Reliance Jio Infocomm Limited 4G OFC Network

DGPS Survey report for Forest Diversion of proposed OFC Cable Route from Korba to Batati with Route Length 25.61 Km, in District Korba

APPLICATION SUBMITTED BY:

RELIANCE JIO INFOCOMM LIMITED

DGPS SURVEY AND GIS MAPPING DONE BY:

Geotrax International Services
Raipur, Chhattisgarh.

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1. Introduction and Background

PROJECT 4G OPTICAL FIBER CABLE

1.1 Background

Reliance Jio Infocomm Limited is setting up 4G Optical Fiber Cable network across the country. In the state of Chhattisgarh, the company plans to set up the telecom network (including laying of OFC cable) along the NHAI/PWD Road corridor. Reliance Jio Infocomm is granted license by Ministry of Communications & IT, Dept. of Telecommunications, and Govt. Of India, to establish Optical Fiber Cable network under the license number 370/2011 dated. 23.06.2011 issued to M/S Infotel Broadband Services Limited (company name changed to Reliance Jio Infocomm Limited on 22.01.2013). The OFC Cable is laid under the ground at approx. depth of 1.65m and the trench width is 0.5m. In most of the places the cable trench line on National Highways is approx. at a distance of 14.5m from the road centerline and for State/District highways it is approx. 7m from the road centerline.

1.2 Location and Communication

The proposed OFC Cable route from Korba to Batati (Tehsil: Pasarkhet and Korba, District: Korba). The Korba to Batati route (Length approx. 25.61 km.) links the town Korba to Dharamjaygarh. The survey site passes through two forest ranges – Paraskhet and Korba of Korba forest division. The cable route's proposed starting point is Korba Latitude 22°21'48.62" N and Longitude 82°42'07.54.466" E and the end location is Batati at Latitude 22°21'14.29" N and Longitude 82°56'23.29" E. The OFC Cable route is covered under Survey of India Toposheet 64 J/11 and 64 J/15 on RF 1:50000.

1.3 Objective

As per directives of Ministry of Environment & Forests (MoEF) dated 8th July 2011; all applications for Forest Diversion, under Forest Conservation Act, 1980 must be accompanied with Geo-referenced shape file, showing the boundary of the proposed area (both soft copy and hard copy maps), prepared using Differential GPS (DGPS) and the same should be uploaded to MoEF website along with the online application.

To meet this requirement of MoEF, Reliance Jio Infocomm Limited, entrusted the DGPS survey work to M/s Geotrax International Services, Raipur, which is an empanelled agency of Directorate of Geology and Mines, Chhattisgarh (***Ref. Circular No. F-7-14/2013/12, dated. 10.11.2014***).

1.4 Geotrax Empanelment Certificate in Chhattisgarh

By Speed post

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छत्तीसगढ़ शासन
खनिज साधन विभाग
मंत्रालय
महानदी भवन, नया रायपुर–492002

19 NOV 2014

//अधिसूचना//

रायपुर, दिनांक नवम्बर, 2014

कमांक एफ 7–14/2013/12:: राज्य शासन एतद् द्वारा चीफ कन्ट्रोलर ऑफ माइन्स, भारतीय खान ब्यूरो नागपुर के परिपत्र कमांक 2/2010, दिनांक 06.4.2010 के पैरा–2 के बिन्दु–2 के तारतम्य में समस्त खनिजों के खनिज रियायतों के सीमा स्तम्भ का Differential Globle Positioning System(डीजीपीएस) का उपयोग करते हुए सर्वेक्षण करने के लिए तालिका में दर्शित संस्थानों को अधिमान्यता प्रदान करता है:–

क्र.	एजेंसी का नाम एवं पता
1	2
1	M/S SHREERAM GEMICON (PVT.) LIMITED GEOLOGICAL AND MINING CONSULTANTS L-09, Songanga Colony Seepat Road, Bilaspur (Chhattisgarh)
2	M/S SINHA MINING CONSULTANCY, GOA Office No. 9, D.Costa Commercial Apartment, Near Old Railway Station Gate, Malbhat, Margo - 403601, Goa-India
3	M/S SPATIAL PLANNING AND ANALYSIS RESEARCH CENTRE PVT. LTD. E/11, Infocity, Chandaka Industrial Estate, Bhubaneshwar, Orissa, India, Pin - 751024
4	M/S SIDDHARTH GEO CONSULTANTS, 21/3, First Floor Ramkund, Samta Colony, Behind Lifeworth Hospital, Raipur (Chhattisgarh) 492001
5	M/S SOHAM FERRO MANGANESE PVT. LTD. Block No. 16,17 Ground Floor N.K.Y. Tower, Anjani Sq. Wardha Road, Nagpur (Maharashtra)
6	M/S SAN SURVEY ENGINEERING , HOOGHLY(WB) Regd. Off. - 465, Jiban Pal Bagan, Karbala (West), P.O. & Dist. - Hooghly, West Bengal, Pin - 712103 Contact Office - Anjali Complex, Bankim Kanan, Chinsurah Station Road, Chinsurah, Hoogly, West Bengal -712102
(7)	M/S GEOTRAX INTERNATION SERVICES, HYDERABAD (TELANGANA) Plate No 156 & 157, Lokayuta Colony, Badangpet Nadergul, Hyderabad 500058, Telangana
8	M/S RAFT CONTRACTORS AND DESIGNERS, Plot No. D-36, Ground Floor, Koelnagar, Raurkela, Dist. Sundargarh, Orissa, Pin No. - 769014
9	M/S MICRONET SOLUTION, Bisesar House, Opp. HSSC Board Office, (P.B. 85 G.P.O.) Civil Line, Nagpur, Maharashtra - 440001
10	M/S BHARAT ALUMINIUM COMPANY LIMITED (BALCO) P.O. Balco Nagar Korba(C.G.), India, Pin 495684

2/ अधिमान्यता प्राप्त संस्थानो के लिए शर्तें:–

2.1. The Survey Agency Shall Be responsible for the accuracy of the data collected and Survey.

2.2. Coordinates of boundry pillars shall be established in the World Geodetic System 1984 (WGS-84) Datum.

2.3 Each boundry pillar shall be surved using DGPS, at least 2 Hours observation for its ground position.

2.4 The maximum distance between any two successive pillars should not be more than 100 meter.

2.5 All corner pillar should be of pyramid shaped whith base of 1 meter and height of 2 meter and should be placed 1 mater above the ground and 1 meter below the ground.

2.6 Distance and bearing to the forward and backward pillars and latitudes and longitudes should be market on all the corner pillars.

2.7 डीजीपीएस सर्वे कार्य हेतु पारिश्रमिक का निर्धारण अधिमान्य प्राप्त संस्थान एवं खनिज रियायतधारी के मध्य आपसी समन्वय से किया जाएगा। किसी भी प्रकार का आपसी विवाद होने पर राज्य शासन उत्तरदायी नही होगा।

2.8 डीजीपीएस सर्वे कार्य के गुणवत्ता में कमी पाये जाने पर या किसी भी प्रकार की कार्य संबंधी शिकायत पाये जाने पर जांच उपरांत राज्य शासन को यह अधिकार होगा कि उक्त अधिकृत एंजेसी की मान्यता किसी भी समय समाप्त की जा सकती है।

2.9 डीजीपीएस सर्वे के संबंध में भारतीय खान ब्यूरो/राज्य शासन द्वारा समय–समय पर जारी निर्देशों का पालन अधिमान्यता प्राप्त संस्थान को करना होगा।

2.10 राज्य शासन द्वारा जारी यह अधिमान्यता 03 वर्ष के लिए होगी। समयावधि समाप्ति से 03 माह पूर्व अधिकृत एंजेसी नवीनीकरण हेतु आवेदन कर सकेगा।

2.11 भारत सरकार एवं राज्य शासन द्वारा डीजीपीएस सर्वे के संबंध में समय–समय पर जारी निर्देशों का पालन किया जाना होगा।

3/ यह अधिमान्यता अधिसूचना के जारी होने की तिथि से 03 वर्ष के लिए होगी।

छत्तीसगढ़ के राज्यपाल के नाम से
तथा आदेशानुसार,

(सुबोध कुमार सिंह)
सचिव
छत्तीसगढ़ शासन
खनिज साधन विभाग

पृ. कमांक एफ 7–14/2013/12 रायपुर, दिनांक नवम्बर, 2014

17 NOV 2014

प्रतिलिपि:–

1. सचिव, भारत सरकार, खान मंत्रालय, शास्त्री भवन, नई दिल्ली,
2. कंट्रोलर जनरल, भारतीय खान ब्यूरो, सेकण्ड फ्लोर, ए–ब्लॉक, इन्दरा भवन, सिविल लाईन, नागपुर (महाराष्ट)
3. चीफ कन्ट्रोलर ऑफ माईन्स, भारतीय खान ब्यूरो, सेकण्ड फ्लोर, ए–ब्लॉक, इन्दरा भवन, सिविल लाईन, नागपुर (महाराष्ट)
4. क्षेत्रीय खान नियंत्रक, भारतीय खान ब्यूरो, छटवां तल, बी एवं सी –ब्लॉक, इन्दरा भवन, सिविल लाईन, नागपुर (महाराष्ट)
5. संचालक, भौमिकी तथा खनिकर्म, छत्तीसगढ़ ब्लॉक–4, द्वितीय तल, इन्द्रावती भवन, नया रायपुर,
6. समस्त कलेक्टर, जिला ———————— छत्तीसगढ़

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7. समस्त संबंधित ——————————————————————————————————————

की ओर सूचनार्थ एवं आवश्यक कार्यवाही हेतु

8. संचालक, शासकीय मुद्रणालय, गोन्दवारा, भनपुरी, रायपुर(छत्तीसगढ़) की ओर राजपत्र में प्रकाशनार्थ।

9. श्री श्रीकांत राव, सहायक भौमिकी विद्, संचालनालय भौमिकी तथा खनिकर्म, द्वितीय फ्लौर, इन्द्रावती भवन, नया रायपुर। कृपया उक्त आदेश/अधिसूचना को संचानलालय की वेबसाईट में अपलोड करने का कष्ट करें।

10. गार्ड फाईल रजिस्टर

सचिव
छत्तीसगढ़ शासन
खनिज साधन विभाग

Not to Scale

Fig-1: Korba to Batati 4G OFC Cable Proposed Route on Satellite Imagery

2. Scope of Work

1. Establishment of one base station with 72 Hours observationand secondary control points at every 10km along the proposed route.
2. DGPS Survey for collection of ground coordinates along the OFCCable trench at every 50m interval and/or at every turn/bend along the porposed trench. The DGPS data is collected at forest patches only.
3. Data processing and Interpretation
    a. Geo-referencing of SOI Toposheet (1:50000), Forest Stock map (1:15000, if available) and satellite imagery
    b. Creation of OFC Cable trench boundary vector map using the DGPS Surveyed data
    c. Superimposition of cable route layer on Georeferencedforest maps, SOI Toposheet and Satellite imagery.
    d. Computation of Forest area proposed for diversion. It includes Reserved/Protected Forest & Revenue Forest.
    e. Preparation of Geo-referenced forest map at 1:15000 scale, and SOI Toposheet at 1:50000 scale.
    f. Preparation of DGPS survey report along with soft copy of – maps in shapefile format and kml file
4. Printing of report and Geo-referenced maps and Technical compliance.

3. Deliverables

The deliverables envisaged for the assignment are described below

1. Post processed DGPS observations data as well as raw data in RINEX format.
2. DGPS Reports - Base line & network adjustment report for the primary and Secondary Control Points.
3. Geo-referenced SOI maps & forest block mapsbased on DGPS observations – Hard and Soft Copy (SHP and KML formats).
4. Proposed Forest Diversion area statement as per DGPS Survey
5. DGPS Survey and mapping report

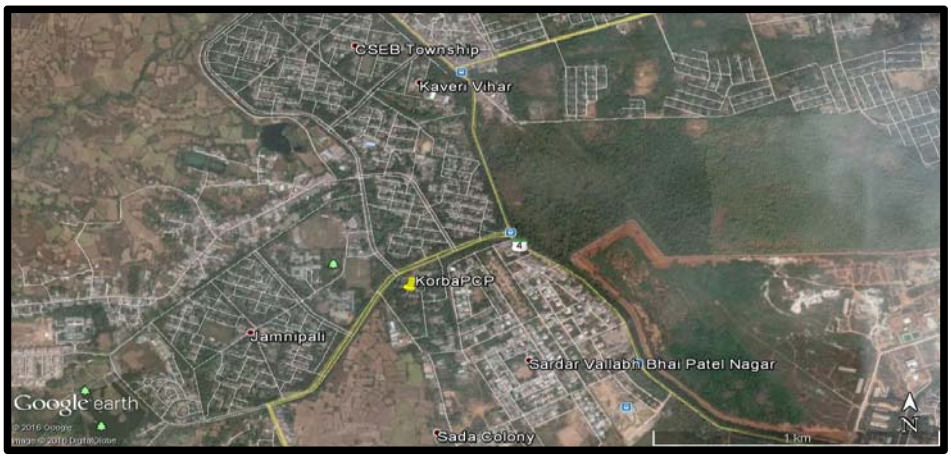
4. Brief description of the Technical approach

4.1 Input Data

The proposed 4G Cable Route plan is shown on the ground by the engineer/ Vendor of Reliance Jio Infocomm Ltd (RJIL). The Forest & SOI maps required for geo-referencing were provided by Reliance Jio Infocomm Limited. It is proposed that the cable is laid within the ROW of the NHAI/PWD road corridor (where possible). The cable trench is laid at a depth of 1.65m below ground and the trench width is 0.5m. The revenue village maps were collected from NIC online website (http://cg.nic.in/bhunaksha/). The revenue forest information& details are collected from the District Revenue department and were provided by RJIL.

4.2 Planning DGPS Survey & Data Preparation

Based on the input data (maps) the location of DGPS base station - Primary and Secondary Control Points (PCP and SCP) in the project area are planned. One PCP with 72 hours observation was planned at NTPC, Korba Township (on roof top of Ganga Bhavan guest house). Based on the OFC Route details provided by Reliance Jio ROW team, Secondary Control Points (SCP) locations were planned using satellite imagery. For establishment of SCP coordinates a DGPS Static Observation for at least 2 hours duration at each of the Secondary Control Points is planned.



Not to Scale

Fig-2: Satellite Image showing the location of the Primary Control Point in Korba

4.3 Establishment of Primary Control Point (PCP)

The primary Control Point (PCP) with 72 hours of DGPS Observation was established as the DGPS base station in NTPC Guest House, Korba. The PCP is established inside NTPC Township on roof top of Ganga Bhavan guest house. The DGPS observation was done from 1 September 2015 to 4 September 2015 and the location was marked with a permanent paint. As per Survey of India (SOI) Guideline, the PCP is to be fixed through continuous observation for 72 hours duration. The observed data was processed with reference to the data of International GNSS Service (IGS) stations as per SOI guideline (IGS processed report is enclosed as Annexure-1). For the route survey of OFC line from Korba to Batati the NTPC Korba PCP was used as a reference point, and using the reference point more Secondary control points were observed in static and RTK mode along/near the proposed OFC route.

The coordinate of the PCP is given below:

Point ID	Latitude (d:m:s)	Longitude (d:m:s)	Ellipsoidal Height (m)
Korba PCP	22°24’56.56025”N	82°39’42.25144”E	255.971

Fig-3: Images showing NTPC Township, Ganga Bhawan Guest House Primary Control Point (PCP)

4.4 Establishment of Secondary Control Point (SCP)

The Secondary Control Point (SCP) with 2-4 hours of static observation was established at various locations along the Korba-Hatti Road. The SCP's were established in static mode and the DGPS data was processed with reference to the Primary Control Point. The static data is Post Processed using Trimble Business Centre software for obtaining the SCP coordinates. All along the road Temporary Bench Mark (TBM) are established at every 5km. The DGPS observation of TBM are established in Real-Time-Kinematic mode.

Point ID	Latitude (d:m:s)	Longitude (d:m:s)	Ellipsoidal Height (m)	Location
Korba PCP	22°24'56.56025"N	82°39'42.25144"E	255.971	Ganga Bhawan Guest House, NTPC Township
SCP 1	22°22'32.40843"N	82°47'34.54303"E	247.307	Korba-Rajgamar Rd

TBM Point ID	Latitude (d:m:s)	Longitude (d:m:s)	Ellipsoidal Height (m)	Remarks
TBM-SCP1	22°22'32. 40843"	82°47'34.543033"	247.307	
TBM-H-2	22°22'20.70255"N	82°47'09.01097"E	253.982	
TBM-H-3	22°22'10.42516"N	82°46'37.67376"E	256.399	
TBM-H-4	22°22'51.95001"N	82°48'26.33150"E	252.322	
TBM-H-5	22°22'54.48452"N	82°49'08.21028"E	261.214	
TBM-H6	22°22'34.27634"N	82°49'19.89877"E	269.726	
TBM H 7	22°22'14.97647"N	82°49'46.95588"E	275.48	
TBM-H-8	22°21'50.70262"N	82°49'58.42005"E	286.674	

TBM Point ID	Latitude (d:m:s)	Longitude (d:m:s)	Ellipsoidal Height (m)	Remarks
TBMH-H-9	22°21'58.85692"N	82°50'50.50235"E	283.058	
TBM-H-11	22°21'55.37619"N	82°51'24.42381"E	287.132	
TBM-H-12	22°21'44.64992"N	82°51'44.68277"E	283.874	
TBM H 14	22°20'44.24805"N	82°53'38.32971"E	310.24	
TBM-H-13	22°21'04.80332"N	82°52'17.25107"E	285.104	
TBM-H-16	22°21'13.65295"N	82°54'45.92949"E	297.734	
TBM-H-18	22°19'38.61747"N	82°56'22.50014"E	260.345	

4.5 DGPS Survey Procedure

DGPS survey was carried out using a pair of DGPS instrument. One DGPS Instrument was used as Base Station. The first base station for the survey was established at the Primary control Point PCP. The base is shifted using the Real Time Kinematic Survey method. The distance between the Base Station and rover was always less than 5km.

The other DGPS instrument was working as Rover. The survey was conducted in Real Time Kinematic (RTK) mode. The Survey team carried out DGPS Survey of boundary points by walking along the proposed cable trench boundary. DGPS readings were collected at every 50m distance along trench and at every turn or bend. For Geo-referencing village maps around 5 GCPs were collected for the each village having Govt. Forest Land.

During the survey the start and end of forest patch was identified in the field with the help of staff from the forest department. The forest department staff also provided information regarding the forest range, compartment number etc.

The static data is Post Processed using Trimble Business Centre software.

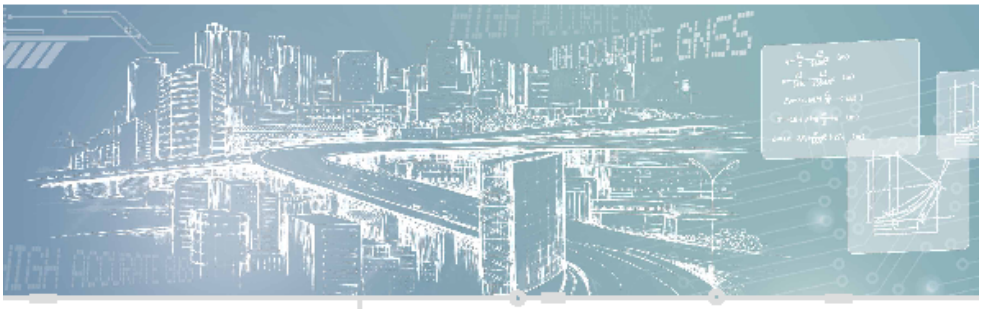
4.6 Creation of Vector Layers

The surveyed points captured through DGPS were plotted in the GIS Software and the Polygon and Polyline layers are created using the DGPS Surveyed points. Different layers such as the Forest Patch polygon, Forest Trench centerline, Non-Forest Trench line, polygon showing Revenue forest patches (Chote Jad ka Jungle + Bade Jad Ka Jungle) etc., are prepared. The vector layers prepared are then super-imposed on the Geo-referenced Forest map and Cadastral maps.

4.7 Specification of DGPS Equipment

Geotrax deployed the most advance and hi-precision devices to carry out the DGPS survey. The DGPS performance specifications are given below. The corresponding fact sheets are placed below for ready reference.

ComNav **T300 GNSS Receiver**



Features

- *Ultra small*
- *Super light*
- *Many user-friendly conveniences built in*
- *GPS L1/L2/L5, BeiDou B1/B2/B3, GLONASS L1/L2*
- *Low power consumption*
- *Support long baseline E-RTK*

RTK robust enough for challenging environments, in a device that is light and easy to carry

With decades of experience in the surveying GNSS receiver, the T300 is a product which combines lots of market proved advantages together. It can track all the working GNSS constellations. By using ComNav's unique QUAN™ algorithm technology, it can function in RTK mode with all the GNSS constellations or by using any single GNSS constellation such as GLONASS or BeiDou. The strong anti-interference ability of the receiver makes it possible to work in any environment.

Design driven to improve user experience

Our R&D people are always thinking about how to improve the physical experience of users and workflow in the field. With this in mind, the T300 integrates a cutting edge GNSS board, Bluetooth®, UHF (Rx&Tx) into a compact board. Smart design makes the T300 the lightest and smallest (volume) receiver in the world.

Hot swap battery design

Extending the field working time is also a passion for our R&D people. They do lots of tests and analysis to reduce the power consumption, and make the whole system work more efficiently. In parallel, they've designed in the capability to hot swap the battery source. When the warning sounds and LED flashes, put your second battery in place. Then recharge the first while you keep working.

Consumer grade batteries... always available

Losing power in the field is significantly inconvenient for users, as the batteries for GNSS receivers are often unusual types and not readily available. Once again our R&D people developed a solution so that the T300 runs on normal consumer batteries.

Technical Specifications T300

Signal Tracking

- 256 channels with simultaneously tracked satellite signals
  - GPS: L1 C/A, L1 C, L2 P, L5
  - BeiDou: B1, B2, B3
  - GLONASS: L1, L2
  - SBAS: WAAS, EGNOS, MSAS, GAGAN

Performance Specifications

- Cold start: <50 s
- Warm start: <30 s
- Hot start: <15 s
- Initialization time: <10 s
- Singal re-acquisition: <2 s
- Initialization reliability: >99.9%

Positioning Specifications

- Post Processing Static
  -Horizontal: 2.5 mm + 0.5 ppm RMS
  -Vertical: 5 mm + 0.5 ppm RMS
- Real Time Kinematic
  -Horizontal: 8 mm + 1 ppm RMS
  -Vertical: 15 mm + 1 ppm RMS
- E-RTK[1] (baseline<100 km)
  -Horizontal: 0.2 m + 1 ppm RMS
  -Vertical: 0.4 m + 1 ppm RMS
- Code differential GNSS positioning
  -Horizontal: 0.25 m+ 1 ppm RMS
  -Vertical: 0.5 m + 1 ppm RMS
- SBAS: Typically <1 m 3D RMS
- Standalone: <1.5 m 3D RMS

Communications and Memory

- 1 Serial port (7 pin Lemo),
  Baud rates up to 921,600 bps.
- Radio modem: Tx/Rx with full frequency range from 410-470 MHz [2]
  -Transmit power: 0.5-2W adjustable
  - Range: 1-4 km
- Position data output rates: 1 Hz, 2 Hz, 5 Hz, 10 Hz
- 5 LEDs (indicating Power, Satellite Tracking, Bluetooth® and Differential Data)
- Bluetooth® : V 2.X protocol, work compatible with Windows 7, Windows mobile and Android

Data Format

- Correction data I/O:
  - RTCM 2.x, 3.x, CMR (GPS only), CMR+ (GPS only).
- Position data output:
  - ASCII: NMEA-0183 GSV, RMC, HDT, VHD, GGA, GSA, ZDA, VTG, GST, PJK, PTNL
  - ComNav Binary update to 20 Hz

Physical

- Size(WxH): 15.8 cm x 7.5 cm
- Weight: 0.95 kg (include 2 batteries)

Environmental

- Operating temperature: -40 °C to + 65 °C (40 °F to 149 °F)
- Storage temperature: -40 °C to + 85 °C (40 °F to 185 °F)
- Humidity: 100% condensation
- Waterproof and dust proof: IP67 protected from temporary immersion to depth of 1 meter, floats
- Shock: survives a 2 meter drop on to concrete

Electrical

- Input Voltage: 5-27 VDC
- Power consumption: 2.85 W (3 constellations)[3]
- Li-ion battery capacity: 2 x 1800 mAh, up to 8 hours typically
- Memory: 256 MB internal with up to 16 GB pluggable memory card

Software

- ComNav field data collection software CGSurvey
- Carlson's SurvCE field data collection software (optional)
- MicroSurvey's FieldGenius field data collection software (optional)

1 E-RTK, BeiDou B3 signal used in RTK calculate engine; concern the current situation, this mode can be used in APAC.

2 410-470 MHz, 3 frequency range, 410-430, 430-460, 460-470, need to clarify when place the order.

3 Power consumption will increase if using internal radio modem transmitter.

Specifications subject to change without notice.

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5. Results

The total route length from Korba to Batati is approx. 25.61 km and the proposed forest area for diversion is 0.650 Ha. DGPS Survey processing report and co-ordinates of the PCP are in Annexure-1, and DGPS coordinates of TBM and forest patch boundary coordinates is in Annexure-2. The geo-referenced maps are in Annexure -3.

AREA STATEMENT

Korba to Batati - Proposed Forest Diversion Area Statement			
Total Route Length (in KM)	Total Forest Patch Length (in KM)	OFC Cable Trench Width (in KM)	Total Forest Diversion Area (in HA)
25.61	**12.99**	**0.0005**	**0.650**

TABLE-A

Korba to Batati - Schedule of Forest Land - Protected Forest & Orange Forest Area						
SL. NO.	PATCH NUMBER	DIV.	RANGE	COMPARTMENT TYPE	COMPARTMENT NUMBER	DIVERSION AREA (in HA)
1	7	KORBA	PASAR KHET	ORANGE AREA	OA 1265	0.036
2	7			ORANGE AREA	OA 1265	0.026
3	7			ORANGE AREA	OA 1265	0.008
4	3		KORBA	ORANGE AREA	OA 1281	0.006
5	6			ORANGE AREA	OA 1265	0.038
6	1			PROTECTED FOREST	P 986	0.047
7	3			PROTECTED FOREST	P 985	0.061
8	4			PROTECTED FOREST	P 979	0.037
9	9		PASAR KHET	PROTECTED FOREST	P 1008	0.022
10	14			PROTECTED FOREST	P 1006	0.075
11	7			PROTECTED FOREST	P 1004	0.023
12	8			PROTECTED FOREST	P 1008	0.032
13	8			PROTECTED FOREST	P 1004	0.029
14	14			PROTECTED FOREST	P 1008	0.031
TOTAL FOREST AREA						**0.472**

	Korba to Batati – Schedule of Forest Land - Revenue Forest (Cjj + Bjj)						
	SL. NO.	PATCH NUMBER	DIST.	TALUK	VILLAGE NAME	KHASRA NUMBER	DIVERSION AREA (in HA)
TABLE-B	1	7	KORBA	PASAR KHET	DENGURDIH	210	0.005
	2	7				210	0.003
	3	9			KORKOMA	610	0.003
	4	9				610	0.005
	5	9				43/1	0.006
	6	10				604/1 KA	0.001
	7	10				611/1 KA	0.017
	8	11				589/1	0.024
	9	13				897	0.004
	10	14				920	0.023
	11	12				566	0.002
	12	2		KORBA	DUMARDIH	298	0.070
	13	5			RAJGAMAR	175	0.011
	14	4				123/ 1 KA	0.004
	TOTAL FOREST AREA						**0.178**
	TOTAL FOREST LAND (TABLE A+TABLE B)						**0.650**

6. Background of Organization

6.1 Company Profile: Geotrax

Geotrax International Services (www.geotrax.in) is a Professional Land Mapping and Services provider across India established in the year 1999. During the last 14+ years, we had an opportunity to execute a variety of surveying jobs all over India and in the Middle East to various customer specifications for RIS, LIS, and Municipal GIS oriented jobs. Cadastral Surveys using ETS/DGPS and Provision of Ground control conforming to stringent accuracy standards using high end instruments as RTK/GPRS DGPS is our specialty. We also have a UAV (Drone) and Ground Penetrating Radar (on Roaster).

Geotrax is headed by Mr. V.V.S Bandhakavi (Ex-Survey of India employee) who has more than 40+ years' experience in the field of surveying in India and abroad.

Some of our major clients include:

- Odisha Space Application Centre (ORSAC)
- Steel Authority of India (SAIL)
- National Thermal Power Corporation (NTPC)
- Survey Settlement and Land Records Department (Govt. Of Gujarat)
- Survey Settlement and Land Records Department (Govt. Of Madhya Pradesh)
- Irrigation Dept. (Govt. of Jammu and Kashmir)
- National Remote Sensing Agency (Hyderabad)
- Meinhardt India Private Limited (Delhi),
- Nagarjuna Construction Company (NCC, Hyderabad)
- Consulting Engineering Services (CES, New Delhi)
- Lee Associates of South Asia (LASA, Delhi)
- Power development Corporation (Govt. of Jammu and Kashmir)

Geotrax expertise covers:

- DGPS Surveys for Mining lease boundary, and Forest Diversion
- Consultancy services for Mining Plan & EIA
- Boundary and cadastral surveys using DGPS and Total station;
- Topographic surveys.
- Ground control surveys for photogrammetric projects, including Airborne GPS.

- Only one of the two companies in India who are empanelled by NRSA for DGPS survey for ground control point collection
- Route and alignment surveys combining conventional and photogrammetric methods.
- Construction and cross-section surveys (from road design to precision layout and quality control).

Being a client focused organization, GeoTrax's combination of survey equipment, personnel, and computer resources allow for the tailoring of the project approach to match the orders of accuracy and precision requirements for each project. GeoTrax's equipment resources include 250 DGPS, 33 hand-held GPS units, theodolites, electronic digital and automatic levels, 19 Electronic Total Stations, and data collectors.

On the mapping side, our CAD and GIS professionals assist the survey projects by creating accurate maps. We have dedicated CAD experts who have extensive experience with different CAD software.

7. Annexure

7.1 Annexure – 1: PCP Observation Processing Report

AUSPOS GPS Processing Report

September 5, 2015

This document is a report of the GPS data processing undertaken by the AUSPOS Online GPS Processing Service (version: AUSPOS 2.2) . The AUSPOS Online GPS Processing Service uses International GNSS Service (IGS) products (final, rapid, ultra-rapid depending on availability) to compute precise coordinates in ITRF anywhere on Earth and GDA94 within Australia. The Service is designed to process only dual frequency GPS phase data.

An overview of the GPS processing strategy is included in this report.

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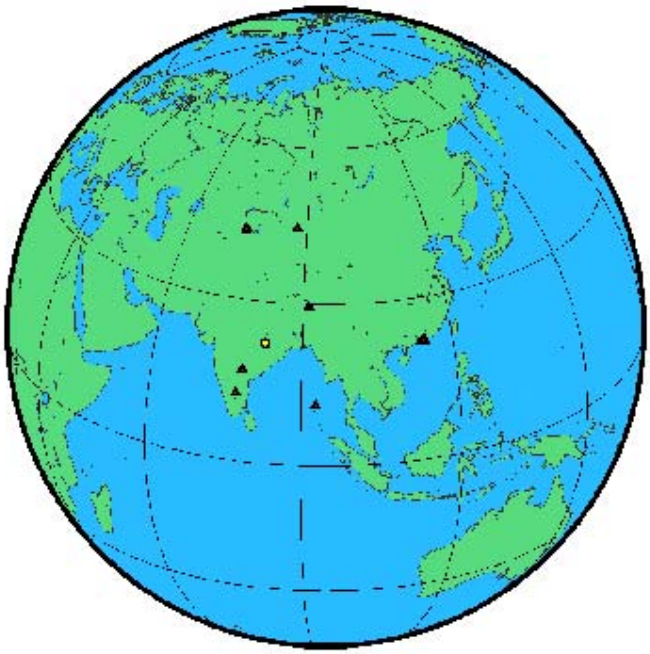
1 User Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP).

Station (s)	Submitted File	Antenna Type	Antenna Height (m)	Start Time	End Time
0310	03102853244a.150	CNTT300 NONE	1.835	2015/09/01 16:58:00	2015/09/04 17:19:00

2 Processing Summary



Date	User Stations	Reference Stations	Orbit Type
2015/09/01 16:58:00	0310	CHUM FUMO HKNP HKOH HKSC HKSL HYDE IISC LHAZ PBRI PGL2 URUM	IGS rapid

Remark: An IGS Rapid Orbit product has been used in this computation, IGS Rapid orbits are usually of very high quality. However, to ensure you achieve the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final Orbit product.

3 Computed Coordinates, ITRF2008

All computed coordinates are based on the IGS realisation of the ITRF2008 reference frame. All the given ITRF2008 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

3.1 Cartesian, ITRF2008

Station	X (m)	Y (m)	Z (m)	ITRF2008 @
0310	753502.779	5851003.824	2417128.610	01/09/2015
CHUM	1228950.508	4508079.981	4327868.535	01/09/2015
FOMO	-2359952.427	5416530.098	2394688.444	01/09/2015
HKNP	-2392360.773	5400226.077	2400094.284	01/09/2015
HKOH	-2423817.411	5386056.906	2399883.192	01/09/2015
HKSC	-2414267.426	5386768.794	2407459.848	01/09/2015
HKSL	-2393382.928	5393860.985	2412592.230	01/09/2015
HYDE	1208444.133	5966805.988	1897077.240	01/09/2015
IISC	1337935.993	6070317.091	1427877.150	01/09/2015
LHAZ	-106941.934	5549269.787	3139215.148	01/09/2015
PBRI	-295635.865	6240848.753	1278178.464	01/09/2015
POL2	1239971.079	4530790.135	4302578.856	01/09/2015
URUM	193030.295	4606851.297	4393311.527	01/09/2015

3.2 Geodetic, GRS80 Ellipsoid, ITRF2008

Geoid-ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM2008 geoid. More information on the EGM2008 geoid can be found at http://earth-info.nga.mil/GandG/wgs84/gravitymod/egm2008/

Station	Latitude (DMS)	Longitude (DMS)	Ellipsoidal Height(m)	Derived Above Geoid Height(m)
0310	22 24 56.56025	82 39 42.25144	255.971	317.021
CHUM	42 59 54.60506	74 45 03.96764	716.348	759.338
FOMO	22 11 50.69355	113 32 32.97328	56.634	61.319
HKNP	22 14 56.63158	113 53 37.96894	350.652	353.998
HKOH	22 14 51.66789	114 13 42.80678	166.369	168.246
HKSC	22 19 19.81360	114 08 28.29557	20.198	22.654
HKSL	22 22 19.21147	113 55 40.75206	95.260	98.803
HYDE	17 25 02.14157	78 33 03.14377	441.688	518.493
IISC	13 01 16.20960	77 34 13.36808	843.666	929.587
LHAZ	29 39 26.40057	91 06 14.50981	3624.596	3659.287
PBRI	11 38 16.00905	92 42 43.69165	-22.503	38.431
POL2	42 40 47.17388	74 41 39.36690	1714.208	1754.274
URUM	43 48 28.61936	87 36 02.41272	858.878	922.257

3.3 Positional Uncertainty (95% C.L.) - Geodetic, ITRF2008

Station	Longitude(East) (m)	Latitude(North) (m)	Ellipsoidal Height(Up) (m)
0310	0.006	0.005	0.013
CHUM	0.006	0.005	0.009
FOMO	0.007	0.005	0.009
HKNP	0.007	0.005	0.008
HKOH	0.007	0.005	0.009
HKSC	0.007	0.005	0.009
HKSL	0.007	0.005	0.008
HYDE	0.006	0.005	0.009
IISC	0.006	0.005	0.010
LHAZ	0.006	0.004	0.010
PBRI	0.006	0.005	0.010
POL2	0.006	0.005	0.009
URUM	0.006	0.005	0.008

4 Ambiguity Resolution - Per Baseline

Baseline	Ambiguities Resolved	Baseline Length (km)
HKOH - HKSL	92.0 %	33.892
HKOH - HKSC	94.2 %	12.211
CHUM - POL2	96.7 %	35.732
0310 - HYDE	49.4 %	700.596
HYDE - PBRI	54.1 %	1649.361
CHUM - URUM	95.9 %	1042.674
HKNP - URUM	85.6 %	3359.554
HKNP - HKSL	91.7 %	14.063
HKNP - PBRI	38.6 %	2522.221
FOMD - HKNP	93.2 %	36.679
HYDE - LHAZ	78.4 %	1856.740
HYDE - IISC	83.9 %	497.626
AVERAGE	79.5%	980.112

Please note for a regional solution, such as used by AUSPOS, an average ambiguity resolution of 50% or better for the network indicates a reliable solution.

5 Computation Standards

5.1 Computation System

Software	Bernese GNSS Software Version 5.2.
GNSS system(s)	GPS only.

5.2 Data Preprocessing and Measurement Modelling

Data preprocessing	Phase preprocessing is undertaken in a baseline by baseline mode using triple-differences. In most cases, cycle slips are fixed by the simultaneous analysis of different linear combinations of L1 and L2. If a cycle slip cannot be fixed reliably, bad data points are removed or new ambiguities are set up A data screening step on the basis of weighted postfit residuals is also performed, and outliers are removed.
Basic observable	Carrier phase with an elevation angle cutoff of 7° and a sampling rate of 3 minutes. However, data cleaning is performed a sampling rate of 30 seconds. Elevation dependent weighting is applied according to $1/\sin(e)^2$ where e is the satellite elevation.
Modelled observable	Double differences of the ionosphere-free linear combination.
Ground antenna phase centre calibrations	IGS08 absolute phase-centre variation model is applied.
Tropospheric Model	A priori model is the GMF mapped with the DRY-GMF.
Tropospheric Estimation	Zenith delay corrections are estimated relying on the WET-GMF mapping function in intervals of 2 hour. N-S and E-W horizontal delay parameters are solved for every 24 hours.
Tropospheric Mapping Function	GMF
Ionosphere	First-order effect eliminated by forming the ionosphere-free linear combination of L1 and L2. Second and third effect applied.
Tidal displacements	Solid earth tidal displacements are derived from the complete model from the IERS Conventions 2010, but ocean tide loading is not applied.
Atmospheric loading	Applied
Satellite centre of mass correction	IGS08 phase-centre variation model applied
Satellite phase centre calibration	IGS08 phase-centre variation model applied
Satellite trajectories	Best available IGS products.
Earth Orientation	Best available IGS products.

5.3 Estimation Process

Adjustment	Weighted least-squares algorithm.
Station coordinates	Coordinate constraints are applied at the Reference sites with standard deviation of 1mm and 2mm for horizontal and vertical components respectively.
Troposphere	Zenith delay parameters and pairs of horizontal delay gradient parameters are estimated for each station in intervals of 2 hours and 24 hours.
Ionospheric correction	An ionospheric map derived from the contributing reference stations is used to aid ambiguity resolution.
Ambiguity	Ambiguities are resolved in a baseline-by-baseline mode using the Code-Based strategy for 180-6000km baselines, the Phase-Based L5/L3 strategy for 18-200km baselines, the Quasi-Ionosphere-Free (QIF) strategy for 18-2000km baselines and the Direct L1/L2 strategy for 0-20km baselines.

5.4 Reference Frame and Coordinate Uncertainty

Terrestrial reference frame	IGS08 station coordinates and velocities mapped to the mean epoch of observation.
Australian datum	GDA94 coordinates determined via Helmert transformation from ITRF using the Dawson and Woods (2010) parameters.
Derived AHD	For stations within Australia, AUSGeoid09 is used to compute AHD. AUSGeoid09 is the Australia-wide gravimetric quasigeoid model that has been a posteriori fitted to the Australian Height Datum.
Above-geoid heights	Earth Gravitational Model EGM2008 released by the National Geospatial-Intelligence Agency (NGA) EGM Development Team is used to compute above-geoid heights. This gravitational model is complete to spherical harmonic degree and order 2159, and contains additional coefficients extending to degree 2190 and order 2159.
Coordinate uncertainty	Coordinate uncertainty is expressed in terms of the 95% confidence level for both GDA94 and ITRF2008. Uncertainties are scaled using an empirically derived model which is a function of data span, quality and geographical location.

7.2 Annexure – 2: DGPS Surveyed coordinates of Forest Patches

Sl. No.	Patch No	Pillar ID	Easting (m)	Northing (m)	Latitude "N"	Longitude "E"
1	PATCH NO 1	P1	682259.568	2474633.2	22°22'04.83960"	82°46'12.45720"
2		P2	682352.632	2474664.52	22°22'05.82240"	82°46'15.72240"
3		P3	682444.927	2474687.533	22°22'06.53520"	82°46'18.95880"
4		P4	682841.973	2474775.042	22°22'09.22800"	82°46'32.87280"
5		P5	682994.435	2474801.272	22°22'10.02360"	82°46'38.21160"
6		P6	683094.254	2474833.526	22°22'11.03160"	82°46'41.71440"
7		P7	683172.4086	2474849.025	22°22'11.50680"	82°46'44.45040"
8	PATCH NO 2	P8	683873.2905	2475127.051	22°22'20.27280"	82°47'09.06360"
9		P9	684072.4565	2475385.782	22°22'28.60680"	82°47'16.13040"
10		P10	684419.6731	2475459.587	22°22'30.87120"	82°47'28.29840"
11		P11	684605.8947	2475498.667	22°22'32.07000"	82°47'34.82160"
12		P12	684664.23	2475520.939	22°22'32.77200"	82°47'36.87000"
13		P13	684844.4474	2475690.397	22°22'38.21160"	82°47'43.24200"
14		P14	684930.4686	2475740.064	22°22'39.79200"	82°47'46.26960"
15		P15	685054.0952	2475737.874	22°22'39.67320"	82°47'50.58960"
16	PATCH NO 3	P16	685214.1095	2475794.87	22°22'41.46240"	82°47'56.20560"
17		P17	685255.482	2475818.704	22°22'42.22200"	82°47'57.66000"
18		P18	685283.62	2475829.349	22°22'42.55680"	82°47'58.65000"
19		P19	685319.4449	2475849.429	22°22'43.19760"	82°47'59.91000"
20		P20	685379.997	2475870.973	22°22'43.87440"	82°48'02.03400"
21		P21	685402.25	2475875.801	22°22'44.02200"	82°48'02.81520"
22		P22	685645.784	2475960.281	22°22'46.67160"	82°48'11.36160"
23		P23	685770.33	2476016.84	22°22'48.46440"	82°48'15.73920"
24		P24	685882.152	2476058.507	22°22'49.77480"	82°48'19.66680"
25		P25	686004.975	2476110.585	22°22'51.42000"	82°48'23.97960"
26		P26	686080.076	2476161.544	22°22'53.04720"	82°48'26.62560"
27		P27	686126.714	2476231.312	22°22'55.29360"	82°48'28.28520"
28		P28	686258.861	2476305.935	22°22'57.66960"	82°48'32.93640"
29		P29	686341.833	2476323.621	22°22'58.21320"	82°48'35.84520"
30		P30	686418.092	2476326.5	22°22'58.27440"	82°48'38.51280"
31	PATCH NO 4	P31	686978.321	2476318.068	22°22'57.78120"	82°48'58.08960"
32		P32	687006.27	2476311.639	22°22'57.56160"	82°48'59.06520"
33		P33	687047.204	2476306.444	22°22'57.37800"	82°49'00.49440"
34		P34	687076.916	2476298.659	22°22'57.11160"	82°49'01.52760"
35		P35	687141.428	2476287.387	22°22'56.71920"	82°49'03.77760"
36		P36	687226.056	2476255.382	22°22'55.64640"	82°49'06.72240"
37		P37	687265.111	2476214.958	22°22'54.31800"	82°49'08.07240"
38		P38	687339.036	2476115.872	22°22'51.06720"	82°49'10.61400"
39		P39	687381.144	2476081.606	22°22'49.93680"	82°49'12.07200"
40		P40	687434.174	2476060.324	22°22'49.22400"	82°49'13.91520"
41		P41	687484.0701	2476044.274	22°22'48.68400"	82°49'15.65040"
42		P42	687627.0703	2476010.879	22°22'47.54280"	82°49'20.63640"

Sl. No.	Patch No	Pillar ID	Easting (m)	Northing (m)	Latitude "N"	Longitude "E"
43		P43	687627.254	2476010.848	22°22'47.53920"	82°49'20.64360"
44		P44	687583.8266	2475955.31	22°22'45.75360"	82°49'19.10280"
45	PATCH NO 5	P45	687581.061	2475560.8	22°22'32.93040"	82°49'18.83640"
46		P46	687619.7317	2475464.882	22°22'29.79480"	82°49'20.14680"
47		P47	687700.6947	2475381.583	22°22'27.05520"	82°49'22.94400"
48	PATCH NO 6	P48	688199.471	2475116.59	22°22'18.24600"	82°49'40.26360"
49		P49	688229.152	2475109.507	22°22'18.00480"	82°49'41.29680"
50		P50	688300.823	2475066.007	22°22'16.56120"	82°49'43.78440"
51		P51	688341.424	2475047.514	22°22'15.94560"	82°49'45.19560"
52		P52	688377.678	2475022.355	22°22'15.11040"	82°49'46.45200"
53		P53	688428.089	2474964.3	22°22'13.20600"	82°49'48.19080"
54		P54	688540.037	2474865.717	22°22'09.95520"	82°49'52.06080"
55		P55	688578.084	2474825.006	22°22'08.61600"	82°49'53.37120"
56		P56	688598.935	2474744.801	22°22'06.00240"	82°49'54.06600"
57		P57	688631.149	2474652.608	22°22'02.99280"	82°49'55.15320"
58		P58	688656.0622	2474559.277	22°21'59.94720"	82°49'55.98480"
59	PATCH NO 7	P59	688682.622	2474431.74	22°21'55.79280"	82°49'56.85960"
60		P60	688719.502	2474288.61	22°21'51.12360"	82°49'58.08720"
61		P61	688731.087	2474241.562	22°21'49.59000"	82°49'58.47240"
62		P62	688743.832	2474028.896	22°21'42.67440"	82°49'58.82520"
63		P63	688805.94	2474036.845	22°21'42.90840"	82°50'00.99960"
64		P64	688832.838	2474045.587	22°21'43.18200"	82°50'01.94280"
65		P65	688988.0113	2474077.121	22°21'44.14320"	82°50'07.37880"
66		P66	689047.9562	2474108.214	22°21'45.12960"	82°50'09.48840"
67		P67	689072.8123	2474123.324	22°21'45.61200"	82°50'10.36320"
68		P68	689126.203	2474155.778	22°21'46.64520"	82°50'12.24240"
69		P69	689151.039	2474170.821	22°21'47.12400"	82°50'13.11720"
70		P70	689186.788	2474185.384	22°21'47.58480"	82°50'14.37360"
71		P71	689224.759	2474214.929	22°21'48.53160"	82°50'15.71280"
72		P72	689315.893	2474264.464	22°21'50.10480"	82°50'18.92040"
73		P73	689411.593	2474312.561	22°21'51.63120"	82°50'22.28280"
74		P74	689516.266	2474377.577	22°21'53.70120"	82°50'25.96920"
75		P75	689570.6332	2474410.971	22°21'54.76680"	82°50'27.88440"
76		P76	689604.6815	2474429.406	22°21'55.35000"	82°50'29.08320"
77		P77	689629.3751	2474442.777	22°21'55.77480"	82°50'29.95080"
78		P78	689656.656	2474441.371	22°21'55.72080"	82°50'30.90480"
79		P79	689700.895	2474450.479	22°21'55.99800"	82°50'32.45280"
80		P80	689724.35	2474447.855	22°21'55.90440"	82°50'33.27360"
81		P81	689785.306	2474458.172	22°21'56.21400"	82°50'35.40840"
82		P82	689848.815	2474467.276	22°21'56.48400"	82°50'37.62960"
83		P83	689872.495	2474473.479	22°21'56.67840"	82°50'38.46120"
84		P84	689992.856	2474486.352	22°21'57.04920"	82°50'42.67320"
85		P85	690064.372	2474488.267	22°21'57.08160"	82°50'45.17160"
86		P86	690133.256	2474501.181	22°21'57.47400"	82°50'47.58720"

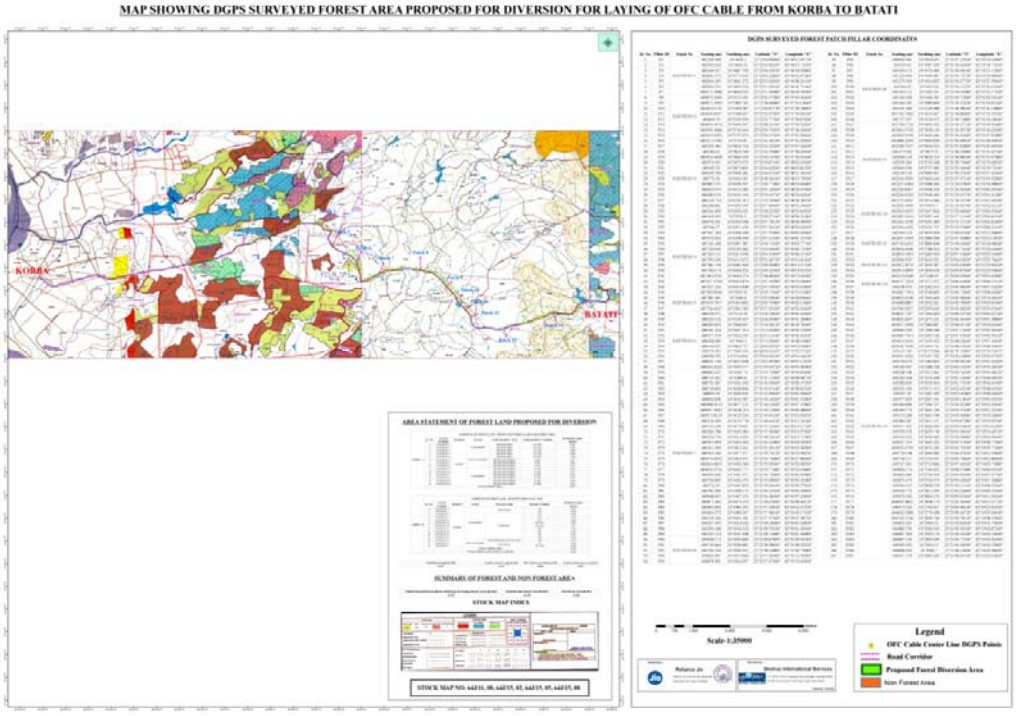
Sl. No.	Patch No	Pillar ID	Easting (m)	Northing (m)	Latitude "N"	Longitude "E"
87		P87	690207.992	2474524.022	22°21'58.18680"	82°50'50.20800"
88		P88	690233.188	2474540.162	22°21'58.70160"	82°50'51.09360"
89		P89	690242.114	2474541.608	22°21'58.74480"	82°50'51.40680"
90	PATCH NO 8	P90	690658.174	2474550.869	22°21'58.87800"	82°51'05.95440"
91		P91	690743.664	2474536.881	22°21'58.38840"	82°51'08.93520"
92		P92	690766.534	2474530.352	22°21'58.16880"	82°51'09.73080"
93		P93	690845.987	2474515.866	22°21'57.66480"	82°51'12.50280"
94		P94	690878.301	2474516.597	22°21'57.67560"	82°51'13.62960"
95	PATCH NO 8	P95	690950.901	2474503.697	22°21'57.22920"	82°51'16.16400"
96		P96	691024.92	2474487.203	22°21'56.66400"	82°51'18.74160"
97		P97	691094.112	2474470.489	22°21'56.09160"	82°51'21.15360"
98		P98	691224.393	2474430.087	22°21'54.72720"	82°51'25.68960"
99		P99	691273.459	2474416.855	22°21'54.27720"	82°51'27.39960"
100		P100	691366.62	2474413.06	22°21'54.11520"	82°51'30.65400"
101		P101	691410.111	2474410.35	22°21'54.01080"	82°51'32.17320"
102		P102	691440.539	2474401.89	22°21'53.72280"	82°51'33.23160"
103		P103	691464.182	2474389.869	22°21'53.32320"	82°51'34.05240"
104		P104	691641.069	2474239.988	22°21'48.38040"	82°51'40.16880"
105		P105	691700.7082	2474194.667	22°21'46.88280"	82°51'42.23520"
106		P106	691757.357	2474129.475	22°21'44.74080"	82°51'44.18640"
107	PATCH NO 9	P107	691790.1726	2474091.041	22°21'43.47720"	82°51'45.31680"
108		P108	691816.5742	2474058.135	22°21'42.39720"	82°51'46.22400"
109		P109	691862.9158	2474000.686	22°21'40.51080"	82°51'47.81880"
110		P110	691888.2033	2473969.828	22°21'39.49920"	82°51'48.69000"
111		P111	691928.7197	2473918.924	22°21'37.82880"	82°51'50.08320"
112		P112	691973.502	2473873.52	22°21'36.33480"	82°51'51.62760"
113		P113	692004.116	2473829.213	22°21'34.88040"	82°51'52.67880"
114		P114	692033.284	2473793.408	22°21'33.70680"	82°51'53.68320"
115		P115	692064.336	2473757.982	22°21'32.54040"	82°51'54.75240"
116		P116	692130.126	2473689.067	22°21'30.27600"	82°51'57.02400"
117		P117	692196.9335	2473603.646	22°21'27.47160"	82°51'59.32080"
118		P118	692207.6284	2473588.566	22°21'26.97840"	82°51'59.68800"
119		P119	692226.8407	2473568.518	22°21'26.31600"	82°52'00.35040"
120		P120	692246.0529	2473548.469	22°21'25.65720"	82°52'01.01280"
121	PATCH NO 10	P121	692275.9451	2473514.366	22°21'24.53760"	82°52'02.04240"
122		P122	692292.4569	2473495.17	22°21'23.90760"	82°52'02.61120"
123		P123	692319.0552	2473457.856	22°21'22.68360"	82°52'03.52560"
124		P124	692387.6116	2473287.441	22°21'17.11440"	82°52'05.84760"
125		P125	692416.4158	2473231.083	22°21'15.27120"	82°52'06.82680"
126		P126	692456.6445	2473191.757	22°21'13.97880"	82°52'08.21640"
127	PATCH NO 11	P127	692594.213	2473059.303	22°21'09.61560"	82°52'12.96840"
128		P128	692657.1953	2472989.399	22°21'07.31880"	82°52'15.13920"
129		P129	692742.6422	2472889.858	22°21'04.05000"	82°52'18.08040"
130		P130	692818.6548	2472788.319	22°21'00.71640"	82°52'20.69400"

Sl. No.	Patch No	Pillar ID	Easting (m)	Northing (m)	Latitude "N"	Longitude "E"
131		P131	692894.4334	2472685.563	22°20'57.34680"	82°52'23.29680"
132	PATCH NO 12	P132	692908.9237	2472645.221	22°20'56.02920"	82°52'23.78640"
133		P133	692912.5079	2472633.287	22°20'55.64040"	82°52'23.90520"
134		P134	692914.0833	2472609.618	22°20'54.87000"	82°52'23.94840"
135	PATCH NO 13	P135	694113.0168	2472168.95	22°20'40.05960"	82°53'05.65080"
136		P136	694127.2423	2472172.322	22°20'40.16400"	82°53'06.15120"
137		P137	694158.376	2472182.615	22°20'40.48440"	82°53'07.24200"
138		P138	694181.7554	2472190.862	22°20'40.74360"	82°53'08.06280"
139	PATCH NO 14	P139	694652.0138	2472345.663	22°20'45.58560"	82°53'24.56520"
140		P140	694688.8887	2472352.261	22°20'45.78360"	82°53'25.85400"
141		P141	694780.9207	2472359.603	22°20'45.98520"	82°53'29.07600"
142		P142	694825.2787	2472366.663	22°20'46.19760"	82°53'30.62760"
143		P143	694852.6937	2472375.241	22°20'46.46400"	82°53'31.58880"
144		P144	694911.3599	2472389.887	22°20'46.91760"	82°53'33.64440"
145		P145	694960.359	2472396.938	22°20'47.12640"	82°53'35.36160"
146		P146	694989.7313	2472405.106	22°20'47.37840"	82°53'36.39120"
147		P147	695019.6165	2472425.422	22°20'48.02640"	82°53'37.44240"
148		P148	695046.7658	2472444.731	22°20'48.64200"	82°53'38.40000"
149		P149	695119.429	2472470.822	22°20'49.46280"	82°53'40.95240"
150		P150	695091.5659	2472457.782	22°20'49.04880"	82°53'39.97320"
151		P151	695159.074	2472484.865	22°20'49.90200"	82°53'42.34200"
152		P152	695185.967	2472488.528	22°20'50.01000"	82°53'43.28520"
153		P153	695248.548	2472512.461	22°20'50.76240"	82°53'45.48120"
154		P154	695265.918	2472525.058	22°20'51.16560"	82°53'46.09320"
155		P155	695282.839	2472543.304	22°20'51.75240"	82°53'46.69440"
156		P156	695321.429	2472571.512	22°20'52.65240"	82°53'48.05520"
157		P157	695347.43	2472581.095	22°20'52.95480"	82°53'48.96600"
158		P158	695377.853	2472587.231	22°20'53.13840"	82°53'50.03160"
159		P159	695406.896	2472596.237	22°20'53.42280"	82°53'51.05040"
160		P160	695439.775	2472601.244	22°20'53.57040"	82°53'52.20240"
161		P161	695470.208	2472601.568	22°20'53.56680"	82°53'53.26800"
162		P162	695489.287	2472611.157	22°20'53.87280"	82°53'53.93760"
163		P163	695517.431	2472620.603	22°20'54.16800"	82°53'54.92400"
164		P164	695539.078	2472633.748	22°20'54.58560"	82°53'55.68720"
165		P165	695556.622	2472649.685	22°20'55.09680"	82°53'56.30640"
166		P166	695627.214	2472665.252	22°20'55.57560"	82°53'58.77960"
167		P167	695655.6739	2472672.436	22°20'55.79520"	82°53'59.77680"
168		P168	695729.198	2472694.383	22°20'56.47920"	82°54'02.35800"
169		P169	695744.117	2472704.337	22°20'56.79600"	82°54'02.88360"
170		P170	695767.901	2472712.806	22°20'57.06240"	82°54'03.71880"
171		P171	695834.174	2472760.022	22°20'58.57080"	82°54'06.05520"
172		P172	695863.085	2472790.945	22°20'59.56440"	82°54'07.07760"
173		P173	695872.479	2472792.974	22°20'59.62560"	82°54'07.40880"
174		P174	695904.512	2472808.378	22°21'00.11160"	82°54'08.53560"

Sl. No.	Patch No	Pillar ID	Easting (m)	Northing (m)	Latitude "N"	Longitude "E"
175		P175	695920.772	2472812.059	22°21'00.22680"	82°54'09.10440"
176		P176	695975.236	2472803.125	22°20'59.91360"	82°54'11.00160"
177		P177	696095.3892	2472838.179	22°21'01.00440"	82°54'15.21720"
178		P178	696373.554	2472794.917	22°20'59.48160"	82°54'24.91920"
179		P179	696662.5588	2472770.428	22°20'58.56720"	82°54'35.00640"
180		P180	696763.2706	2472839.796	22°21'00.78120"	82°54'38.55600"
181		P181	696852.665	2472904.01	22°21'02.82960"	82°54'41.70960"
182		P182	696885.799	2472920.542	22°21'03.35520"	82°54'42.87240"
183		P183	696897.303	2472953.176	22°21'04.41000"	82°54'43.29000"
184		P184	696897.159	2472993.639	22°21'05.72760"	82°54'43.30440"
185		P185	696903.592	2473014.15	22°21'06.39000"	82°54'43.53840"
186		P186	696898.456	2473066.7	22°21'08.10000"	82°54'43.38000"
187		P187	696917.278	2473085.265	22°21'08.69760"	82°54'44.04600"

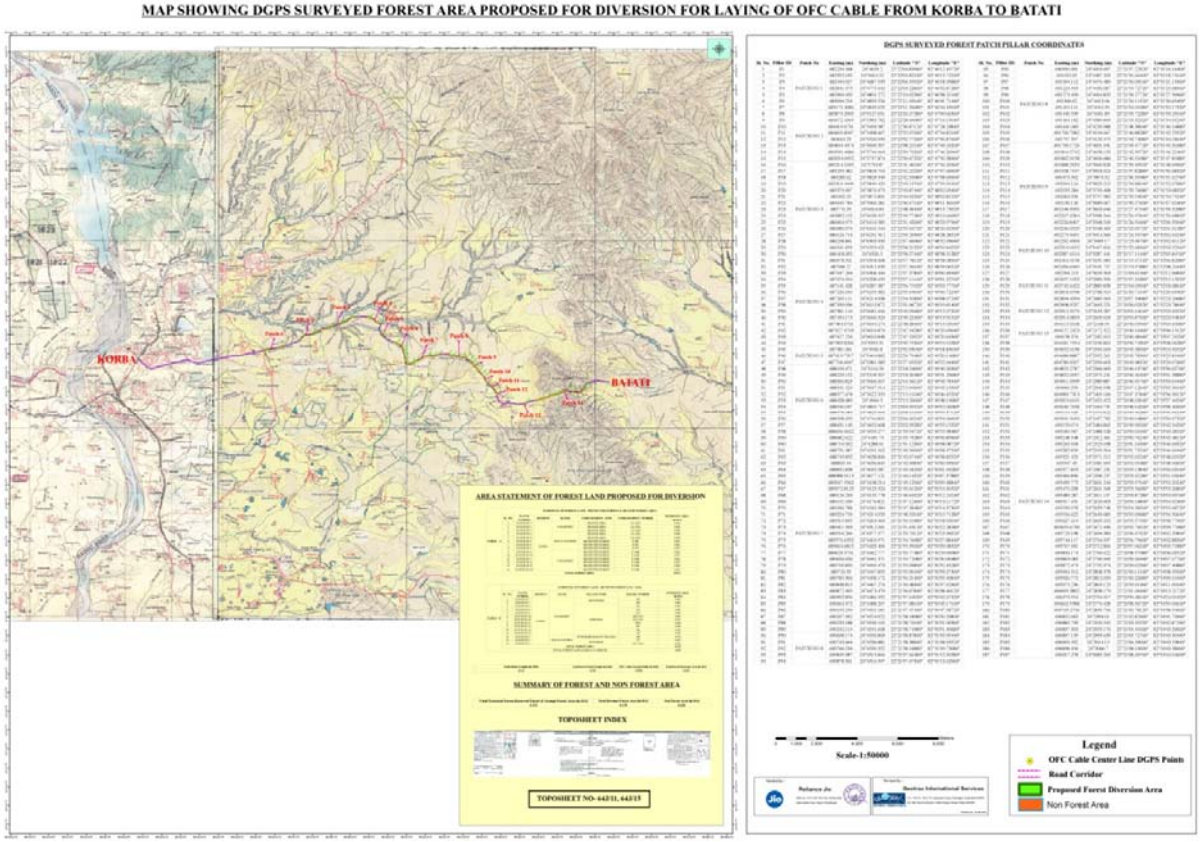
7.3 Annexure – 3: Geo-Referenced Maps of the Proposed Route

7.3.1 Geo-referenced Forest Map showing Proposed 4G OFC Route



Not to Scale

7.3.2 Geo-referenced SOI Map (1:50000) showing Proposed 4G OFC Route



Not to Scale