Report No: GG/TS/18015

REPORT ON
DGPS SURVEY FOR COMPENSATORY FORESTATION FOR PROPOSED 132 KV NAGRI – INDAGAON TRANSMISSION LINE

FOR

CHHATTISGARH STATE POWER TRANSMISSION CO LTD
(A GOVT. OF CHHATTISGARH UNDERTAKING)

REPORT SUBMITTED TO

OFFICE OF THE EXECUTIVE DIRECTOR (EHT: C&M) DAGANIA, RAIPUR (CG)

BY

GAVESHANA GEOSCIENCES PRIVATE LIMITED

132, First Floor, US Complex, Opp Apollo Hospital, Mathura Road, New Delhi - 110076

Tel: 011-2639 7059 / 7061; Email: info@gaveshanageo.com; Web: www.gaveshanageo.com

REPORT ON
DGPS SURVEY FOR COMPENSATORY FORESTATION FOR PROPOSED 132 KV NAGRI – INDAGAON TRANSMISSION LINE

Nagri – Indagaon Transmission line work was awarded by Chhattisgarh State Power Transmission Company Limited (A CG Govt. Undertaking) to M/S Gaveshana Geosciences Pvt Ltd, New Delhi (India) vide contract agreement dated 23 July 2016. The proposed transmission line will be utilized to evacuate power from 132 kV Nagri Sub Station.

The scope of work include the identification of route, detail survey on identified route, tree enumeration and doing ground work related to finalization of forest proposal. With the requirement of DGPS survey for compensatory forestation area in order to finalize the forest proposal, this report summarizes the detail of DGPS survey for identified compensatory forestation area.

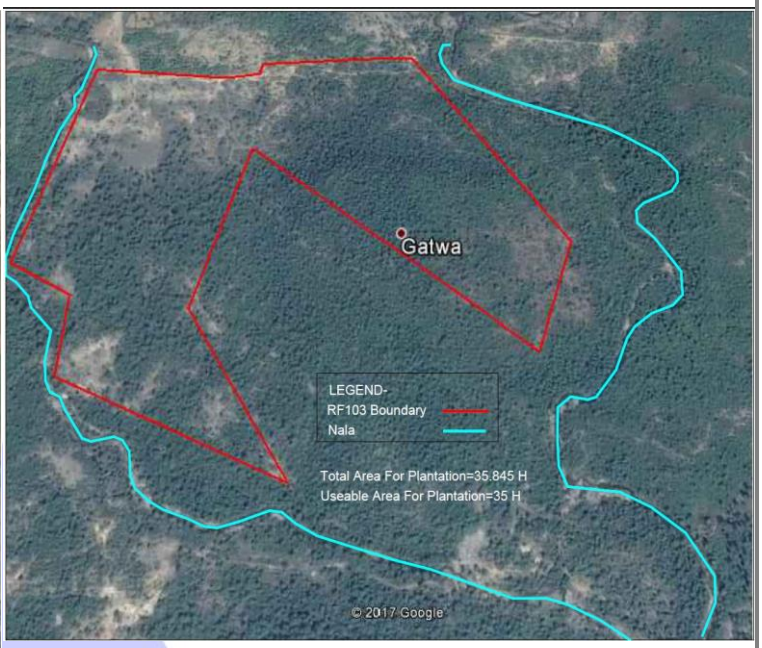
2.0 SURVEY AREA

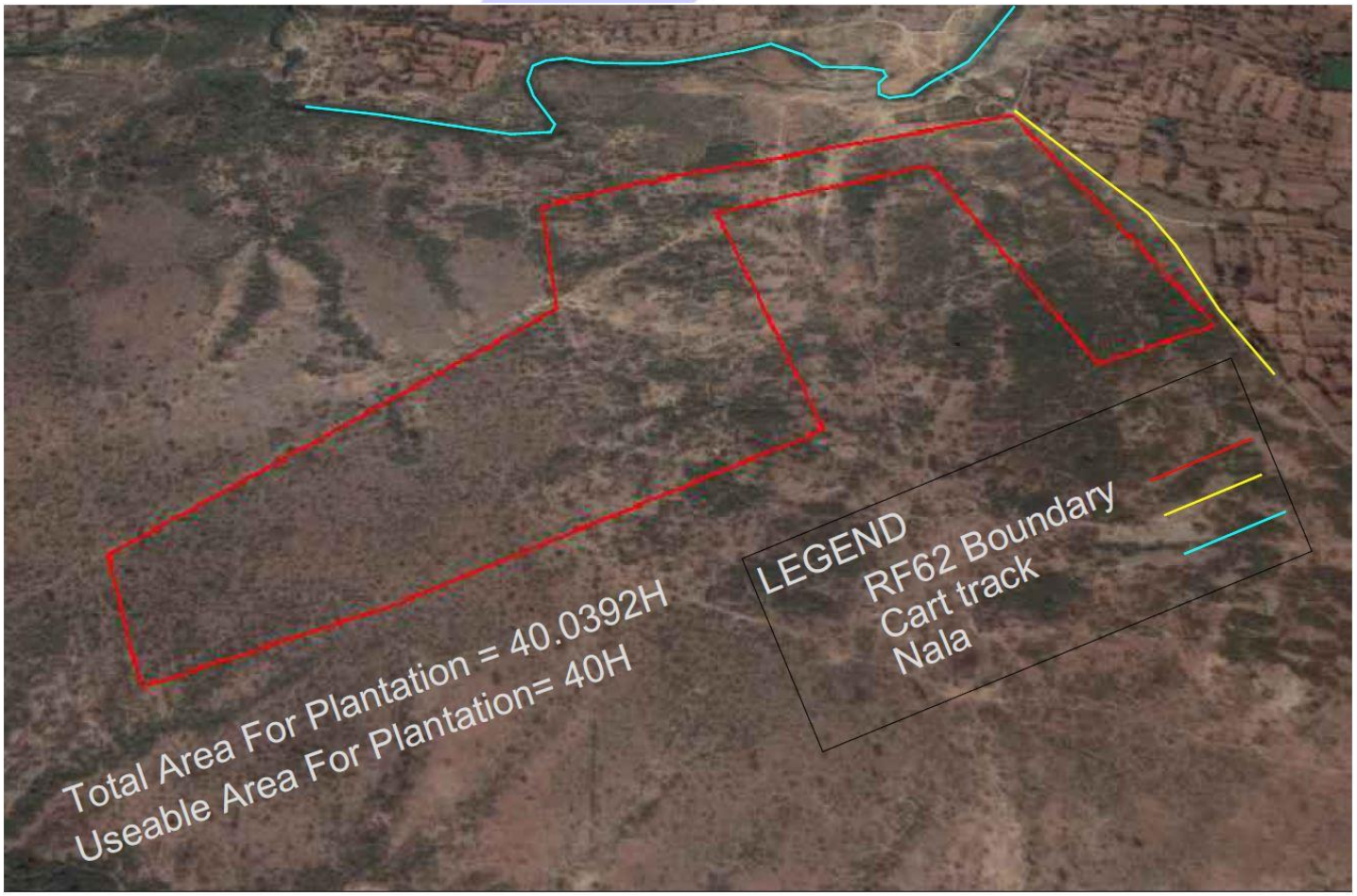
The compensatory forest area is identified around Jhanjgir area i.e. RF 62 and RF 103. PF 101 is situated around 15 km ground distance from Jhanjgir railway station, whereas RF 108 is situated around 12 km ground distance from Jhanjgir railway station and RF 55 PF is situated around 12 km ground distance from Jhanjgir railway station. The Substation of Nagri Is Situated Appx 200 km from Jhanjgir.

PF101 is identified for plantation in which only 50 hectare area will be used for plantation, whereas PF108 is described as 64.338 hectare area identified for plantation in which only 50 hectare area would be used for plantation. RF103 is described as 117.409 hectare area identified for plantation in which only 35 hectare area would be used for plantation. RF 62 is identified for plantation in which only 40 hectare area would be used for plantation and RF 55 is described as 248.295 hectare area identified for plantation in which 50 hectare area would be used for plantation.

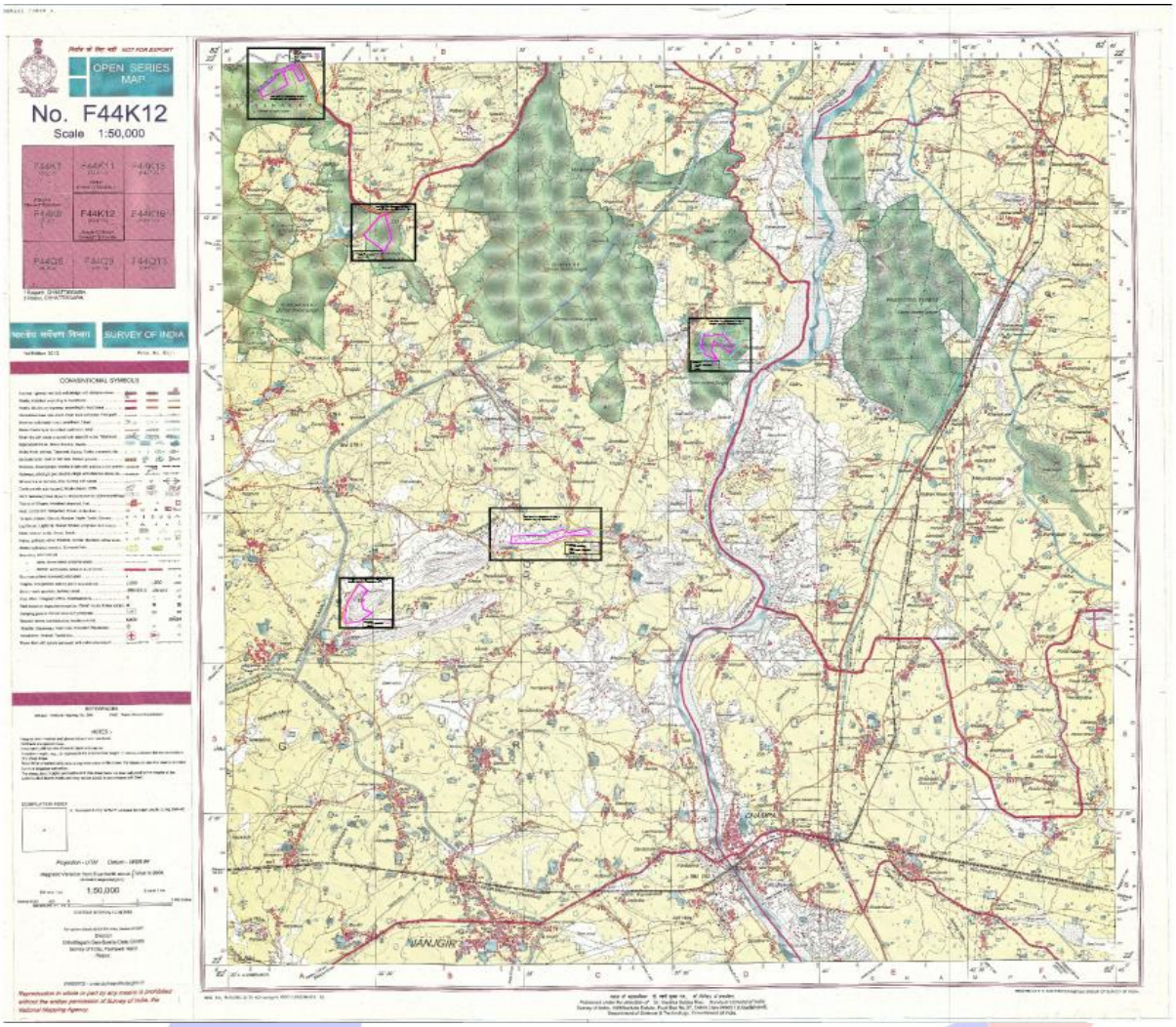
THE GOOGLE IMAGERY FOR BOTH IDENTIFIED COMPENSATORY FOREST AREA IS GIVEN BELLOW


LEGEND-
RF62 Boundary
Cart Track
Total Area For Plantation=40.0392H
Useable Area For Plantation=40H

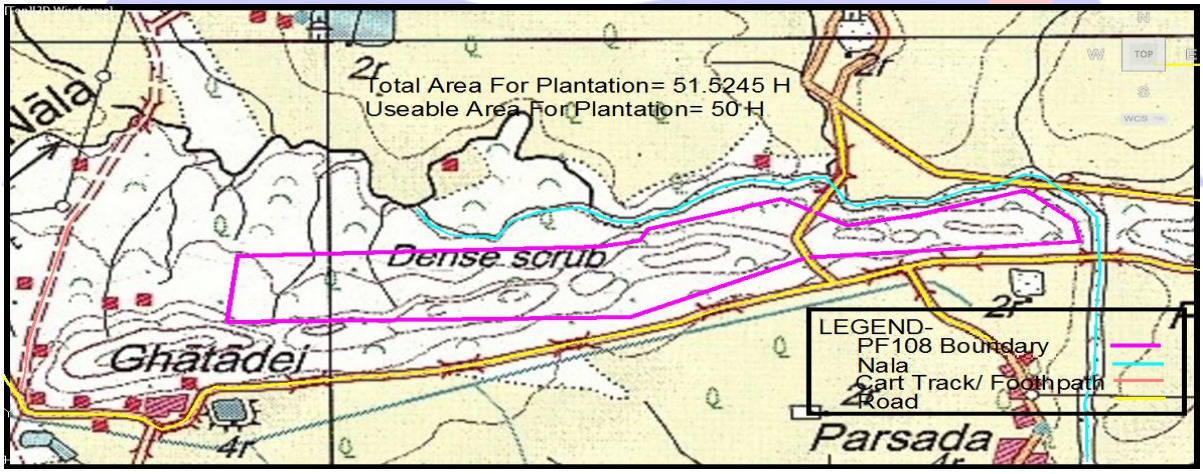

Gatwa
LEGEND-
RF103 Boundary
Nala
Total Area For Plantation=35.845 H
Useable Area For Plantation=35 H
© 2017 Google


Total Area For Plantation = 40.0392H
Useable Area For Plantation= 40H
LEGEND
RF62 Boundary
Cart track
Nala

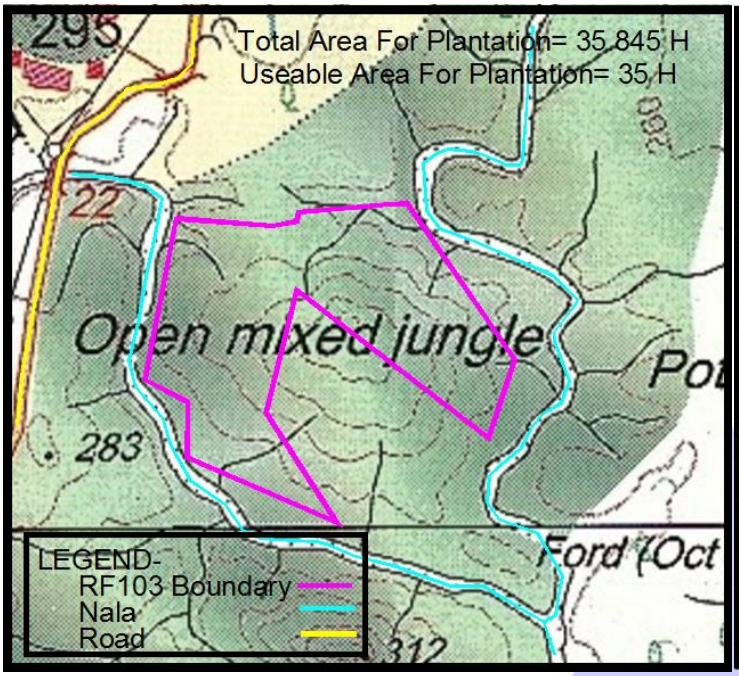
Each compensatory forest area i.e. PF 101,108,103,62 and 55 falls in survey of India topo sheet No.E44D8, The topo sheet plot is given below



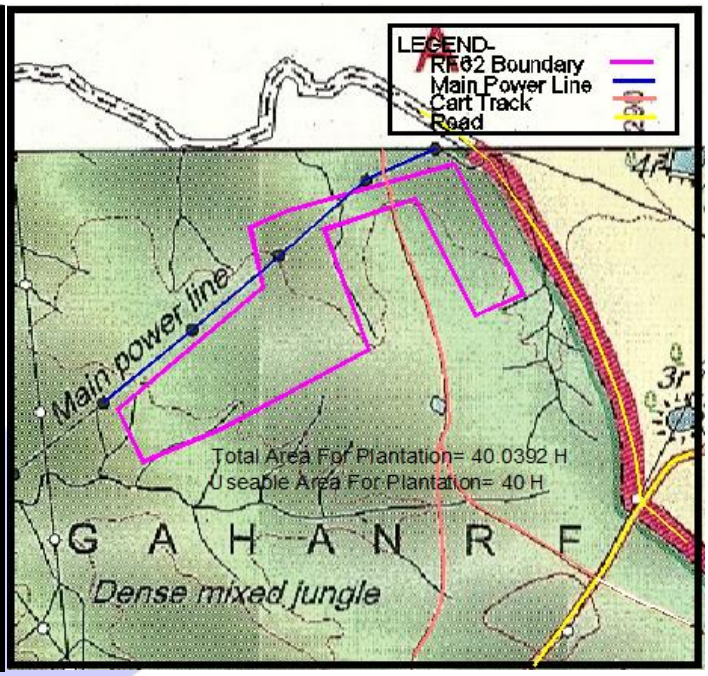
Identified compensatory forest area i.e. PF 108, PF 101, RF 55, RF 62, & RF 103



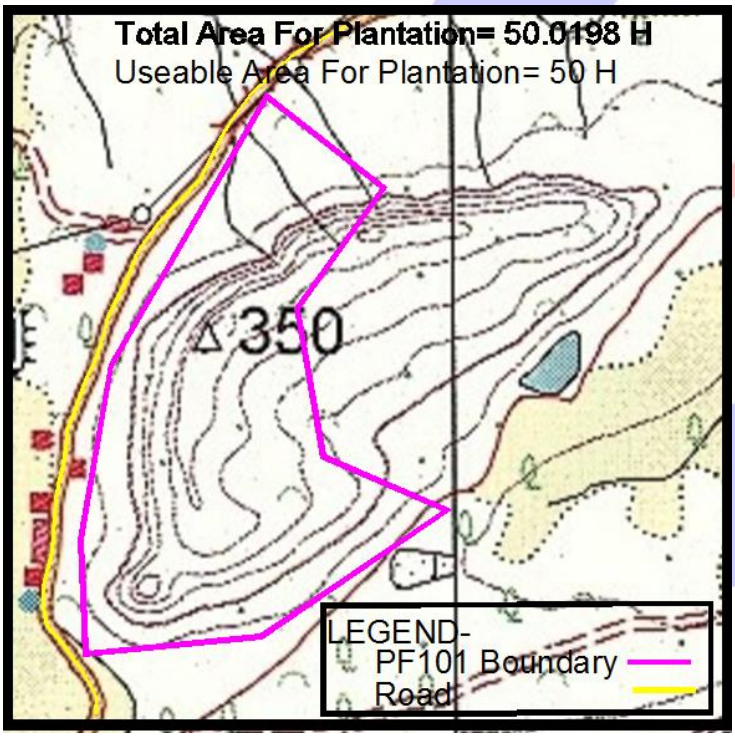
Compensatory forest PF 108



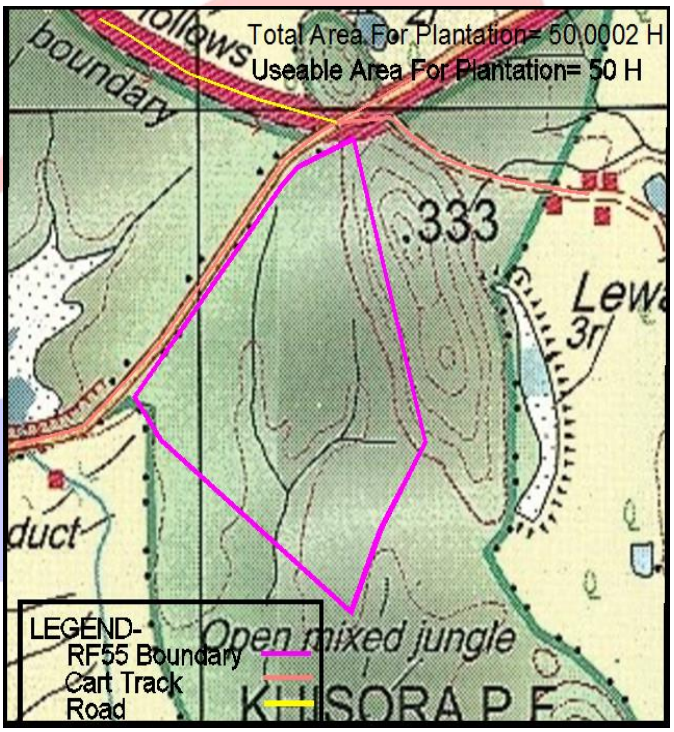
Compensatory forest RF 103



Compensatory forest RF 62



Compensatory forest PF 101



Compensatory forest RF 55

3.0 INTRODUCTION ABOUT DGPS

The survey using DGPS (Differential Global Positioning system) was the purpose to enhance location accuracy as compare to hand GPS from 7 – 10 m to 10 cm.

The real time DGPS occurs when the base station calculates and broadcasts corrections for each satellite as it receives the data. The correction is received by the roving receiver via a radio signal if the source is land based or via satellite signal if it is satellite based and applied to the position it is calculating. As a result, the position displayed and logged to the data file of the roving GPS receiver is a differential corrected position.

Another method for obtaining real – time differential correction data in the field is by using geostationary satellites. This system obtains corrections from more than one reference station. Reference stations collect the base station GPS data and relay this data in RTCM SC-104 format to a network control center, which sends the information to a geostationary satellite for verification. The verified information is sent to the roving GPS receiver to ensure it obtains GPS positions in real time.

4.0 EQUIPMENT DEPLOYED:

Specific Surveying equipment was used for fixing the control points on ground for this project. The present work was performed by using GRX-1 dual frequency GNSS base receiver in Statics Method.

The GRX1 receiver is a multi-frequency, GNSS receiver built to be the most advanced and compact receiver for the surveying market. The receiver is a multi-function, multi-purpose receiver intended for survey and construction markets.

The GRX1 receivers and processes multiple signal types (including GPS L1, L2, C/A, L2C GLONASS L1, L2, C/A Signals) improving the accuracy and reliability of the survey points and positions, especially under difficult jobsite conditions. The receiver provides the functionality, accuracy, availability, and integrity needed for fast and easy data collection.

PRINCIPLES OF OPERATION:

Surveying with the right GPS receiver can provide users accurate and precise positioning; a requirement for any surveying project. This section gives an overview of existing and proposed Global Navigation Satellite Systems (GNSS) and receiver functions so that basic operating principles can be applied.

GNSS OVERVIEW:

Currently the following two global navigation satellite systems (GNSS) offer line of site radio navigation and positioning, velocity, and time services on a global, all – weather scale to any user equipped with a GNSS tracking receiver on or near the earth surface:

- GPS: The Global Positioning System maintained and operated by the United States Department of Defence. For information on the status of this system, visit the US Naval Observatory website (http://tycho.usno.navi.mil/) or the US Coast Guard website (http://www.naven.uscg.gov/).

- GLONASS: The Global Navigation Satellite system maintained and operated by the Russian Federation Ministry of Defence. For information on the status of this system, visit the Coordination Scientific InformationCenter Website (http://www.glonas-ianc.rsa.ru/).

Despite numerous technical differences in the implementation of these systems, satellite positioning systems have three essential components:

- **SPACE**: GPS and GLONASS satellites orbit approximately 12,000 nautical miles above Earth and are equipped with a clock and radio. These satellites broadcast ranging signals and various digital information (ephemerides, almanacs, time and frequency corrections, and so forth).

- **CONTROL**: Ground stations located around the Earth that monitor the satellites and upload data, including clock corrections and new

ephemerides (satellite positions as a function of time), to ensure the satellites transmit data properly.

- **USER:** the community and military that use GNSS receivers to calculate positions.

CALCULATING ABSOLUTE POSITIONS:

When calculating an absolute position, a stationary or moving receiver determines its three – dimensional position with respect to the origin of an Earth-Center Earth-Fixed coordinate system. To calculate this position, the receiver measures the distance (called pseudo ranges) between it and at least four satellites. The measured pseudo ranges are corrected for clock differences (receiver and satellites) and signal propagation delays due to atmospheric effects. The positions of the satellites are computed from the ephemeris data transmitted to the receiver in navigation messages. When using a single satellite system, the minimum number of satellites needed to compute a position is four. In a mixed satellite scenario (GPS and GLONASS), the receiver must lock onto five or more satellites to account for the different time scales used in these systems and to obtain an absolute position.

CALCULATING DIFFERENTIAL POSITIONS:

DGPS (Differential GPS) is a relative positioning technique where the measurements from two or more remote receivers are combined and processed using sophisticated algorithms to calculate the receiver's relative coordinates with high accuracy. DGPS accommodates various implementation techniques that can be classified according to the following criteria:

- The type of GNSS measurements used, either code-phase differential measurements or carrier – phase differential measurements
- If real – time or post-mission results are required. Real-time applications

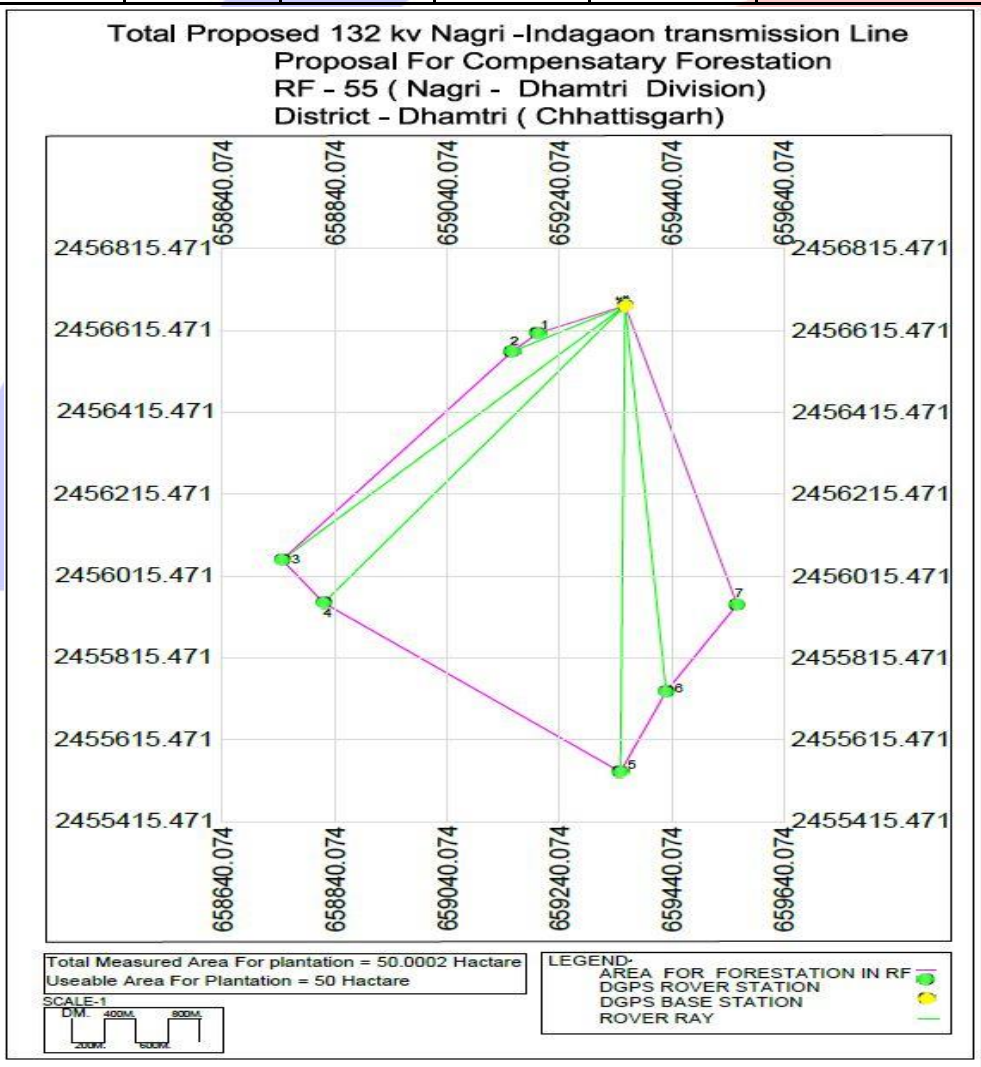
  Can be further divided according to the source of differential data and communication link used.

With DGPS in its most traditional approach, one receiver is placed at a known, surveyed location and is referred to as the reference receiver or base station. Another receiver is placed at an unknown location and is referred to as the remote receiver or rover. The reference station collects the code-phase and carrier –phase measurements from each GNSS satellite in view.

5.0 CONCLUSION:

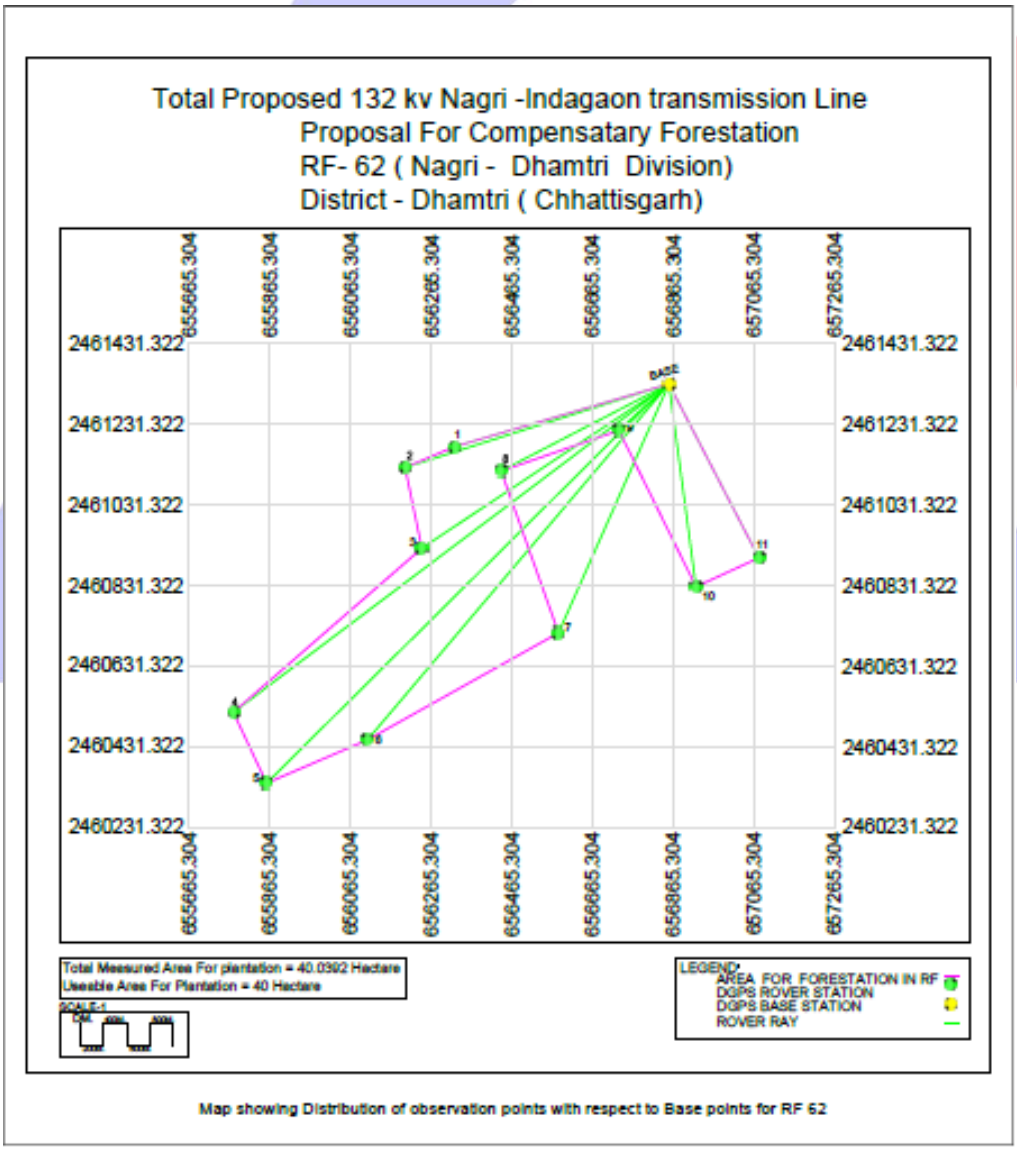
The DGPS survey is conducted for five identified compensatory forest area i.e. RF 55, RF 62, RF 101, RF 103 and RF 108. The sample survey was also conducted for two parts in the identified areas in order to calculate the present density of proposed area for compensatory forestation. The detail of DGPS survey for RF 55 is given hereunder

DGPS OBSERVATION OF COMPENSATORY FORESTATION AREA OF RF 55 FOR PROPOSED 132KV NAGRI-INDAGAON TRANSMISSION LINE								
S.N	Point	Distance From Base In (meter)	Co-Ordinate in UTM-44 4(DMS)			Co-Ordinate in WGS84(DD)		Co-Ordinate in WGS-84(DMS)
			Easting	Northing	Latitude	Longitude	Latitude	Longitude
1	Base-1	0	2456676.263	659357.024	22.2081227	82.54597661	22°12'29.2418"N	82°32'45.5158"E
2		168.9161	2456608.82	659202.156	22.2075279	82.54446794	22°12'27.1005"N	82°32'40.0846"E
3		230.2375	2456563.971	659156.027	22.2071271	82.54401612	22°12'25.6577"N	82°32'38.458"E
4		870.4074	2456055.557	658746.833	22.2025732	82.53999741	22°12'9.2636"N	82°32'23.9907"E
5		902.6242	2455950.169	658820.817	22.2016147	82.54070454	22°12'5.8127"N	82°32'26.5363"E
6		1138.762	2455537.532	659348.631	22.1978396	82.54578259	22°11'52.2225"N	82°32'44.8173"E
7		945.1468	2455733.931	659429.913	22.1996058	82.54659028	22°11'58.5808"N	82°32'47.725"E
8		756.5803	2455946.314	659555.992	22.2015122	82.54783403	22°12'5.4439"N	82°32'52.2025"E



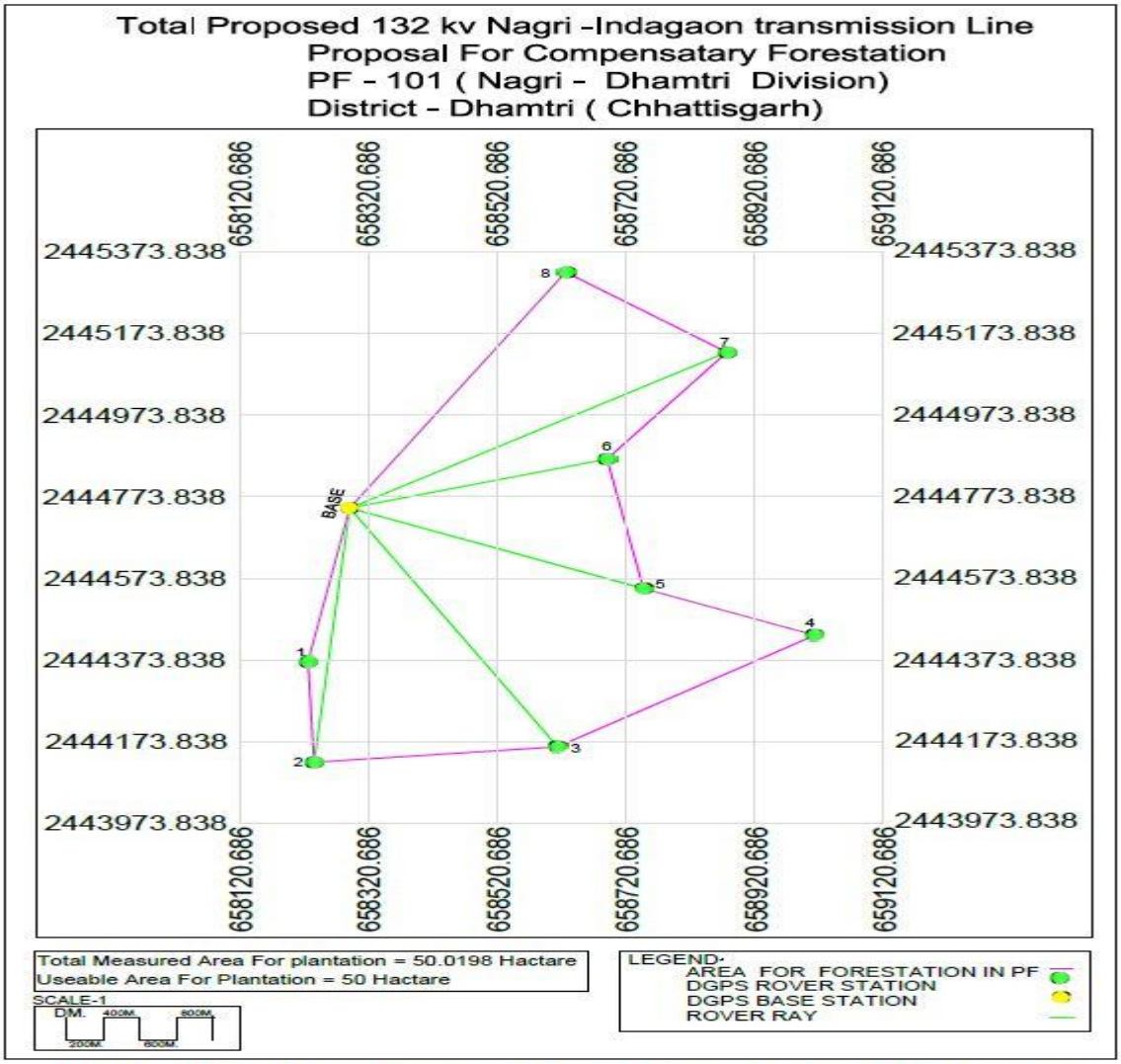
Map showing Distribution of observation points with respect to Base points for RF 55

DGPS OBSERVATION OF COMPENSATORY FORESTATION AREA OF RF 62 FOR PROPOSED 132KV NAGRI-INDAGAON TRANSMISSION LINE								
S.N	Point	Distance From Base In (meter)	Co-Ordinate in UTM-44 4(DMS)		Co-Ordinate in WGS84(DD)		Co-Ordinate in WGS-84(DMS)	
			Easting	Northing	Latitude	Longitude	Latitude	Longitude
1	Base-1	0	2461331.813	656855.969	22.25039613	82.5221736	22°15'1.4261"N	82°31'19.8248"E
2		553.6621452	2461176.46	656324.549	22.24904133	82.5170028	22°14'56.5488"N	82°31'1.21"E
3		686.4067067	2461124.536	656201.6064	22.24858353	82.515805	22°14'54.9007"N	82°30'56.898"E
4		736.0979258	2460924.326	656242.9482	22.24677167	82.5161866	22°14'48.378"N	82°30'58.2718"E
5		1352.61651	2460517.657	655775.8202	22.2431412	82.5116154	22°14'35.3083"N	82°30'41.8154"E
6		1405.831506	2460341.796	655857.8565	22.24154557	82.5123942	22°14'29.5641"N	82°30'44.619"E
7		1157.090204	2460448.991	656107.983	22.24249107	82.5148311	22°14'32.9679"N	82°30'53.3919"E
8		675.2170119	2460714.663	656582.0276	22.24484746	82.5194557	22°14'41.4509"N	82°31'10.0407"E
9		468.9900413	2461116.081	656439.5421	22.24848563	82.5181125	22°14'54.5483"N	82°31'5.2051"E
10		169.1618521	2461216.755	656731.9634	22.2493683	82.5209593	22°14'57.7259"N	82°31'15.4534"E
11		507.2275333	2460829.036	656923.0142	22.24584942	82.5227749	22°14'45.0579"N	82°31'21.9897"E
12		485.6762905	2460900.442	657079.1293	22.24648009	82.5242964	22°14'47.3283"N	82°31'27.4671"E



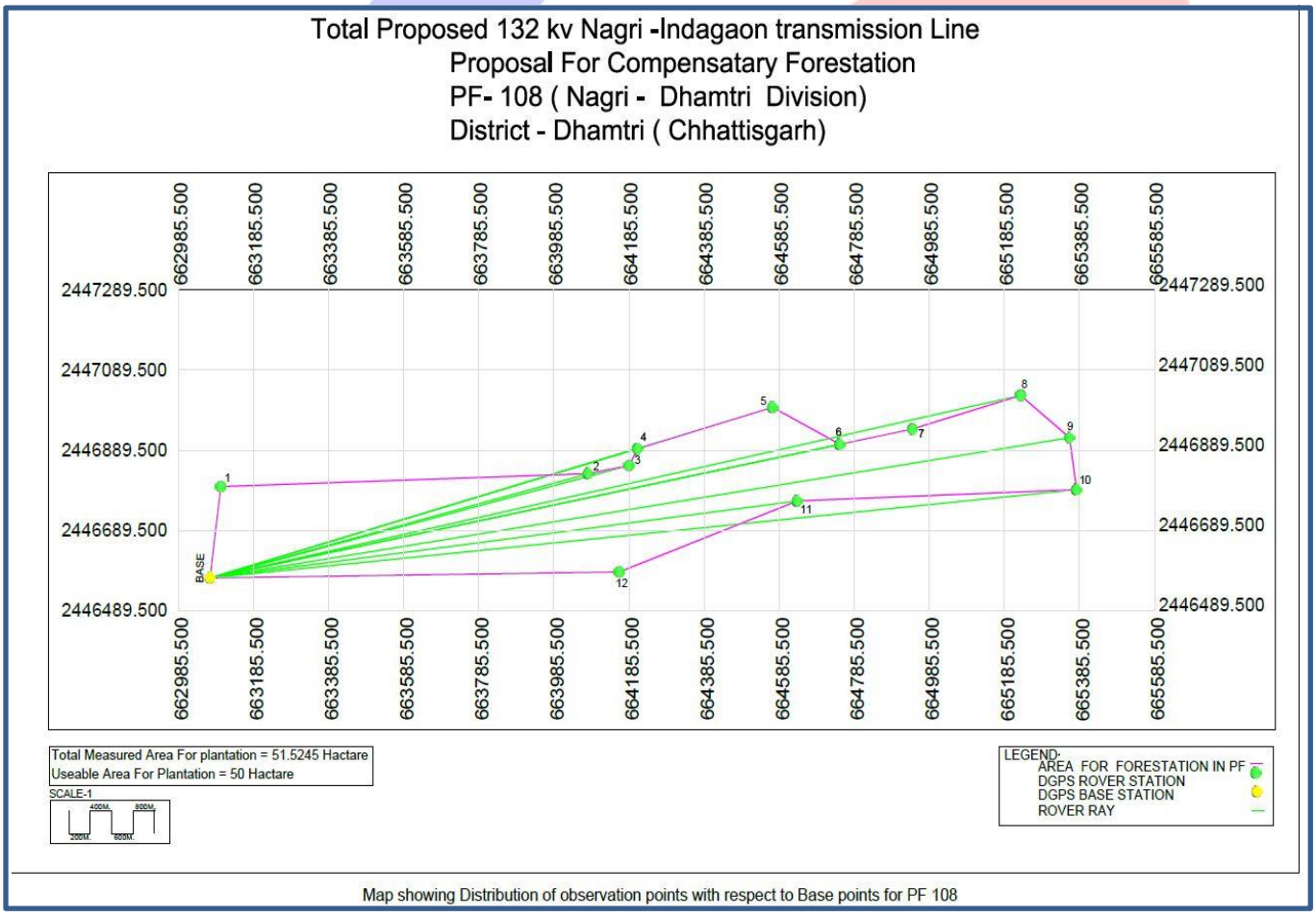
Map showing Distribution of observation points with respect to Base points for RF 62

DGPS OBSERVATION OF COMPENSATORY FORESTATION AREA OF RF 101 FOR PROPOSED 132KV NAGRI-INDAGAON TRANSMISSION LINE								
S.N	Point	Distance From Base In (meter)	Co-Ordinate in UTM-4484(DMS)		Co-Ordinate in WGS84(DD)		Co-Ordinate in WGS-84(DMS)	
			Easting	Northing	Latitude	Longitude	Latitude	Longitude
1	Base1	0	2444746.412	658291.6	658291.6	22.10048042	82.53447467	22°6'1.7295"N
2		381.910308	2444370.081	658226.6	658226.6	22.09708761	82.53380759	22°5'49.5154"N
3		625.1637004	2444123.7	658236.3	658236.3	22.09486161	82.53387783	22°5'41.5018"N
4		667.9377123	2444161.612	658614.3	658614.3	22.09516957	82.53754505	22°5'42.6105"N
5		786.8252567	2444434.48	659014	659014	22.09759741	82.5414446	22°5'51.3507"N
6		497.2376155	2444548.712	658747.9	658747.9	22.09865336	82.53887692	22°5'55.1521"N
7		417.0841151	2444866.249	658691.1	658691.1	22.10152628	82.53835806	22°6'5.4946"N
8		699.0326678	2445127.837	658877.4	658877.4	22.10387171	82.54018923	22°6'13.9382"N
9		667.6634386	2445323.748	658627	658627	22.10566389	82.53778114	22°6'20.39"N



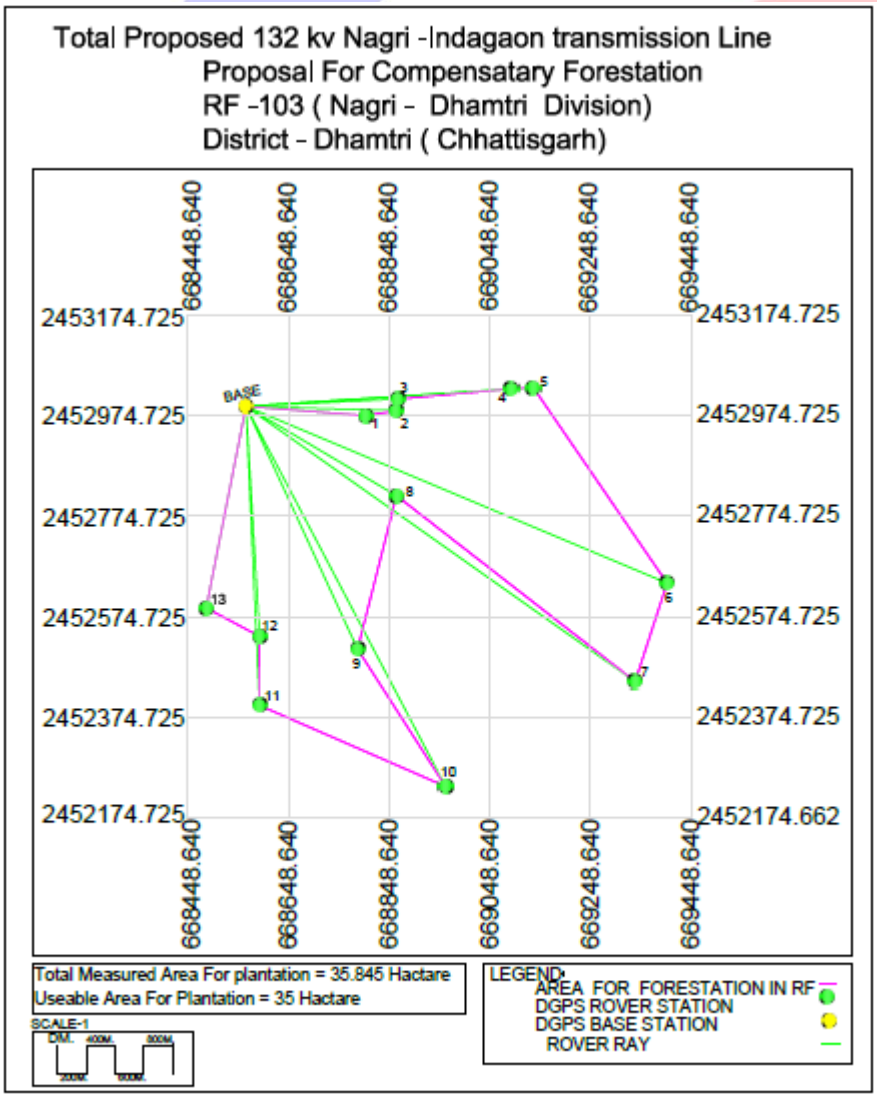
Map showing Distribution of observation points with respect to Base points for PF 101

DGPS OBSERVATION OF COMPENSATORY FORESTATION AREA OF RF 108 FOR PROPOSED 132KV NAGRI-INDAGAON TRANSMISSION LINE								
S.N	**Point**	**Distance From Base In (meter)**	**Co-Ordinate in UTM-44 4(DMS)**		**Co-Ordinate in WGS84(DD)**		**Co-Ordinate in WGS-84(DMS)**	
			Easting	Northing	Latitude	Longitude	Latitude	Longitude
1	Base-1	0	2446571.198	663069.5	22.1165186	82.58096163	22°6'59.467"N	82°34'51.4619"E
2		229.6149356	2446798.99	663098.4	22.11857308	82.58126445	22°7'6.8631"N	82°34'52.552"E
3		1040.671148	2446831.547	664077.1	22.11877495	82.59075364	22°7'7.5898"N	82°35'26.7131"E
4		1150.846862	2446851.61	664185.6	22.11894588	82.5918081	22°7'8.2052"N	82°35'30.5092"E
5		1183.529159	2446893.524	664208.3	22.11932227	82.59203169	22°7'9.5602"N	82°35'31.3141"E
6		1557.763096	2446996.743	664568	22.12022039	82.5955287	22°7'12.7934"N	82°35'43.9033"E
7		1710.842781	2446904.349	664747.6	22.11936897	82.59725986	22°7'9.7283"N	82°35'50.1355"E
8		1907.765476	2446942.674	664940.7	22.11969675	82.59913591	22°7'10.9083"N	82°35'56.8893"E
9		2206.567567	2447026.487	665228.6	22.12042631	82.60193427	22°7'13.5347"N	82°36'6.9634"E
10		2315.887345	2446920.926	665358.8	22.11946061	82.60318584	22°7'10.0582"N	82°36'11.469"E
11		2318.71841	2446791.345	665377.7	22.11828858	82.60335594	22°7'5.8389"N	82°36'12.0814"E
12		1576.124843	2446763.366	664633.8	22.11810655	82.59614325	22°7'5.1836"N	82°35'46.1157"E
13		1090.591487	2446586.149	664160	22.11655095	82.59153235	22°6'59.5834"N	82°35'29.5165"E



Map showing Distribution of observation points with respect to Base points for PF 108

DGPS OBSERVATION OF COMPENSATORY FORESTATION AREA OF RF 103 FOR PROPOSED 132KV NAGRI-INDAGAON TRANSMISSION LINE								
S.N	Point	Distance From Base In (meter)	Co-Ordinate in UTM-44 4(DMS)		Co-Ordinate in WGS84(DD)	Co-Ordinate in WGS-84(DMS)		
			Easting	Northing	Latitude	Longitude	Latitude	Longitude
1	Base-1	0	2452992.362	668564.22	22.17398197	82.63488653	22°10'26.3351"N	82°38'5.5915"E
2		239.5032106	2452973.886	668803	22.17379188	82.63719987	22°10'25.6508"N	82°38'13.9195"E
3		297.910482	2452983.975	668862	22.17387724	82.63777301	22°10'25.9581"N	82°38'15.9828"E
4		302.17393	2453006.954	668866	22.17408436	82.63781448	22°10'26.7037"N	82°38'16.1321"E
5		528.1040201	2453027.195	669091.2	22.1742452	82.63999945	22°10'27.2827"N	82°38'23.998"E
6		571.9776268	2453029.429	669135	22.17426109	82.64042457	22°10'27.3399"N	82°38'25.5285"E
7		906.8134493	2452641.496	669400.4	22.17073188	82.64295722	22°10'14.6348"N	82°38'34.646"E
8		946.3817453	2452446.041	669337	22.16897299	82.64232187	22°10'8.3028"N	82°38'32.3587"E
9		347.457099	2452815.007	668863	22.17235125	82.63776494	22°10'20.4645"N	82°38'15.9538"E
10		530.6095587	2452510.207	668785.7	22.16960623	82.63698398	22°10'10.5824"N	82°38'13.1423"E
11		852.6565659	2452237.463	668960.6	22.16712612	82.63865117	22°10'1.654"N	82°38'19.1442"E
12		594.3191722	2452398.653	668591.1	22.16861776	82.63508557	22°10'7.0239"N	82°38'6.3081"E
13		457.5114204	2452535.67	668591.6	22.16985507	82.6351042	22°10'11.4783"N	82°38'6.3751"E
14		407.9833914	2452592.103	668485.2	22.17037505	82.63407864	22°10'13.3502"N	82°38'2.6831"E



Map showing Distribution of observation points with respect to Base points for RF 103

SITE PHOTOGRAPHS: