17	A17	22° 10' 3.04899" N	83° 19' 37.27828" E	2453207.88101	739961.54303
18	A18	22° 10' 3.16399" N	83° 19' 36.52239" E	2453211.08676	739939.82827
19	A19	22° 10' 3.28536" N	83° 19' 35.26016" E	2453214.26625	739903.60097
20	A20	22° 10' 3.30698" N	83° 19' 33.80686" E	2453214.29297	739861.94567
21	A21	22° 10' 3.32322" N	83° 19' 32.48394" E	2453214.21162	739824.02880
22	A22	22° 10' 3.53365" N	83° 19' 32.16083" E	2453220.54370	739814.67050
23	A23	22° 10' 4.02299" N	83° 19' 31.85489" E	2453235.46382	739805.67316
24	A24	22° 10' 4.43529" N	83° 19' 31.65533" E	2453248.06072	739799.76024
BASE	BASE STATION 1	22° 9' 50.57426" N	83° 19' 56.83289" E	2452832.69675	740527.79219

17/04/2020
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उप वनमण्डलाधिकारी
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वन मण्डलाधिकारी
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Table 3: Bounding area coordinates of Route-I for approach road Railway Siding Gharghoda

DGPS SURVEY BOUNDING COORDINATES ROUTE - I					
S No	Survey Id	Latitude	Longitude	Northing	Easting
1	L1	22° 9' 49.84597" N	83° 19' 57.19383" E	2452810.45	740538.4799
2	L2	22° 9' 50.11616" N	83° 19' 56.76099" E	2452818.572	740525.9486
3	L3	22° 9' 50.97775" N	83° 19' 55.34820" E	2452844.456	740485.0556
4	L4	22° 9' 51.91619" N	83° 19' 53.87308" E	2452872.678	740442.3404
5	L5	22° 9' 53.20503" N	83° 19' 51.85321" E	2452911.44	740383.8493
6	L6	22° 9' 54.67258" N	83° 19' 49.48282" E	2452955.546	740315.2297
7	L7	22° 9' 56.17699" N	83° 19' 47.12612" E	2453000.793	740246.985
8	L8	22° 9' 57.16980" N	83° 19' 45.61724" E	2453030.673	740203.2776
9	L9	22° 9' 58.51484" N	83° 19' 43.61659" E	2453071.174	740145.3121
10	L10	22° 9' 59.65381" N	83° 19' 42.13921" E	2453105.565	740102.4388
11	L11	22° 10' 0.53296" N	83° 19' 40.90503" E	2453132.069	740066.6574
12	L12	22° 10' 1.25291" N	83° 19' 39.92993" E	2453153.79	740038.3755
13	L13	22° 10' 1.90663" N	83° 19' 39.22457" E	2453173.592	740017.8544
14	L14	22° 10' 2.26040" N	83° 19' 38.72739" E	2453184.257	740003.4403
15	L15	22° 10' 2.51828" N	83° 19' 38.26162" E	2453191.986	739989.9716
16	L16	22° 10' 2.71918" N	83° 19' 37.76876" E	2453197.95	739975.7536
17	L17	22° 10' 2.87421" N	83° 19' 37.23516" E	2453202.485	739960.39
18	L18	22° 10' 2.98659" N	83° 19' 36.49752" E	2453205.618	739939.1992
19	L21	22° 10' 3.14514" N	83° 19' 32.42234" E	2453208.706	739822.3476
20	L19	22° 10' 3.10662" N	83° 19' 35.24950" E	2453208.763	739903.3797
21	L20	22° 10' 3.12818" N	83° 19' 33.80406" E	2453208.791	739861.9497
22	L22	22° 10' 3.40965" N	83° 19' 32.01619" E	2453216.665	739810.5842
23	L23	22° 10' 3.94103" N	83° 19' 31.68397" E	2453232.867	739800.814
24	L24	22° 10' 4.21551" N	83° 19' 31.55112" E	2453241.253	739796.8776
25	R1	22° 9' 50.14417" N	83° 19' 57.40669" E	2452819.718	740544.4388
26	R2	22° 9' 50.41438" N	83° 19' 56.97294" E	2452827.84	740531.8811
27	R3	22° 9' 51.27501" N	83° 19' 55.56172" E	2452853.696	740491.0338
28	R4	22° 9' 52.21139" N	83° 19' 54.08986" E	2452881.855	740448.413
29	R5	22° 9' 53.50135" N	83° 19' 52.06822" E	2452920.651	740389.8707
30	R6	22° 9' 54.96908" N	83° 19' 49.69756" E	2452964.763	740321.2433
31	R7	22° 9' 56.47060" N	83° 19' 47.34537" E	2453009.922	740253.1294
32	R8	22° 9' 57.46080" N	83° 19' 45.84048" E	2453039.724	740209.5375
33	R9	22° 9' 58.80177" N	83° 19' 43.84591" E	2453080.102	740151.7481
34	R10	22° 9' 59.93191" N	83° 19' 42.38070" E	2453114.227	740109.2277
35	R11	22° 10' 0.81520" N	83° 19' 41.14087" E	2453140.856	740073.2823
36	R12	22° 10' 1.52726" N	83° 19' 40.17667" E	2453162.339	740045.3165
37	R13	22° 10' 2.16798" N	83° 19' 39.48719" E	2453181.747	740025.2567

01.04.2020
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DGPS SURVEY BOUNDING COORDINATES ROUTE -I					
S No	Survey Id	Latitude	Longitude	Northing	Easting
38	R14	22° 10' 2.55027" N	83° 19' 38.95273" E	2453193.274	740009.7608
39	R15	22° 10' 2.83186" N	83° 19' 38.44674" E	2453201.714	739995.1285
40	R16	22° 10' 3.05115" N	83° 19' 37.91211" E	2453208.226	739979.7049
41	R17	22° 10' 3.22434" N	83° 19' 37.31588" E	2453213.292	739962.5379
42	R18	22° 10' 3.34048" N	83° 19' 36.55341" E	2453216.53	739940.6339
43	R21	22° 10' 3.50130" N	83° 19' 32.54554" E	2453219.717	739825.71
44	R19	22° 10' 3.46324" N	83° 19' 35.28006" E	2453219.747	739904.0873
45	R20	22° 10' 3.48580" N	83° 19' 33.80971" E	2453219.796	739861.9428
46	R22	22° 10' 3.65765" N	83° 19' 32.30546" E	2453224.422	739818.7568
47	R23	22° 10' 4.10495" N	83° 19' 32.02581" E	2453238.06	739810.5323
48	R24	22° 10' 4.64451" N	83° 19' 31.76556" E	2453254.546	739802.8202

Table 4: Centre line pillar coordinates of Route-II Approach road to Railway Siding Gharghoda

DGPS SURVEY COORDINATES OF ROUTE -II					
S No	Survey Id	Latitude	Longitude	Northing	Easting
1	B1	22° 9' 47.08188" N	83° 19' 53.21122" E	2452723.65885	740425.65847
2	B2	22° 9' 47.29651" N	83° 19' 52.89781" E	2452730.12405	740416.57575
3	B3	22° 9' 47.59028" N	83° 19' 52.51003" E	2452738.99116	740405.32427
4	B4	22° 9' 48.17766" N	83° 19' 51.64881" E	2452756.68320	740380.36711
5	B5	22° 9' 48.93222" N	83° 19' 50.50060" E	2452779.39192	740347.10712
6	B6	22° 9' 49.60250" N	83° 19' 49.48472" E	2452799.56600	740317.67876
7	B7	22° 9' 50.36619" N	83° 19' 48.34001" E	2452822.55737	740284.51482
8	B8	22° 9' 51.27506" N	83° 19' 47.00968" E	2452849.93383	740245.96303
9	B9	22° 9' 51.95867" N	83° 19' 45.88797" E	2452870.47159	740213.49630
10	B10	22° 9' 52.31138" N	83° 19' 45.26887" E	2452881.05055	740195.58858
11	B11	22° 9' 53.11516" N	83° 19' 43.86355" E	2452905.16106	740154.93794
12	B12	22° 9' 54.00012" N	83° 19' 42.39722" E	2452931.74221	740112.50078
13	B13	22° 9' 54.69349" N	83° 19' 41.24221" E	2452952.56588	740079.07532
14	B14	22° 9' 55.47824" N	83° 19' 39.97210" E	2452976.15043	740042.30849
15	B15	22° 9' 56.16371" N	83° 19' 38.73138" E	2452996.69371	740006.43104
16	B16	22° 9' 56.82215" N	83° 19' 37.58637" E	2453016.44750	739973.30876
17	B17	22° 9' 57.56698" N	83° 19' 36.23988" E	2453038.77074	739934.37258
18	B18	22° 9' 58.29799" N	83° 19' 34.80628" E	2453060.63038	739892.94662
19	B19	22° 9' 59.04744" N	83° 19' 33.28364" E	2453083.01846	739848.96050
20	B20	22° 9' 59.20503" N	83° 19' 31.89263" E	2453087.25612	739809.02566
21	B21	22° 10' 0.09717" N	83° 19' 30.89697" E	2453114.26556	739780.07377
22	B22	22° 10' 1.10783" N	83° 19' 31.09140" E	2453145.44388	739785.16891
23	B23	22° 10' 2.60192" N	83° 19' 31.37883" E	2453191.53560	739792.70119

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DGPS SURVEY COORDINATES OF ROUTE -II					
S No	Survey Id	Latitude	Longitude	Northing	Easting
24	B24	22° 10' 3.57424" N	83° 19' 31.56589" E	2453221.53115	739797.60305
25	B25	22° 10' 4.46004" N	83° 19' 31.73630" E	2453248.85777	739802.06875
26	B26	22° 10' 4.64451" N	83° 19' 31.76556" E	2453254.54578	739802.82025

Table 5: Bounding area coordinates of Route-II for approach road to Railway Siding Gharghoda

DGPS SURVEY BOUNDING COORDINATES ROUTE -II					
S No	Survey Id	Latitude	Longitude	Northing	Easting
1	L1	22° 9' 47.22590" N	83° 19' 53.32490" E	2452728.13962	740428.84794
2	L2	22° 9' 47.43794" N	83° 19' 53.01526" E	2452734.52694	740419.87462
3	L3	22° 9' 47.73182" N	83° 19' 52.62733" E	2452743.39736	740408.61895
4	L4	22° 9' 48.32282" N	83° 19' 51.76082" E	2452761.19815	740383.50838
5	L5	22° 9' 49.07819" N	83° 19' 50.61138" E	2452783.93125	740350.21269
6	L6	22° 9' 49.74809" N	83° 19' 49.59605" E	2452804.09424	740320.80049
7	L7	22° 9' 50.51092" N	83° 19' 48.45264" E	2452827.05970	740287.67393
8	L8	22° 9' 51.42203" N	83° 19' 47.11904" E	2452854.50331	740249.02758
9	L9	22° 9' 52.10974" N	83° 19' 45.99060" E	2452875.16444	740216.36583
10	L10	22° 9' 52.46379" N	83° 19' 45.36915" E	2452885.78353	740198.39018
11	L11	22° 9' 53.26636" N	83° 19' 43.96595" E	2452909.85757	740157.80102
12	L12	22° 9' 54.15026" N	83° 19' 42.50138" E	2452936.40688	740115.41469
13	L13	22° 9' 54.84310" N	83° 19' 41.34724" E	2452957.21489	740082.01437
14	L14	22° 9' 55.62969" N	83° 19' 40.07415" E	2452980.85458	740045.16158
15	L15	22° 9' 56.31664" N	83° 19' 38.83075" E	2453001.44241	740009.20633
16	L16	22° 9' 56.97506" N	83° 19' 37.68578" E	2453021.19542	739976.08535
17	L17	22° 9' 57.72227" N	83° 19' 36.33498" E	2453043.59009	739937.02459
18	L18	22° 9' 58.45542" N	83° 19' 34.89719" E	2453065.51361	739895.47757
19	L19	22° 9' 59.22090" N	83° 19' 33.34198" E	2453088.38062	739850.55050
20	L20	22° 9' 59.37527" N	83° 19' 31.97946" E	2453092.53148	739811.43363
21	L21	22° 10' 0.15973" N	83° 19' 31.10397" E	2453116.28101	739785.97609
22	L22	22° 10' 1.07378" N	83° 19' 31.27982" E	2453144.47912	739790.58421
23	L23	22° 10' 2.58010" N	83° 19' 31.56960" E	2453190.94812	739798.17815
24	L24	22° 10' 3.53404" N	83° 19' 31.75312" E	2453220.37673	739802.98735
25	L25	22° 10' 4.56554" N	83° 19' 31.97671" E	2453252.20907	739808.90810
26	R1	22° 9' 46.93786" N	83° 19' 53.09755" E	2452719.17808	740422.46900
27	R2	22° 9' 47.15507" N	83° 19' 52.78036" E	2452725.72116	740413.27688
28	R3	22° 9' 47.44873" N	83° 19' 52.39272" E	2452734.58496	740402.02959
29	R4	22° 9' 48.03251" N	83° 19' 51.53679" E	2452752.16825	740377.22584
30	R5	22° 9' 49.45690" N	83° 19' 49.37338" E	2452795.03776	740314.55703

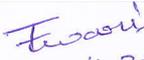
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 वन पं. ३०३

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DGPS SURVEY BOUNDING COORDINATES ROUTE -II					
S No	Survey Id	Latitude	Longitude	Northing	Easting
31	R6	22° 9' 48.78626" N	83° 19' 50.38982" E	2452774.85259	740344.00155
32	R7	22° 9' 50.22145" N	83° 19' 48.22738" E	2452818.05504	740281.35571
33	R8	22° 9' 51.12810" N	83° 19' 46.90031" E	2452845.36435	740242.89848
34	R9	22° 9' 51.80760" N	83° 19' 45.78535" E	2452865.77874	740210.62677
35	R10	22° 9' 52.15897" N	83° 19' 45.16859" E	2452876.31757	740192.78698
36	R11	22° 9' 52.96397" N	83° 19' 43.76115" E	2452900.46455	740152.07486
37	R12	22° 9' 53.84999" N	83° 19' 42.29307" E	2452927.07754	740109.58687
38	R13	22° 9' 54.54388" N	83° 19' 41.13718" E	2452947.91687	740076.13627
39	R14	22° 9' 55.32679" N	83° 19' 39.87004" E	2452971.44628	740039.45540
40	R15	22° 9' 56.01077" N	83° 19' 38.63202" E	2452991.94501	740003.65575
41	R16	22° 9' 56.66924" N	83° 19' 37.48695" E	2453011.69958	739970.53217
42	R17	22° 9' 57.41169" N	83° 19' 36.14478" E	2453033.95139	739931.72057
43	R18	22° 9' 58.14056" N	83° 19' 34.71537" E	2453055.74715	739890.41567
44	R19	22° 9' 58.87397" N	83° 19' 33.22530" E	2453077.65630	739847.37051
45	R20	22° 9' 59.03480" N	83° 19' 31.80580" E	2453081.98076	739806.61769
46	R21	22° 10' 0.03461" N	83° 19' 30.68997" E	2453112.25011	739774.17145
47	R22	22° 10' 1.13419" N	83° 19' 30.90150" E	2453146.17133	739779.71484
48	R23	22° 10' 2.62501" N	83° 19' 31.18831" E	2453192.16243	739787.23067
49	R24	22° 10' 3.60201" N	83° 19' 31.37626" E	2453222.30222	739792.15610
50	R25	22° 10' 4.32357" N	83° 19' 31.59646" E	2453244.59775	739798.12593
51	R26	22° 10' 4.35628" N	83° 19' 31.52490" E	2453245.57271	739796.05981

Table 6: Centre line pillar coordinates of Route-III Approach road to Railway Siding Gharghoda

DGPS SURVEY COORDINATES OF ROUTE -III					
SNo	Survey Id	Latitude	Longitude	Northing	Easting
1	C1	22° 9' 49.99540" N	83° 19' 57.30031" E	2452815.09378	740541.46067
2	C2	22° 9' 50.26534" N	83° 19' 56.86686" E	2452823.20766	740528.91174
2	C3	22° 9' 51.12626" N	83° 19' 55.45512" E	2452849.07223	740488.04943
3	C4	22° 9' 52.06378" N	83° 19' 53.98146" E	2452877.26644	740445.37661
5	C5	22° 9' 53.35319" N	83° 19' 51.96070" E	2452916.04587	740386.85952
6	C6	22° 9' 54.82088" N	83° 19' 49.59007" E	2452960.15622	740318.23292
7	C7	22° 9' 56.32386" N	83° 19' 47.23561" E	2453005.35974	740250.05335
8	C8	22° 9' 57.31525" N	83° 19' 45.72891" E	2453035.19711	740206.40902
9	C9	22° 9' 58.65991" N	83° 19' 43.72883" E	2453075.68599	740148.45993
10	C10	22° 9' 59.79393" N	83° 19' 42.25855" E	2453109.92791	740105.79257
11	C11	22° 10' 0.67417" N	83° 19' 41.02279" E	2453136.46531	740069.96522
12	C12	22° 10' 1.39278" N	83° 19' 40.04954" E	2453158.14542	740041.73686


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DGPS SURVEY COORDINATES OF ROUTE -III					
SNo	Survey Id	Latitude	Longitude	Northing	Easting
13	C13	22° 10' 2.04089" N	83° 19' 39.35214" E	2453177.77790	740021.44657
14	C14	22° 10' 2.40831" N	83° 19' 38.83596" E	2453188.85481	740006.48162
15	C15	22° 10' 2.67819" N	83° 19' 38.34853" E	2453196.94343	739992.38663
16	C16	22° 10' 2.88732" N	83° 19' 37.83511" E	2453203.15178	739977.57560
17	C17	22° 10' 3.04899" N	83° 19' 37.27828" E	2453207.88101	739961.54303
18	C18	22° 10' 3.16399" N	83° 19' 36.52239" E	2453211.08676	739939.82827
19	C19	22° 10' 3.37493" N	83° 19' 36.05524" E	2453217.37108	739926.34223
20	C20	22° 10' 3.72566" N	83° 19' 35.10500" E	2453227.74396	739898.94725
21	C21	22° 10' 3.86561" N	83° 19' 33.87620" E	2453231.50980	739863.66914
22	C22	22° 10' 4.16867" N	83° 19' 32.76716" E	2453240.34635	739831.74589
23	C23	22° 10' 4.30210" N	83° 19' 32.16632" E	2453244.18737	739814.46565
24	C24	22° 10' 4.48404" N	83° 19' 31.68101" E	2453249.57176	739800.47309
25	BRIDGE CENTER	22° 10' 4.77041" N	83° 19' 31.05452" E	2453258.10688	739782.38575

Table 7: Bounding area coordinates of Route-III approach road Railway Siding Gharghoda

DGPS SURVEY BOUNDING COORDINATES ROUTE -III					
S No	Survey Id	Latitude	Longitude	Northing	Easting
1	L1	22° 9' 49.84597" N	83° 19' 57.19383" E	2452810.44980	740538.47990
2	L2	22° 9' 50.11616" N	83° 19' 56.76099" E	2452818.57160	740525.94860
3	L3	22° 9' 50.97775" N	83° 19' 55.34820" E	2452844.45640	740485.05560
4	L4	22° 9' 51.91619" N	83° 19' 53.87308" E	2452872.67810	740442.34040
5	L5	22° 9' 53.20503" N	83° 19' 51.85321" E	2452911.44020	740383.84930
6	L6	22° 9' 54.67258" N	83° 19' 49.48282" E	2452955.54640	740315.22970
7	L7	22° 9' 56.17699" N	83° 19' 47.12612" E	2453000.79290	740246.98500
8	L8	22° 9' 57.16980" N	83° 19' 45.61724" E	2453030.67320	740203.27760
9	L9	22° 9' 58.51484" N	83° 19' 43.61659" E	2453071.17350	740145.31210
10	L10	22° 9' 59.65381" N	83° 19' 42.13921" E	2453105.56460	740102.43880
11	L11	22° 10' 0.53296" N	83° 19' 40.90503" E	2453132.06910	740066.65740
12	L12	22° 10' 1.25291" N	83° 19' 39.92993" E	2453153.78980	740038.37550
13	L13	22° 10' 1.90663" N	83° 19' 39.22457" E	2453173.59150	740017.85440
14	L14	22° 10' 2.26040" N	83° 19' 38.72739" E	2453184.25660	740003.44030
15	L15	22° 10' 2.51828" N	83° 19' 38.26162" E	2453191.98570	739989.97160
16	L16	22° 10' 2.71918" N	83° 19' 37.76876" E	2453197.94990	739975.75360
17	L17	22° 10' 2.87421" N	83° 19' 37.23516" E	2453202.48490	739960.39000
18	L18	22° 10' 2.98659" N	83° 19' 36.49752" E	2453205.61810	739939.19920
19	L21	22° 10' 3.99585" N	83° 19' 32.71786" E	2453235.00802	739830.41468
20	L19	22° 10' 3.55102" N	83° 19' 35.05723" E	2453222.35005	739897.66066

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DGPS SURVEY BOUNDING COORDINATES ROUTE -III					
S No	Survey Id	Latitude	Longitude	Northing	Easting
21	L20	22° 10' 3.68996" N	83° 19' 33.83728" E	2453226.08876	739862.63671
22	L22	22° 10' 4.13116" N	83° 19' 32.10858" E	2453238.90302	739812.89156
23	L23	22° 10' 4.32357" N	83° 19' 31.59646" E	2453244.59775	739798.12593
24	R1	22° 9' 50.14417" N	83° 19' 57.40669" E	2452819.71755	740544.43884
25	R2	22° 9' 50.41438" N	83° 19' 56.97294" E	2452827.83970	740531.88110
26	R3	22° 9' 51.27501" N	83° 19' 55.56172" E	2452853.69560	740491.03380
27	R4	22° 9' 52.21139" N	83° 19' 54.08986" E	2452881.85540	740448.41300
28	R5	22° 9' 53.50135" N	83° 19' 52.06822" E	2452920.65130	740389.87070
29	R6	22° 9' 54.96908" N	83° 19' 49.69756" E	2452964.76280	740321.24330
30	R7	22° 9' 56.47060" N	83° 19' 47.34537" E	2453009.92240	740253.12940
31	R8	22° 9' 57.46080" N	83° 19' 45.84048" E	2453039.72390	740209.53750
32	R9	22° 9' 58.80177" N	83° 19' 43.84591" E	2453080.10185	740151.74807
33	R10	22° 9' 59.93191" N	83° 19' 42.38070" E	2453114.22660	740109.22770
34	R11	22° 10' 0.81520" N	83° 19' 41.14087" E	2453140.85600	740073.28230
35	R12	22° 10' 1.52726" N	83° 19' 40.17667" E	2453162.33870	740045.31650
36	R13	22° 10' 2.16798" N	83° 19' 39.48719" E	2453181.74740	740025.25670
37	R14	22° 10' 2.55027" N	83° 19' 38.95273" E	2453193.27350	740009.76080
38	R15	22° 10' 2.83186" N	83° 19' 38.44674" E	2453201.71430	739995.12850
39	R16	22° 10' 3.05115" N	83° 19' 37.91211" E	2453208.22590	739979.70490
40	R17	22° 10' 3.22434" N	83° 19' 37.31588" E	2453213.29200	739962.53790
41	R18	22° 10' 3.34048" N	83° 19' 36.55341" E	2453216.53030	739940.63390
42	R21	22° 10' 4.34149" N	83° 19' 32.81645" E	2453245.68468	739833.07710
43	R19	22° 10' 3.90031" N	83° 19' 35.15278" E	2453233.13787	739900.23384
44	R20	22° 10' 4.04126" N	83° 19' 33.91512" E	2453236.93084	739864.70157
45	R22	22° 10' 4.47304" N	83° 19' 32.22406" E	2453249.47172	739816.03974
46	R23	22° 10' 4.64451" N	83° 19' 31.76556" E	2453254.54578	739802.82025

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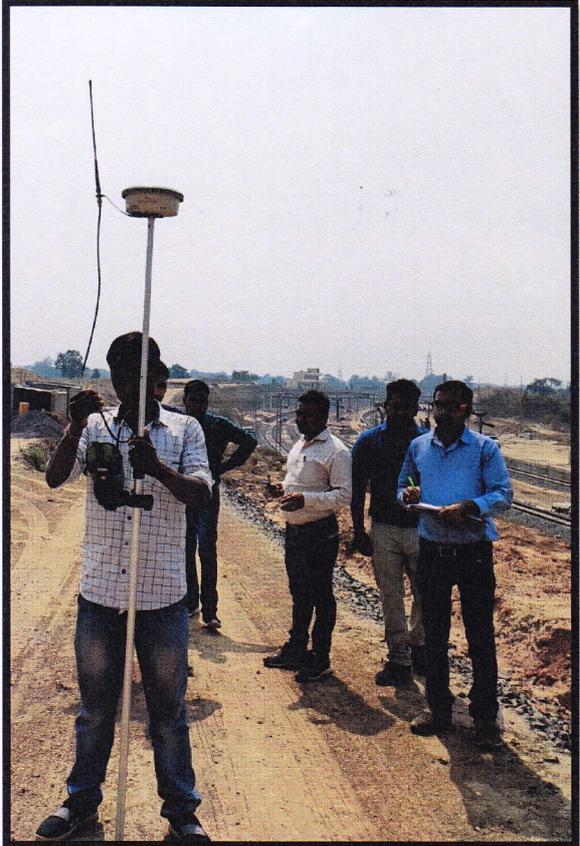
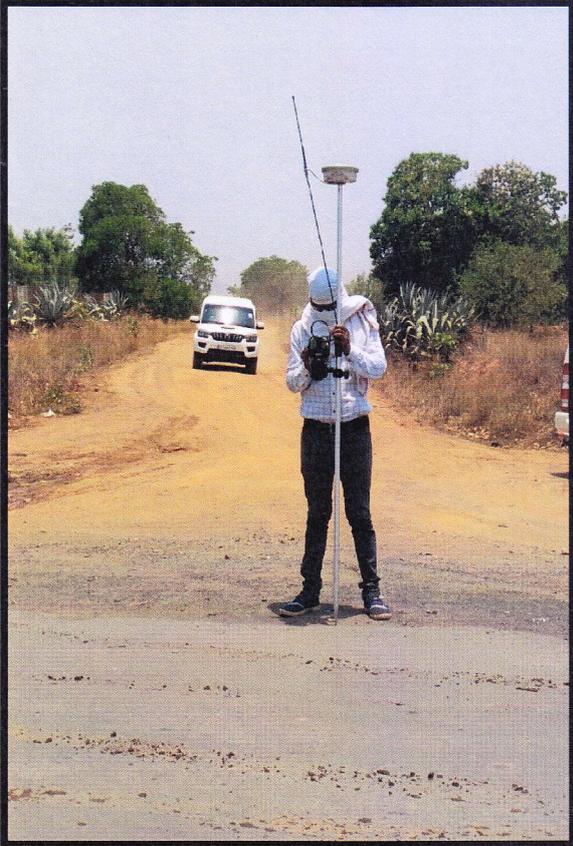
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रायगढ़, वनमण्डल

10. DELIVERABLES

Index Map of Approach Road Railway Siding Gharghoda	Annexure-I
DGPS Surveyed Forest Patches Superimposed on Toposheet (1:50000)	Annexure-II
DGPS Surveyed Pillar Point and boundary Superimposed on Forest Map (1:3000)	Annexure-III
DGPS Survey boundary and Pillar coordinates (1:3000)	Annexure-IV
DGPS Survey boundary and Pillar coordinates Route-I (1:2000)	Annexure-IV(A)
DGPS Survey boundary and Pillar coordinates Route-II (1:2000)	Annexure-IV(B)
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DGPS Surveyed Pillar Point and boundary Superimposed on Satellite Image (1:3000)	Annexure-V





**** Glimpses of Field ****