DGPS SURVEY REPORT

OF

FOREST AREA DEMARCATION

FOR

ESTABLISHMENT OF NEW EKLAVYA MODEL RESIDENTIAL SCHOOL

IN ORANGE AREA

AT

VILLAGE-SURHI

RANGE- NARHARPUR

DIVISION- NORTH BASTAR KANKER

SURVEYED AREA-6.5 HACTARE

APPLICANT

OFFICE OF THE ASSITANT COMMISSIONER,
Tribal Welfare Department -Kanker,
District- North Bastar Kanker, (C.G.)

PREPARED BY

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ACS

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LIST OF MAPS

1.

INTRODUCTION

Office of the Assistant Commissioner, Tribal Welfare Department, District North Bastar Kanker, Chhattishgarh, has been submitted proposal to Forest department Govt. of Chhattisgarh for diversion of forest land for non – forestry purpose, under forest conservation Act 1980.

The area proposed to be diverted for non forestry purpose is for establishment of new ***Eklavya Model Residential School*** over an area of **6.5** ha at village Surhi, under Range- Narharpur, Division- North Bastar Kanker.

As per directives of **Ministry of Environment & Forests** dated **8th July 2011**; all Applications seeking diversion of forest land for non-forest purpose under **Forest Conservation Act, 1980** must be accompanied with Geo-referenced map (both soft copy and hard copy) along with shape file of the forest land proposed for diversion prepared using Differential GPS (DGPS)

As per Online Submission and Monitoring of Forests Clearances Proposals of MoEF & CC, the following maps and files are required to be uploaded-

- Survey of India Toposheet in 1:50,000 scale indicating location of the forest land proposed to be diverted or compensate.
- Copy of the geo-referenced map of the forest/revenue land proposed to be diverted or compensate by using DGPS or Total Station.
- KML & Shape file of the geo-referenced forest/revenue land proposed to be diverted or compensate.

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2.

LOCATION & ACCESSIBILITY

The DGPS surveyed area proposed to be diverted for non forestry purpose is situated at village Surhi, located at 30Km. (aerial distance) NE Direction from tehsil-Kanker, dist.-North Bastar Kanker (C.G.). It falls in Survey of India Toposheet no. – **64 H/11**. The surveyed area is bounded by Longitudes **81° 39' 51.24960" E to 81° 40' 07.13640" E** & Latitudes **20° 28' 53.07600" N to 20° 29' 03.64200" N.** The surveyed area comes under Orange area, under Range- Narharpur, Division- North Bastar Kanker, and the total DGPS surveyed area proposed to be diverted for non forestry purpose is **6.5ha**.

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3.

LAND SCHEDULE OF THE SURVEYED AREA

FOREST LAND

District/ Forest Division	Tehsil / Range	Village	Type of Land	Comp. Number	Surveyed Area (In Hect.)
North Bastar Kanker	Narharpur	Surhi	Orange area	OA 1413	6.5
TOTAL					6.5

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4.

FEATURES & METHODOLOGY OF DGPS SURVEY

DGPS INTRODUCTION

The advanced version or the enhancement to Global positioning System or the GPS is DGPS *i.e.* Differential Global positioning System or DGPS. DGPS was developed to meet the needs of positioning and distance measuring. It provides better and improved location accuracy than GPS.

The underlying premise of differential GPS (DGPS) requires that a two DGPS receiver unit operated sequentially, one is stationary called as Base unit and other is moving called as Rover unit.

Fig. 4.1 A DGPS Base and Rover station Equipment

A GPS receiver must acquire signals from at least four satellites to reliably calculate a three-dimensional position. Ideally, these satellites should be distributed across the sky. The receiver performs mathematical calculations to establish the distance from a satellite, which in turn is used to determine its position. The GPS receiver knows where each satellite is the instant its distance is measured. This position is displayed on the data logger and saved along with any other descriptive information entered in the field software.

CONCEPT OF DGPS

A typical DGPS architecture is shown in figure below

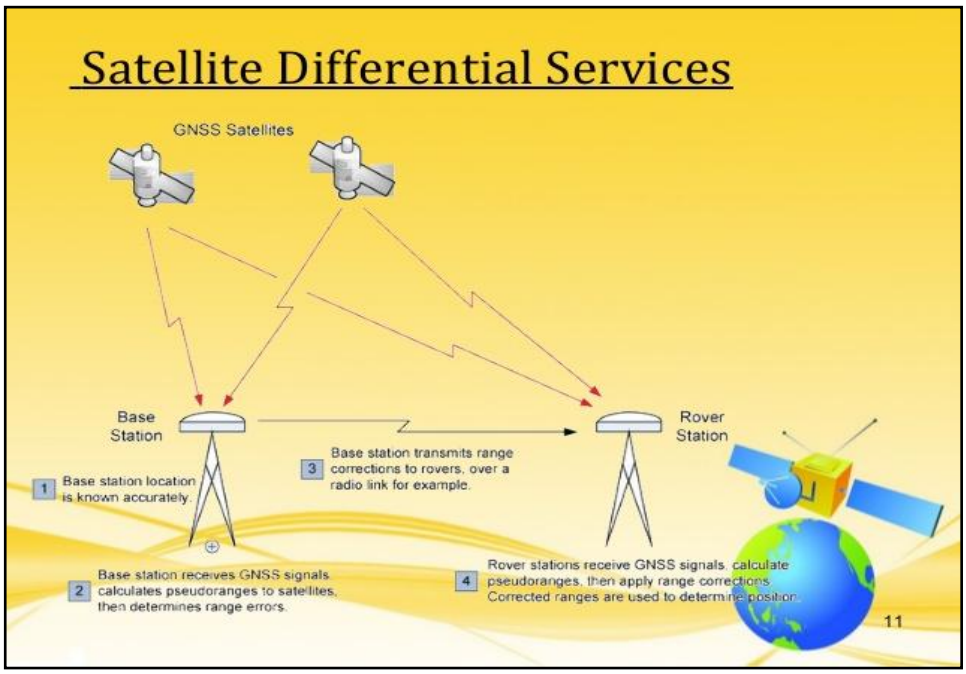

Fig. 4.2 A DGPS Base station and Rover station setup

The DGPS equipment work on GPS/GNSS satellite signal to find out exact position where they are on the global scale. The GPS Operational Constellation consists of 24 satellites that orbit the Earth in very precise orbits twice a day. GPS satellites emit continuous navigation signals. Each GPS satellite transmits data that indicates its location and the current time. All GPS satellites synchronize operations so that these repeating signals are transmitted at the same instant.

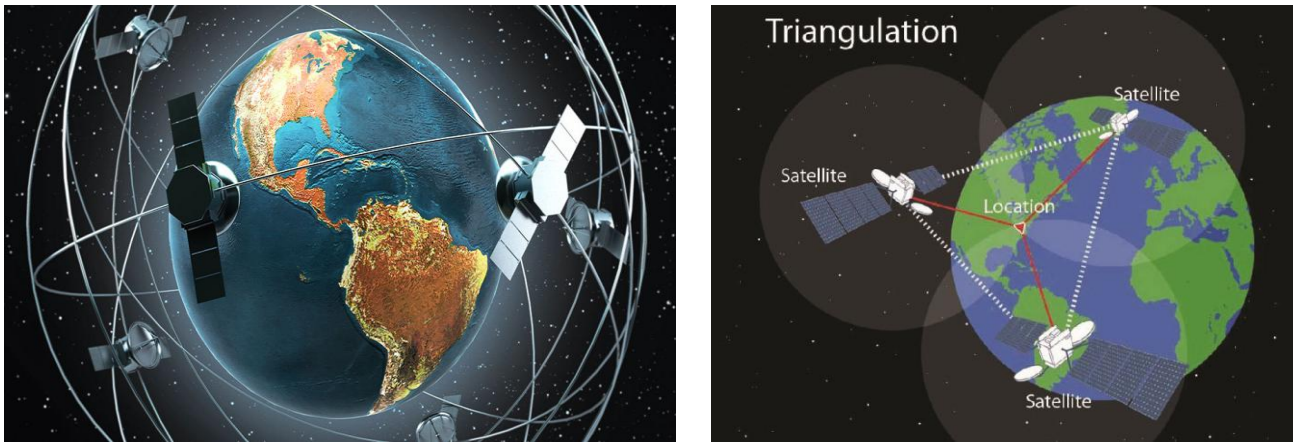

Fig. 4.3 A GPS Satellite orbit the Earth, Location acquired by Satellite system

Measurement of Travel time of the signals from a constellation of GPS Satellites orbiting the earth for enabling the position in the earth.

The GPS satellites are in orbits such that one can be able to receive signals from at least four satellites to enable for the determination of latitude, longitude, altitude and time.

Latitude and Longitude are spherical coordinates on the surface of the earth. Latitude is measured North or South of the Equator. Longitude is measured East or West of Greenwich. DGPS uses Latitudes and Longitudes to reference locations.

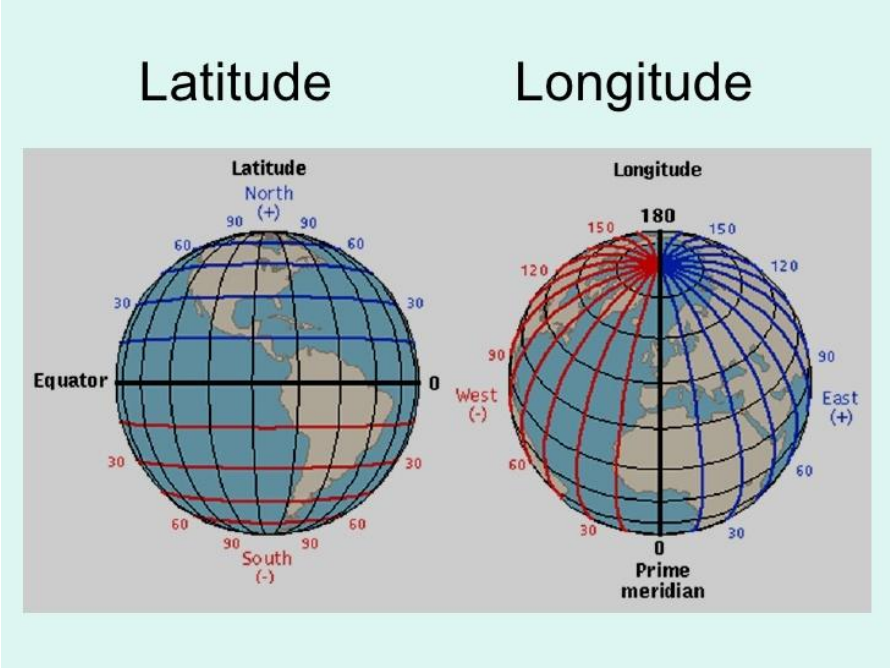

Fig. 4.4 Latitude & Longitude

Differential GPS(DGPS) is a system in which differences between observed and computed co-ordinates ranges(known as differential corrections) at a particular known point are transmitted to users(GPS receivers at other points) to upgrade the accuracy of the users receivers position.

Differential positioning user finds the point position derived from the satellite signals and applies correction to that position. These corrections, difference of the determined position and the known position are generated by a Reference Receiver, whose position is known and is fed to the instrument and are used by the second Receiver to correct its internally generated position. This is known as Differential GPS positioning.

Differential correction is a technique that greatly increases the accuracy of the collected DGPS data. It involves using a receiver at a known location - the "base

station"- and comparing that data with DGPS positions collected from unknown locations with "roving receivers.

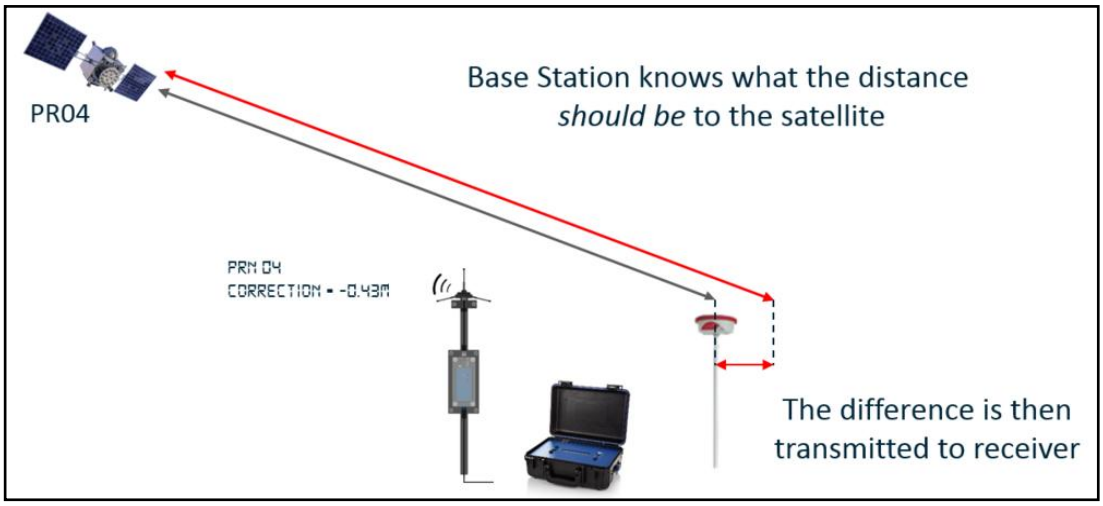

Fig. 4.5 Differential correction of error by DGPS

Differential correction can be applied in real-time directly in the field or when post processing data in the office. Although both methods are based on the same underlying principles, each accesses different data sources and achieves different levels of accuracy. Combining both methods provides flexibility during data collection and improves data integrity.

METHODOLOGY

The survey work has done with the help of ***Differential Global Positioning System survey.*** Firstly the site visit was done and the location for base station was finalized. Then one Base station (permanent reference point) is setting up, initialization of all the parameters of BASE Unit and Initialization of the ROVER Unit in the same manner. The Base unit is collect position data at a stationary location. Simultaneously the Rover unit is moves around the field for collecting field positions.

For the calculation of lease boundary area and fixation of boundary point by coordinates lease area is mark by a several boundary point joining this boundary point by a close line it give the total area of the lease boundary, for carried survey point Rover unit is install on every boundary point and fixed after 15 minutes of reading and further move to another boundary point and repeat this process in the same manner that's how 30 boundary points covered the hole area is surveyed.

For the fixation of Base point two ground control points has been marked around the surveyed area and fixed as a survey point by Rover unit. This survey point is used as a reference for post processing for eliminating data errors and obtaining more precise readings. This point is not directly related to the surveyed area, it is only for reference.

After the successful completion of the survey, all the RAW data collected from the field by Base and Rover unit will be post processed in the GNSS software after that the post processed data is used for area calculation and fix up position of survey points. For drafting of the map firstly Cadastral map in which survey area falls is Geo-referencing using GIS software and then Superimposition of output files on Geo-referenced Vectorized cadastral maps. Finally on the basis of survey result survey report and all the standard format of maps is prepared and also a soft copy of digitize map in shape file and Kml file format is prepare. The methodological flow chart of this work is shown in fig. 4.6 next page.

Flow chart-

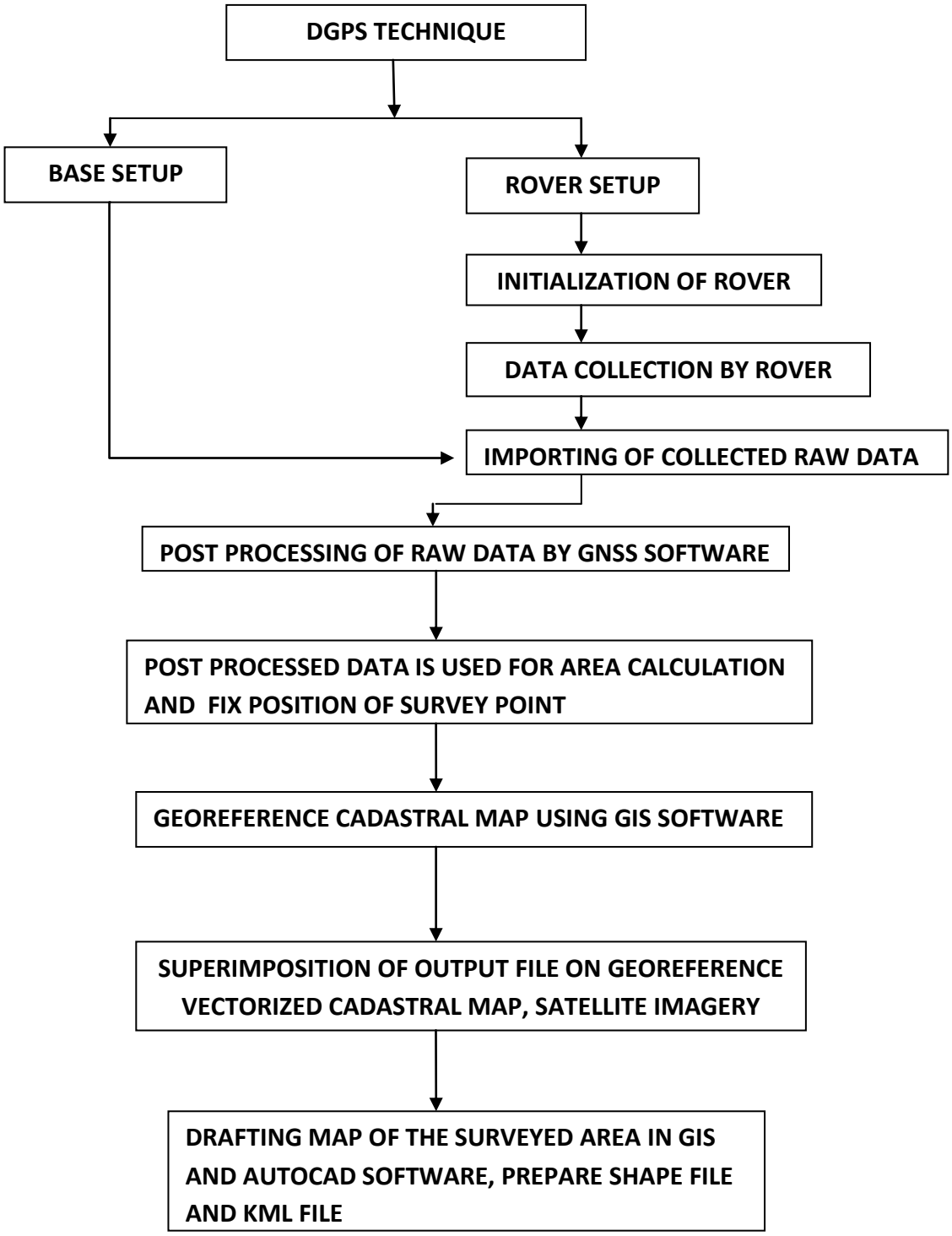

Fig. 4.6 – Flow chart of the methodology adopted

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5.

SCOPE OF WORK

We had to carry out DGPS survey and other related work of forest land diversion for establishment of new ***Eklavya Model Residential School*** at village Surhi under range-Narharpur, Division - North Bastar Kanker, Chhattisgarh as per **Ministry of Environment and Forest, Govt. of India vide their circular 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 purposed under Section -2 of forest conservation Act 1980 the diversion proposal under forest conservation act shall be accompanied by DGPS surveyed maps of the forest land proposed for diversion.

The envisaged scopes of the assignments are described below

1. Computation of Geo-referenced forest land through digitization and comparison with area indicated in the land schedule.
    - Establishment of Base Station by taking DGPS long Observation and fixing the coordinate by processing with IGS (International GNSS Services) data.
    - DGPS observation at the change point of the forest land.
2. Processing of DGPS observation and geo-referencing of the Forest land based on DGPS Surveyed co-ordinates.
3. Generation of the shape file and kml file of the Forest land.
4. On the basis of generated coordinates survey area is marked and area is calculated.
5. Printing of Hard copy maps and report.

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6.

POST PROCESSING

Post-processing is used in Differential GPS to obtain precise positions of unknown points by relating them to known points such as survey markers.

The DGPS measurements are usually stored in computer memory in the DGPS receivers, and are subsequently transferred to a computer running the DGPS post-processing software (GNSS Solution). The software computes baselines using simultaneous measurement data from two or more DGPS receivers.

The baselines represent a three-dimensional line drawn between the two points occupied by each pair of DGPS antennas. The post-processed measurements allow more precise positioning, because most DGPS errors affect each receiver nearly equally, and therefore can be cancelled out in the calculations.

After survey of the area, accumulated raw data are processed by GNSS post-processing software and it generate a post processing report in which it show the location of the point i.e. Coordinates, its elevation, date and time of taking survey, satellite error etc. the pictorial of data processing is as shown below-

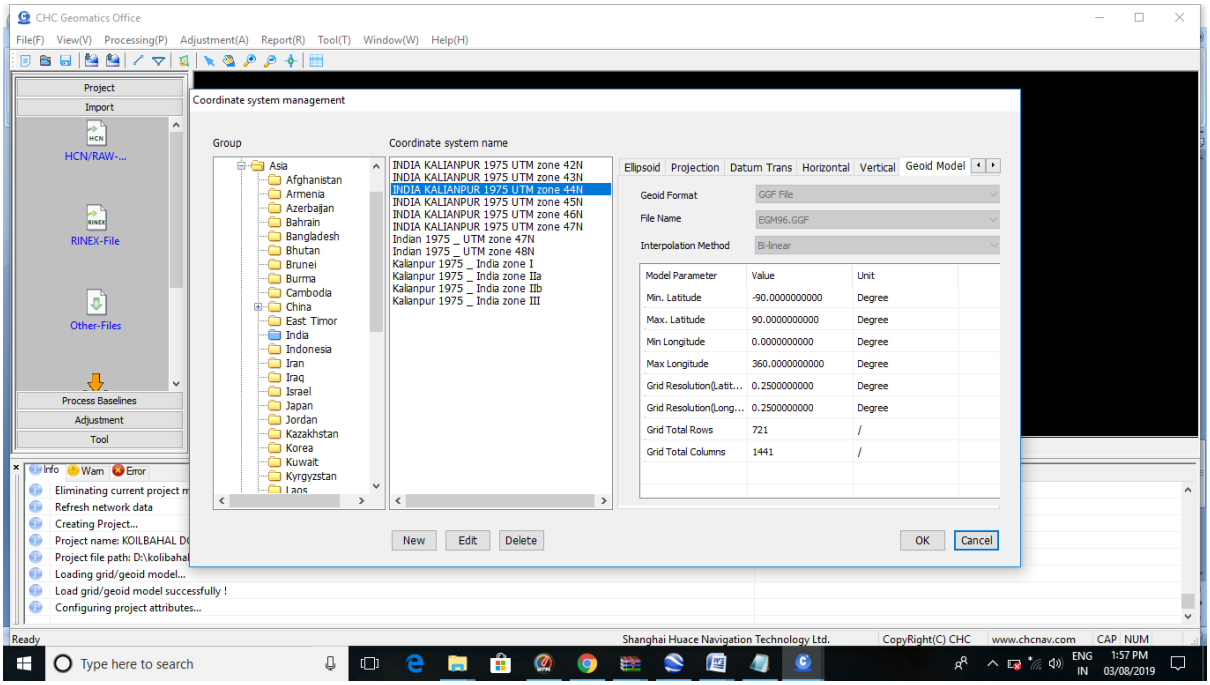


Fig. 6.1 CREATE PROJECT FILE

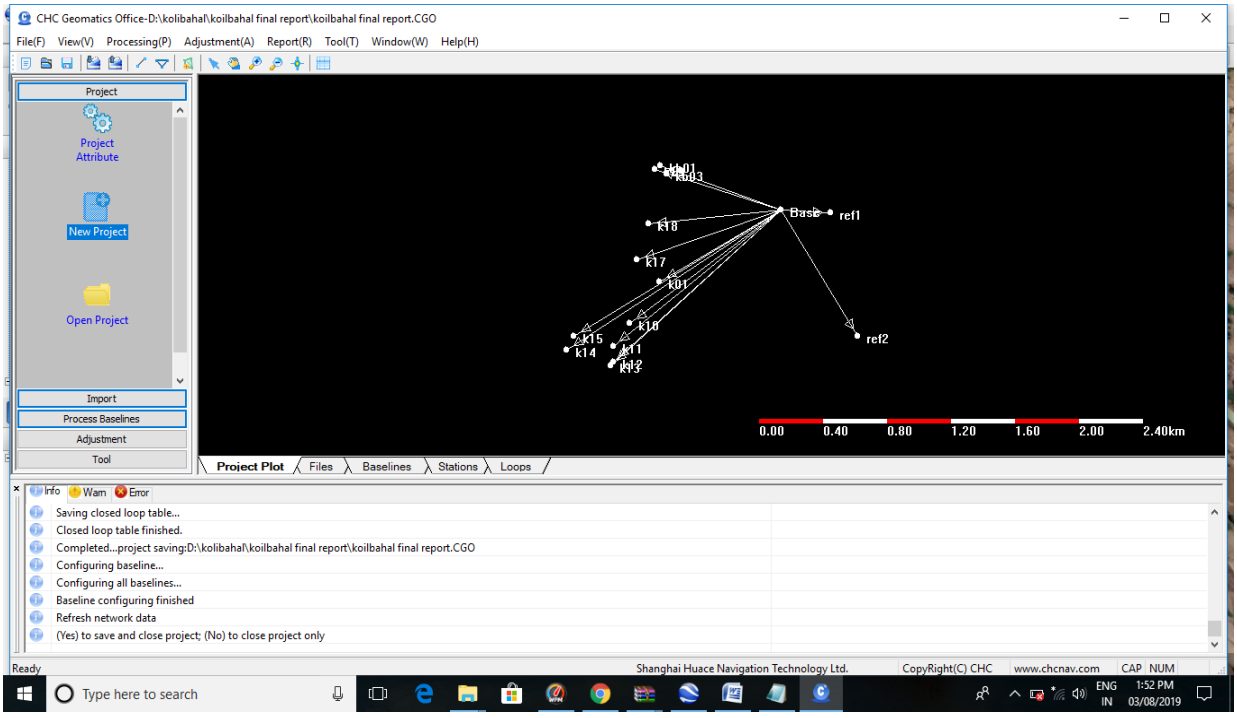


Fig. 6.2 - Raw Data Import and Processing

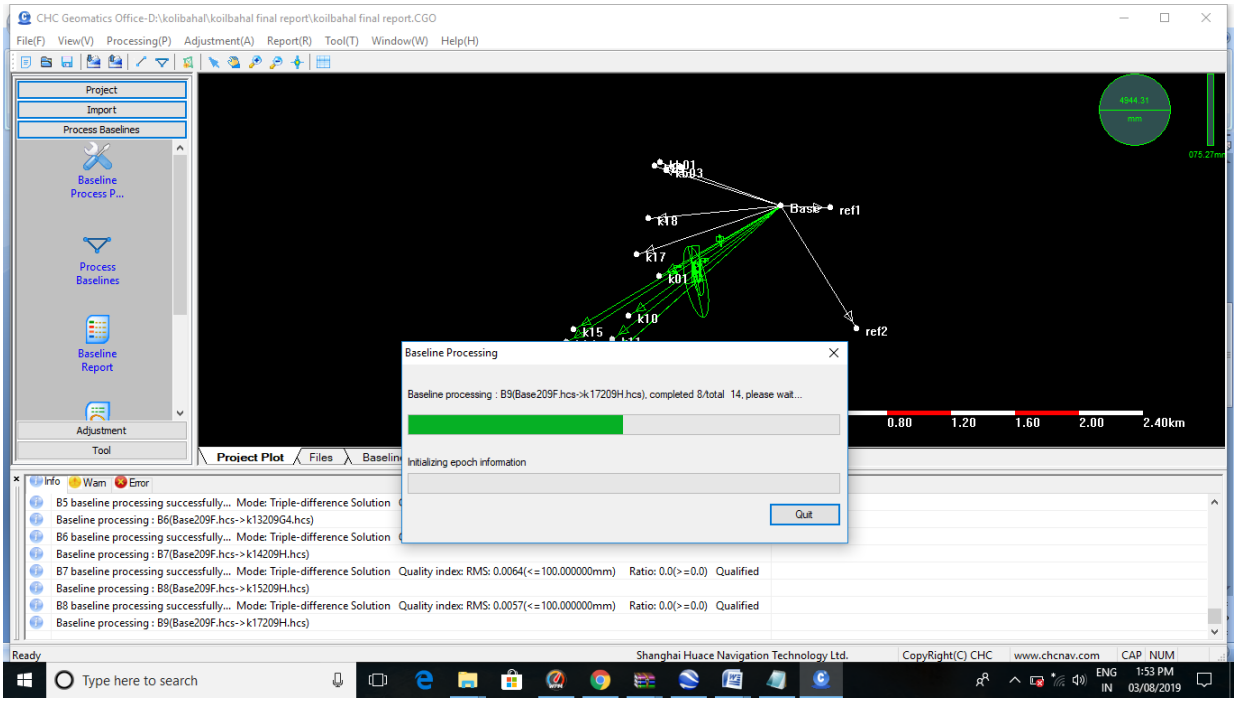


Fig. 6.3 - Base line Processing

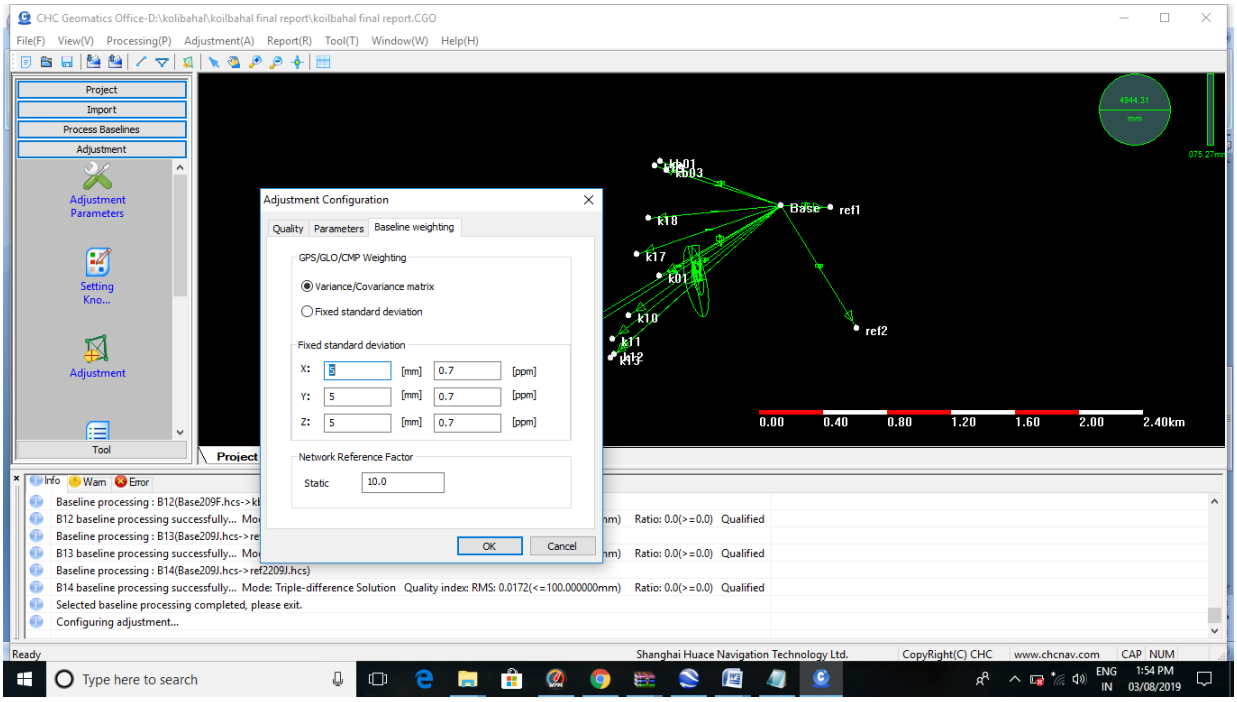


Fig. 6.4 - Configuration Adjustment

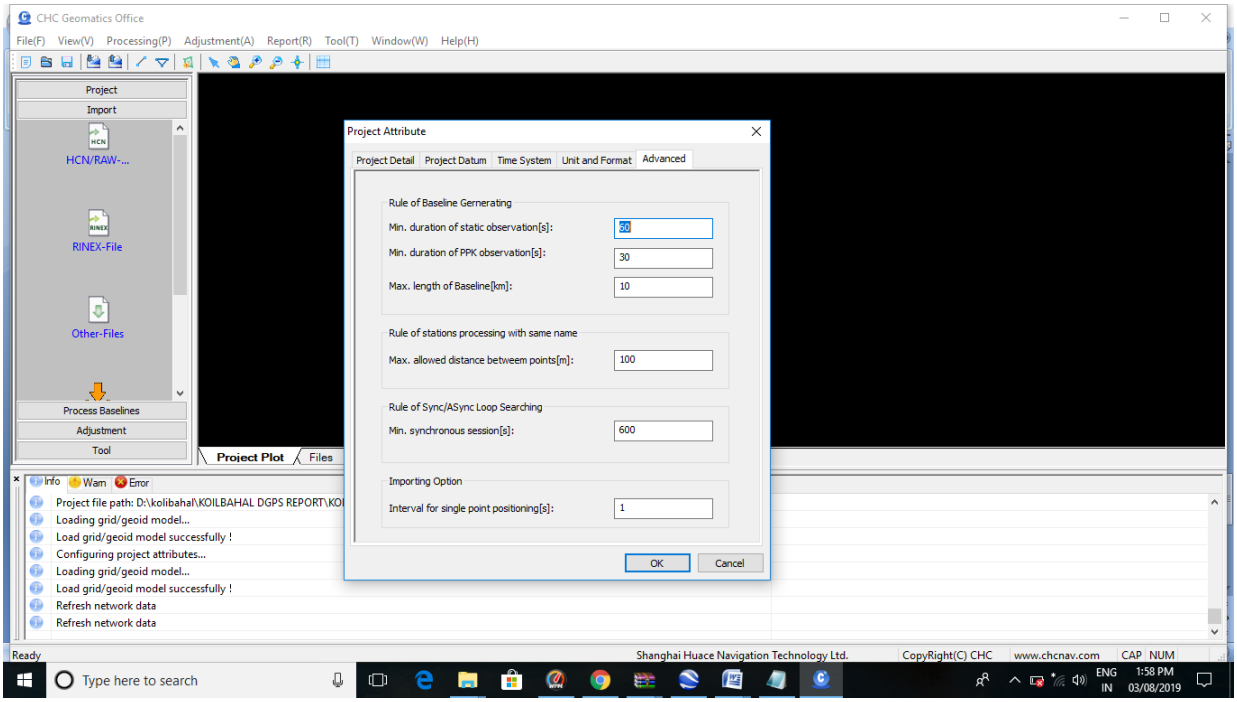


Fig. 6.5 -Project attribute setup

Baseline Summary Report

DGPS REPORT

User Name	DESKTOP-IOHM6TO	**Date & Time**	13:02:00 2020-03-04
Project Datum	INDIA KALIANPUR 1975 UTM zone 44N	**Geoid Model**	EGM96.GGF
Project Name	Transverse Mercator Projection	**Zone**	
Distance Units	m		
Height Units	m		

Baseline Summary List

Number of baselines: 14
The longest baseline(m): 1507.850562
The shortest baseline(m): 293.891139
worst baseline: B6(Base209F.hcs->k13209G4.hcs)
Relative error of worst baseline: 1/452

Baseline ID	Start Point	End Point	Solution Type	Horizontal Precision HDOP(m)	Vertical Precision VDOP(m)	Azimuth	Ellipsoid Dist.(m)	Δ Ellipsoid Height (m)
B1 (Base209F.hcs->k01209G.hcs)	Base	B01	Triple-difference Solution	30.2547	4.4788	237°31'30.92232"	830.436177	-14.499032
B2 (Base209F.hcs->k10209G.hcs)	Base	B10	Triple-difference Solution	22.4797	3.8883	231°22'26.79768"	1118.174799	-12.908904
B3 (Base209F.hcs->k11209G.hcs)	Base	B11	Triple-difference Solution	32.6687	4.7142	228°55'01.98412"	1281.095955	-14.432851

B4 (Base209F.hcs->k11209G4.hcs)	Base	B11	Triple-difference Solution	53.9491	8.6227	225°40'27.09933"	1337.399858	-14.432851
B5 (Base209F.hcs->k12209G.hcs)	Base	B12	Triple-difference Solution	35.4344	5.9151	225°34'27.97697"	1336.120622	-7.454315
B6 (Base209F.hcs->k13209G4.hcs)	Base	B13	Triple-difference Solution	34.3019	6.3754	224°51'18.35811"	1357.547960	-0.700212
B7 (Base209F.hcs->k14209H.hcs)	Base	B14	Triple-difference Solution	18.2740	4.9546	235°02'48.83725"	1507.850562	-4.508992
B8 (Base209F.hcs->k15209H.hcs)	Base	B15	Triple-difference Solution	14.1330	4.2829	236°43'33.89492"	1425.731083	-1.871947
B9 (Base209F.hcs->k17209H.hcs)	Base	B17	Triple-difference Solution	9.9292	3.6694	249°21'09.29981"	890.193745	-6.172074
B10 (Base209F.hcs->k18209H.hcs)	Base	B18	Triple-difference Solution	13.0422	4.3190	263°15'29.89201"	772.216392	-4.307358
B11 (Base209F.hcs->k19209I.hcs)	Base	B19	Triple-difference Solution	10.6289	3.1443	287°41'54.55834"	773.845307	-2.217600
B12 (Base209F.hcs->kb01209I.hcs)	Base	B01	Triple-difference Solution	21.9025	4.9683	290°18'42.44540"	752.471157	-4.948832
B13 (Base209J.hcs->ref1209J3.hcs)	Base	ref1	Triple-difference Solution	13.4653	3.3185	091°52'56.99811"	293.891139	5.309138
B14 (Base209J.hcs->ref2209J.hcs)	Base	ref2	Triple-difference Solution	11.4004	3.1229	149°13'05.37531"	880.246915	0.408458

B1 Baseline Report

1 Baseline Summary

Baseline ID(Star->End)	B1(Base209F.hcs->k01209G.hcs)
Solution Type	Triple-difference Solution
Ephemeris Used	Broadcast
Ellipsoid Dist.(m)	830.436177
Height Mask	5 Degree
RMS(m)	0.014938
Horizontal Precision HDOP(m)	30.254688
Vertical Precision VDOP(m)	4.478803
Start Time (GPST)	2020/03/04 06:08:50.0 (week 2064 22130.0 s)
Stop Time (GPST)	2019/04/04 06:12:15.0 (week 2064 22335.0 s)
Duration time	00:03:25

2 Occupations Data

Station	Start Point	End Point
Data File	D:\DMERA\base\20190728\hcn\Base209F.HCN	D:DAMERA\rover\20190728\hcn\B1209G.HCN
Receiver Type	CHC I70	CHC I70
Receiver Serial	1059786	1059853
Antenna Type	CHCI70	CHCI70
Survey Type	Bottom Of Antenna Mount	Bottom Of Antenna Mount
Antenna Height(m)	1.800000	1.800000

3 Baseline Components

Start Station Base

Grid		**Local**		**WGS84**	
North(m)	2364954.618368	**Latitude**	22° 48' 15.4533" N	**Latitude**	22° 48' 15.4533"N
East(m)	729406.674473	84° 05' 51.7030"E	84° 05' 51.7030"E	**Longitude**	84° 05' 51.7030"E
Height(m)	275.277153	**Ellipsoid Height(m)**	212.599193	**Ellipsoid Height(m)**	212.599193

End Station B01

Grid		Local		WGS84	
North(m)	2364508.705715	Latitude	22° 48' 15.3864" N	Latitude	22° 48' 15.3864"N
East(m)	728706.050474	Longitude	84° 05' 50.3448"E	Longitude	84° 05' 50.3448"E
Height(m)	260.794359	Ellipsoid Height(m)	198.100161	Ellipsoid Height(m)	198.100161

Baseline B1

Δ North(m)	-445.912575	NS Fwd Azimuth	238°19'54.54194"	Δ X(m)	718.898269
Δ East(m)	-700.623876	Ellipsoid Dist.(m)	830.436177	Δ Y(m)	60.765413
Δ Height(m)	-14.482942	Δ Ellipsoid Height(m)	-14.499180	Δ Z(m)	-411.238481

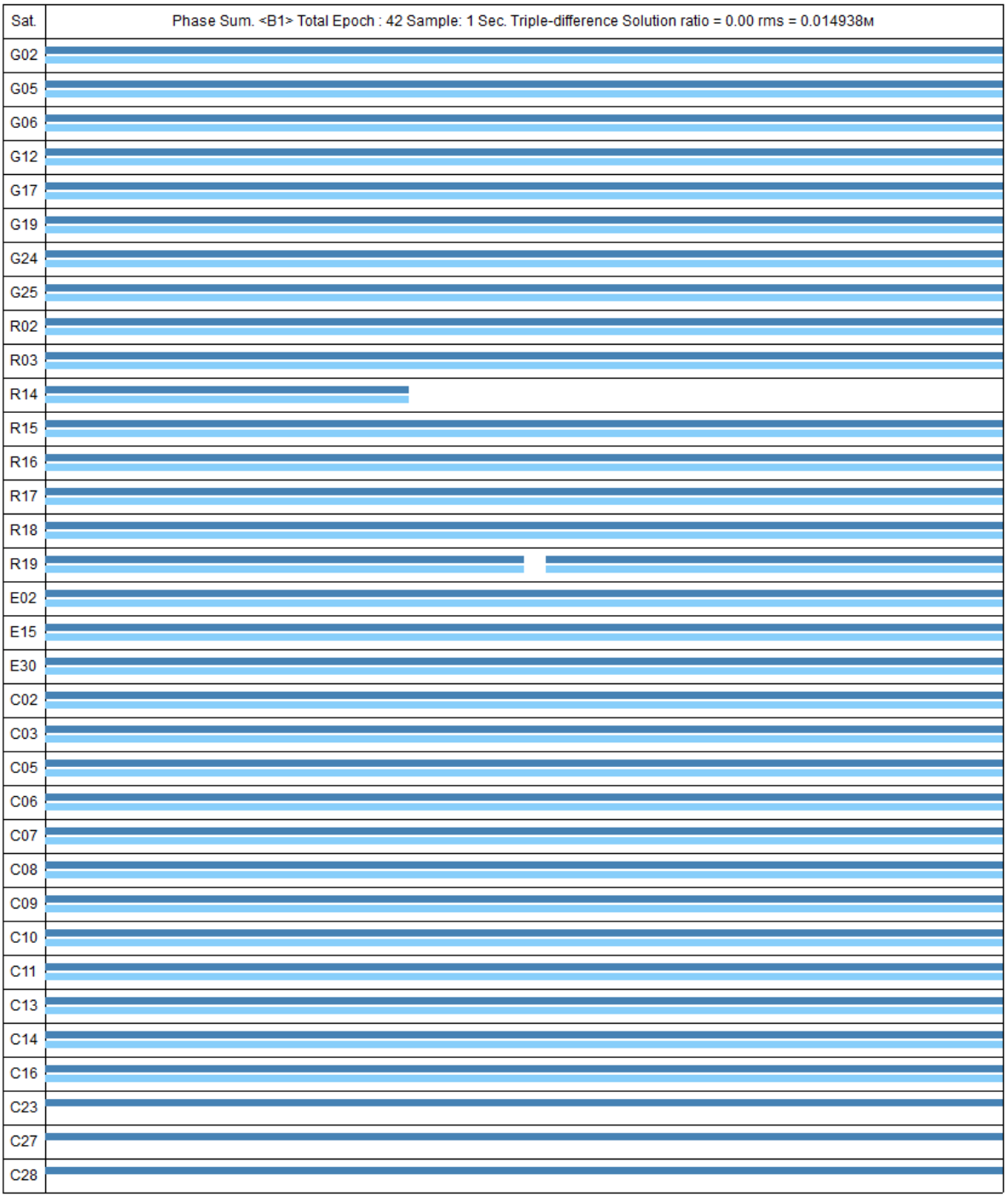
Standard Errors

Std. Δ North(m)	0.086654	Std.NS Fwd Azimuth(s)	34.7137	Std. Δ X(m)	0.390077
Std. Δ East(m)	0.412812	Std.Ellipsoid Dist.(m)	0.000000	Std. Δ Y(m)	0.228257
Std. Δ Height(m)	0.176163	Std. Δ Ellipsoid Height(m)	0.176163	Std. Δ Z(m)	0.066906

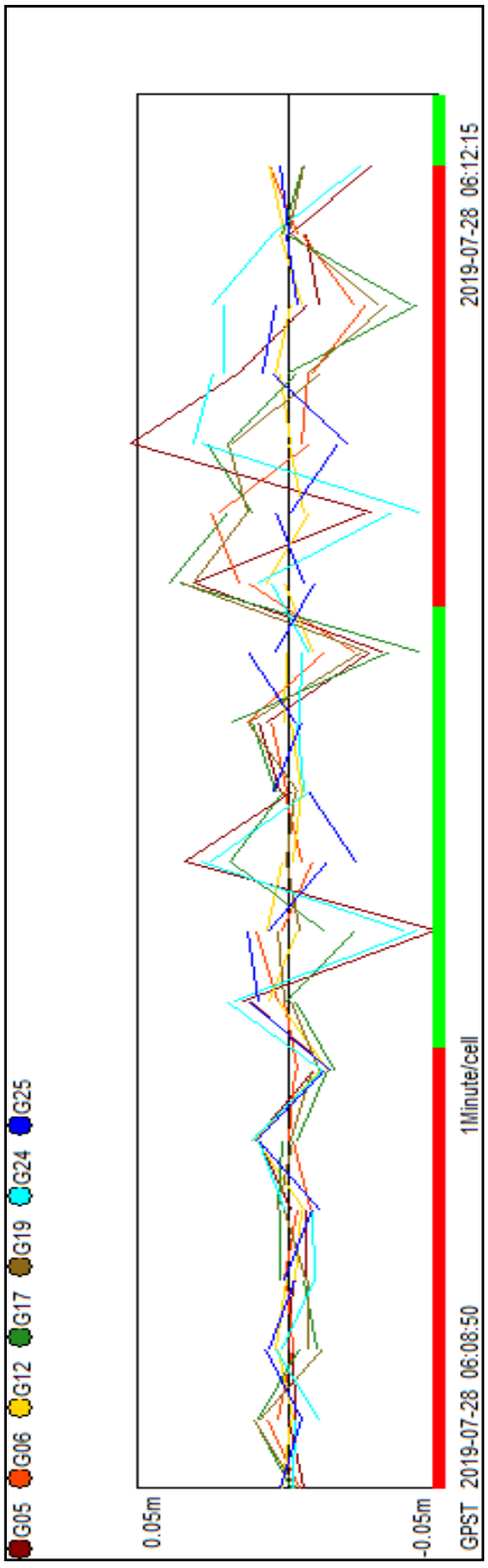
Aposteriori Covariance Matrix(см^2)

	X	Y	Z
X	1521.597677		
Y	-803.269371	521.011172	
Z	-27.533997	9.331051	44.763466

4 Tracking Summary



5 Residuals


G05
G06
G12
G17
G19
G24
G25
0.05m
-0.05m
GPST 2019-07-28 06:08:50
1Minute/cell
2019-07-28 06:12:15

6 Processing Style

6.1 Static

Minimum Obs. Time	10min
Using Broadcast Ephemeris	200.000000km
Using Precise Ephemeris	2000.000000km

6.2 Basic Setting

Height Mask	5 Degree
Ephemeris	Broadcast
Sampling Interval	10s
Solution Type	Triple-difference Solution

6.3 Troposphere

Model	Saastamoinen
Minimum Zenith Delay Interval	2 Hours
Use Observed Met. Data	Enabled

6.4 Ionosphere

Model	Klobuchar
Ambiguity Resolution Pass	Enabled

6.5 Ambiguity

Search Mode	LAMBDA

6.6 Quality

RMS Tolerance	0.100000m
RATIO Tolerance	0.000
Gross Error Tolerance	3.500

7.

SPECIFICATIONS OF EQUIPMENTS

DGPS MODEL - TOPCON CHC i70

Technical Specifications

GNSS Characteristics

- 220 channels with all in view simultaneously tracked satellite signals
  - GPS: L1C/A, L2, L2E, L5
  - GLONASS: L1C/A, L1P, L2C/A, L2P, L3
  - SBAS: WAAS, EGNOS, MSAS
  - Galileo: E1, E5A, E5B
  - BDS: B1, B2
- Advanced multipath mitigation technology
- Low noise carrier phase measurement

GNSS Accuracies (1)

- Real Time Kinematics (RTK):
  - Horizontal: 8 mm + 1 ppm RMS
  - Vertical: 15 mm + 1 ppm RMS
  - Initialization Time: Tipically < 10 s
  - Initialization Reliability: Tipically > 99.9%
- Post-processing Static:
  - Horizontal: 3 mm + 0.1 ppm RMS
  - Vertical: 5 mm + 0.4 ppm RMS
  - Baseline Length: ≤ 300 km

Hardware

- Size (H × W): 135 mm × 116 mm (5.3 in x 4.6 in)
- Weight: 1.1 kg (2.4 lb)
- Environment
  - Operating: -40°C to +85°C (-40°F to +185°F)
  - Storage: -55°C to +85°C (-67°F to +185°F)
- Humidity: 100% condensation
- Dust and Water Proof: IP67
- Shock and Vibration: 2 m (6.56 ft) fall onto concrete
- LCD: 128 x 64 dpi sunlight readable with function/accept buttons

Certifications and Calibrations

- FCC Part 15 (class B Device), FCC Part 22, 24, 90; CE Mark; C-Tick; Bluetooth EPL; IGS & NGS Antenna Calibration; MIL-STD-810G.

Communications and Data Recording

- Serial:
  - 1 x 7-pin LEMO port (external power, RS-232)
  - 1 x USB 2.0 port (USB data download, USB update)
- Network Modem: Internally integrated 3.75G modem
  - HSPA+ 21 Mbps (download), 5.76 Mbps (upload)
  - WCDMA 900/1700/1900/2100
  - EDGE/GPRS/GSM 850/900/1800/1900
- Bluetooth®: Internally integrated multimode system compatible with Android, Windows Mobile and Windows desktop operating systems
- WiFi: 802.11 b/g/n, access point mode
- UHF Radios(2): Protected TNC Female
  - Standard Internal Rx/Tx: 410 MHz to 470 MHz
    Transmit Power: 0.5 W to 2 W
    Protocol: CHC, Trimble, Pacific Crest
    Range: 5 km under optimal conditions
- Protocols:
  - CMR, CMR+, SCMRX input and output
  - RTCM 2.x, RTCM 3.x input and output
  - NMEA 0183 output
  - HCN, HRC and RINEX static formats
  - NTRIP Client, NTRIP Caster
- Data Storage:
  - 32 GB high-speed memory

Electrical

- Power Consumption: 3.8 W (depending on user settings)
- Li-ion Battery Capacity: 2 × 3400 mAh, 7.4 V
- Operating Time(3):
  - RTK UHF Base: 6 h
  - RTK Rover: 8 h to 10 h
  - Static: 12 h
- External Power: 12 V DC to 36 V DC

(1) Accuracy and reliability specifications may be affected by multipath, satellite geometry and atmospheric conditions. Performances assume minimum of 5 satellites, follow up of recommended general GPS practices. (2) UHF is an option and UHF type approvals are country specific. (3) Operating time varies based on temperature.

Specifications are subject to change without notice.

8.

CO-ORDINATES OF THE DGPS SURVEYED POINTS OF NEW EMRS SCHOOL AT VILLAGE-SURHI, RANGE-NARHARPUR, DIVISION-NORTH BASTAR KANKER

S.N.	LATTITUDE	LONGITUDE
BASE POINT	**20° 29' 00.23999" N**	**81° 40' 01.83719" E**
BP01	20° 29' 02.70960" N	81° 40' 06.80520" E
BP02	20° 29' 01.00679" N	81° 40' 06.42000" E
BP03	20° 29' 00.90959" N	81° 40' 07.13640" E
BP04	20° 29' 00.42359" N	81° 40' 06.58560" E
BP05	20° 29' 00.40920" N	81° 40' 05.50920" E
BP06	20° 29' 00.61439" N	81° 40' 04.16279" E
BP07	20° 29' 00.26159" N	81° 40' 02.41320" E
BP08	20° 28' 59.82599" N	81° 40' 01.18559" E
BP09	20° 28' 59.73240" N	81° 40' 00.13439" E
BP10	20° 28' 58.94760" N	81° 39' 59.11200" E
BP11	20° 28' 58.25999" N	81° 39' 58.57559" E
BP12	20° 28' 57.05760" N	81° 39' 57.88439" E
BP13	20° 28' 55.30079" N	81° 39' 57.52439" E
BP14	20° 28' 54.14520" N	81° 39' 57.36600" E
BP15	20° 28' 54.15239" N	81° 39' 57.65040" E
BP16	20° 28' 53.07600" N	81° 39' 57.62519" E
BP17	20° 28' 53.09399" N	81° 39' 54.93240" E
BP18	20° 28' 53.10839" N	81° 39' 52.63919" E
BP19	20° 28' 54.86159" N	81° 39' 52.81919" E
BP20	20° 28' 55.09200" N	81° 39' 51.38279" E
BP21	20° 28' 55.45560" N	81° 39' 51.24960" E

BP22	20° 28' 55.90559" N	81° 39' 53.20079" E
BP23	20° 28' 57.74879" N	81° 39' 53.24399" E
BP24	20° 29' 00.31920" N	81° 39' 53.49240" E
BP25	20° 29' 03.39719" N	81° 39' 53.62559" E
BP26	20° 29' 03.64200" N	81° 39' 55.63079" E
BP27	20° 29' 02.86800" N	81° 39' 55.73519" E
BP28	20° 29' 02.84280" N	81° 39' 58.02839" E
BP29	20° 29' 02.81399" N	81° 40' 00.71400" E
BP30	20° 29' 02.77799" N	81° 40' 03.82439" E
GCP1	20° 29' 16.47239" N	81° 40' 43.94639" E
GCP2	20° 29' 39.88320" N	81° 39' 59.18760" E

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Fixation of Base points

Fixation of boundary points

Fixation of boundary points