

WELCOME: IGF 2015 : PRESENTATION



“LARGE SCALE DTDB FOR SUSTAINABLE PLANNING & DESIGN OF COAL MINING”

by

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ROLE /EVOLUTION OF MAPPING

PRE 1990

PRINTED HARD COPY (DUMB)

- ❖ Mapping started in India during regime of Maj Gen Robert Clive, who was Commander of British Forces in India.
- ❖ Maps being sensitive were earlier , classified publications till 1950, available only for official use.



ROLE /EVOLUTION OF MAPPING

1990-2000

DIGITAL MAPS

- ❖ VECTOR MAPS
- ❖ IMAGE MAPS
- ❖ TRN MODEL
- ❖ DTED
- ❖ MERGED PRODUCTS



ROLE OF MAP HAS CHANGED NOW

21ST CENTURY:- Map has to be function of data bases.
Cartography design depends upon the user's need and demand.

ELECTRONIC /INTERACTIVE/SMART MAPS

- ❖ GIS MAPS , 3D MAPS
- ❖ ORTHO PHOTO, FLY THROUGH
- ❖ PRODUCTS OF LIDAR TECH
- ❖ INTEGRATED PRODUCTS WITH INFO LIKE
 - TOPO & TERRESTRIAL DETAILS
 - GEOINT ANALYSIS
 - AERONAUTICAL CHARTS
 - MET, GEOLOGICAL AND SOIL DATA
 - GEO WATER TABLE ETC.



INFLUENCE OF ICT IN CARTOGRAPHY

- **ICT started influencing cartography since mid of 20th century.**
- **Digital mapping & GIS applications are the need of hours. It is the prime role now for Cartographers.**
- **Internet and web services are redefining how maps can be interactively used in real time situations.**



About Survey of India:-

SURVEY OF INDIA under DST is the National Mapping Org, serving the Nation since 1767.

OUR VISION

To provide user focused, cost effective, reliable and quality geospatial data, information and intelligence for meeting the needs of national security, sustainable national development, and new information markets.

OUR MISSION

To dedicate itself to the collection and applications of geospatial data, and promoting exchange of information, ideas, and technological innovations amongst the data producers.



Contd...

Our Objective & Activities:-

- Adviser to the Government of India on all survey matters, viz Geodesy, Photogrammetry, Mapping & Map Reproduction.

Our Main duties and responsibilities :-

- All Geodetic Control (Horizontal and Vertical) and Geodetic and geophysical Surveys.
- All Topographical control, Surveys and Mapping within India.
- Mapping and Production Of Geographical maps and Aeronautical Charts.
- Surveys for Developmental Projects.
- Large-scale Cities, Guide Maps & Cadastral Surveys etc.
- Survey and Mapping of special purpose maps.
- Spelling of Geographical names.
- Demarcation of the External Boundaries of the Republic of India, their depiction on maps published in the country and also advice on the demarcation of inter-state boundaries.



Contd...

Our Product Archives:-

1. Topographical Maps
2. Open Series Maps (OSMs)
3. Defence Series Maps (DSMs)
4. General Wall Maps:- World Map, India-Political, phisical,Road,Railway maps etc.
5. State Map Series
6. Plastic Map Series
7. Tourist Map Series
8. Trekking Map Series
9. Antique Map Series
10. District Planning Map Series
11. Thematic Maps
12. Educational Maps /Topographical Maps
13. Outline Map Series
14. Tidal & Sea Surface Data



Contd...

15. Magnetic Data

16. Photo Maps

NB: 1. Most of product are available in Hard Copy as well as Digital / Soft Copy Format .

2. Topographical Maps of 250K, 50K, 25K Scale // Open Series Maps in 50K Scale // Defence Series Maps in 50K Scale are available in Digital Vector Format.

HENCE :

- ☛ **Sol is a Warehouse having vast repository of Geospatial Data.**
- ☛ **Sol has great potential for Geospatial Data Creation using all modern technology.**



Geospatial Data & its Use

- Geospatial data and services are presently required in all types of developmental projects.
- *Geospatial Product of Sol and other Govt. and private Data Creating Agencies need meaningful attention of Data Enhancement / Value Addition Agencies & Data User Agencies.*
- Geospatial Industry and various Govt./Private organisations can play important roles in this aspect.



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Optimal Use of data for Geospatial Applications for Sustainable Development & National Security Depend on:-

- ➡ Smooth Geospatial Data flow/sharing between Data Creating Agencies, Data Enhancement/Value Addition Agencies and User Agencies
- ➡ Availability of Quality Geospatial Data w.r.t. Accuracy & Content

IMPEDIMENTS.....

- **Restriction Policy** of MoD on Sol data as per User Agencies

SOLUTION.....

- ➡ National Map Policy-2005 is already in place.
- ➡ A Comprehensive Restriction Policy with Data sharing modalities need to be promulgated and revised periodically.



Digital Topographical Data Base (DTDB)

- ✓ The relationship that, a depicted feature on the map has to its actual size in the real world is known as the **Map Scale**.
- ✓ The map data in the form of computer readable file/(s) is referred to as **“Digital Topographical Data Base” (DTDB)**
- ✓ DTDBs are often described either as Small scale or Large scale based on the **Source Scale**.
- ✓ A **Large Scale DTDB** show small amount of area with greater amount of features and thus most suitable for sustainable planning activities.



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Central Mine Planning and Design Institute (CMPDI):
a public limited company under Coal India Limited(C I L) is a
Govt. of India Enterprise under Ministry of Coal (MoC).

Responsibility

- To assist MoC & Planning Commission for taking strategic decisions relating to coal sectors.
- To extend support on technical and operational matters to CIL and other sister coal producing companies working as an in-house planner and guide them.



Contd....

- ❖ CMPDI is extensively using the Geospatial Technology in all three stages of mining i.e. **Pre-mining** , **Syn-mining** and **Post-mining** .
- ❖ CMPDI/CIL has been conferred “**Geo-spatial World Excellence Award 2012**” for the best application of geospatial technology in mining sector.
- ❖ CMPDI was mostly using 1:50,000 scale map/data of Survey of India for all its geospatial applications augmenting their created data.
- ❖ Eventually CMPDI felt the great need of **Large scale Digital Topographical Data Base** and thus approached Survey of India (Sol) for the same.



MoU

Both CMPDI & Sol entered into an MoU to pave path for creation of Large Scale DTDBs

No of Coalfields 27 falling in 7 states

Area30,000/= sq.km

Scale1:5,000

No of Sheets.....5814

**Contour Interval2&5 meters for flat &
undulating/hilly terrain**



Input & Output specifications:-

INPUT SPECIFICATION

1. Aerial Photo:-

- Scale :: 1:15,000
- Ground Resolution:: 0.30 m
- Overlap :: Fwd 60% Ltrl. 30%
- Camera :: Large format Digital

2. Satellite Imagery:-

- Satellite :: Worldview-I
- Imagery Type :: Stereo
- Spatial Resolution :: 0.46 m
- Radiometric Resolution :: 11 bit

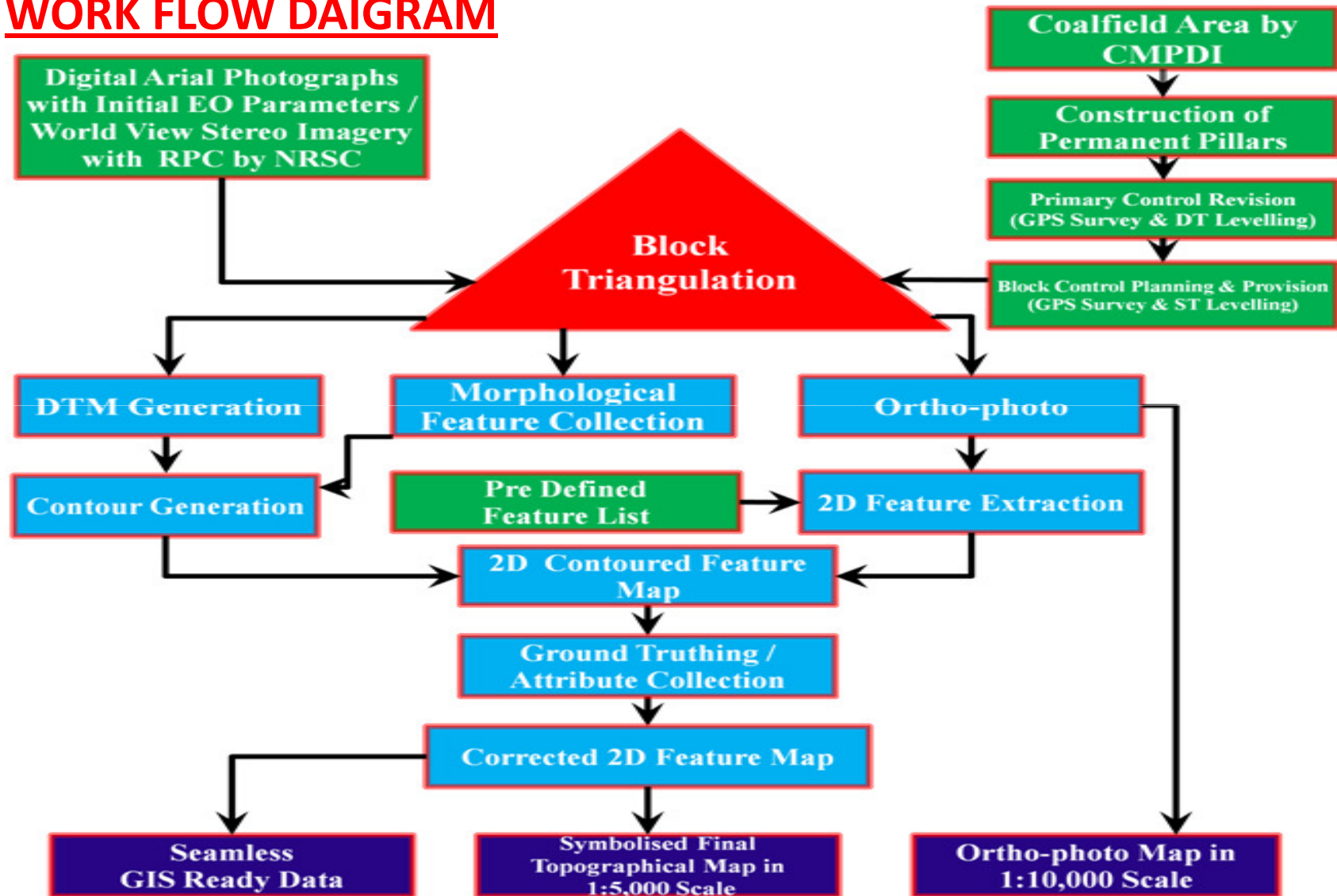
OUTPUT SPECIFICATION

1. Scale of Mapping :: 1:5,000
2. Projecion System ::
 - Projection :: UTM
 - Datum :: WGS-84
 - V Datum :: MSL
3. Sheet Dimension :: 1.5' X 1.5'
4. Sheet size :: 65 cm X 75 cm
5. Secondary Grid :: Coal Grid
6. Text Info :: English
7. Digital Output Format ::
 - Vector (.MDB)/AutoCAD (.DWG)
 - DEM :: Erdas Imagine (.IMG)
 - Ortho Photo :: TIFF / JPEG



Methodology:-

WORK FLOW DAIGRAM



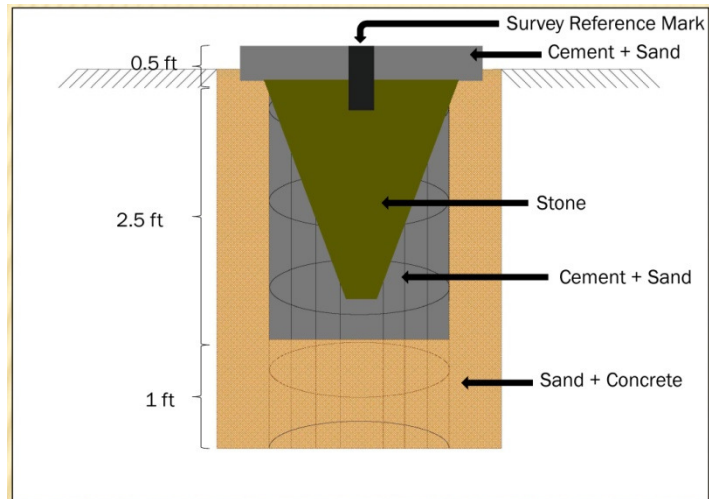


Provision of Permanent Pillars:-

- Area of all 27 coalfields were provided by the CMPDI .
- Area transferred to 1:250k Topographical maps of Sol.
- Planning & Construction of permanent pillars at 20 to 25 km apart.
- Planimetric Co-ordinate Provision in UTM Projection & WGS -84 Datum by 12 hrs DGPS observation.
- Data post processing by Burnese Software using precise ephimeries & data of other round the clock observed points.
- The MSL heights were provided by DT levelling.



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Construction of permanent GCP Pillar for CMPDI Project.





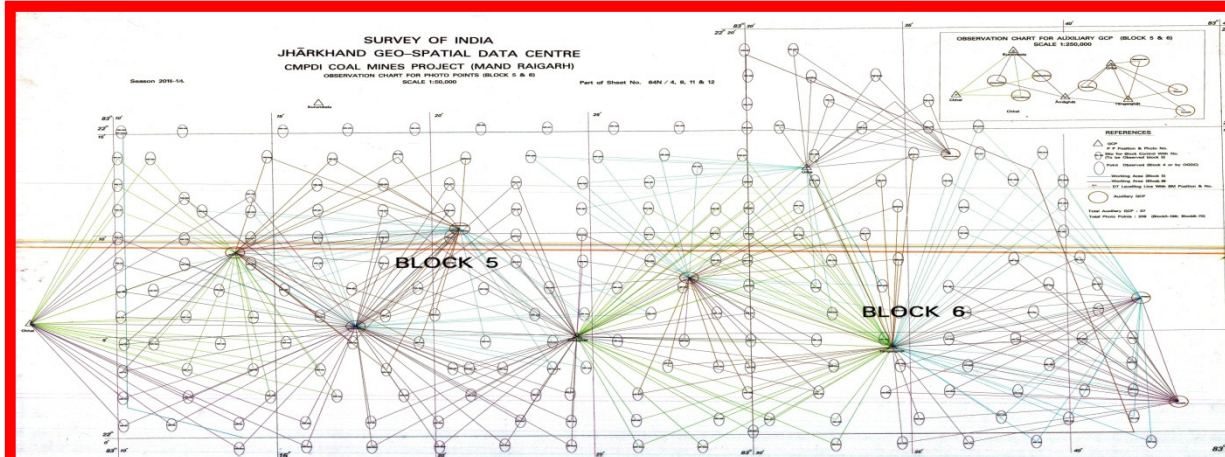
Aerial Photography & Block Control Provision:-

- ☐ NRSC provided Aerial Photographs of 27 coalfields with Initial EO-Parametres & World View-I High Resolution Stereo Imagery with RPC for one Coalfield.
- ☐ Photographs divided into Photogrammetric Blocks.
- ☐ Block Control Planning done by marking Photo Points as per standard photogrammetric requirement/ thresholds.
- ☐ Planimetric Block Control Provision by 1 hour DGPS observation as Rovers with two permanent pillars as master points.
- ☐ Post Processing of GPS Data by TGO/TBC Software
- ☐ MSL height provision by a closed ST levelling.

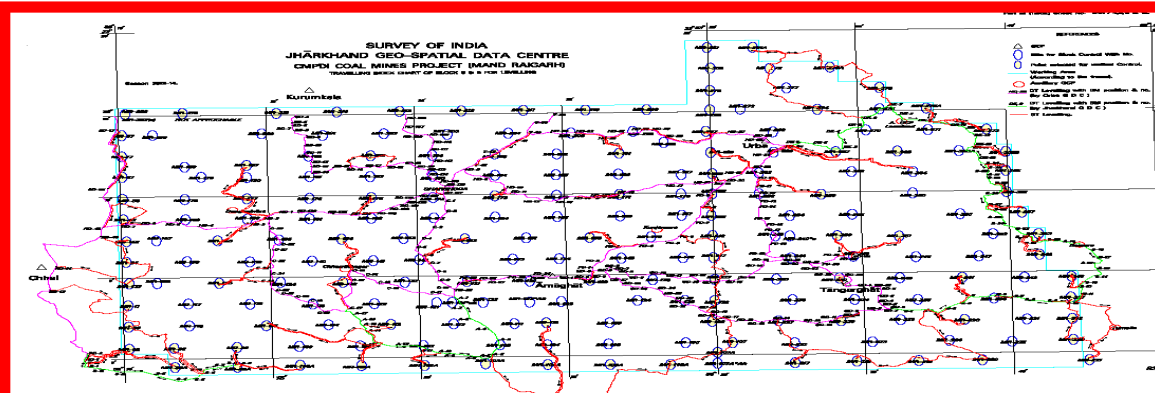


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GPS Observation Plan



Levelling Plan





Block Adjustment, Feature Extraction & Contour Generation:-

➤ Block Adjustment by Digital Photogrammetric Workstation (DPWS) with Appln. S/w Leica Photogrammetric Suite (LPS).

-Threshold RMSE was set at less than one Pixel.

➤ The DEM and Ortho photos generated using the auto extraction utility of the LPS S/w.

➤ The Orthophoto of dimension 3'x3' sheets were created.

➤ 2D feature extraction carried out from Ortho-photo using Microstation Software.

➤ Ortho-photo map also prepared from the same.



Contd....

- The automated DEMs were edited to get corrected DTMs.
- Contours generated using DTMs and morphological 3D Features
- 2D Features & Contours finally merged to get the desired DTDB.

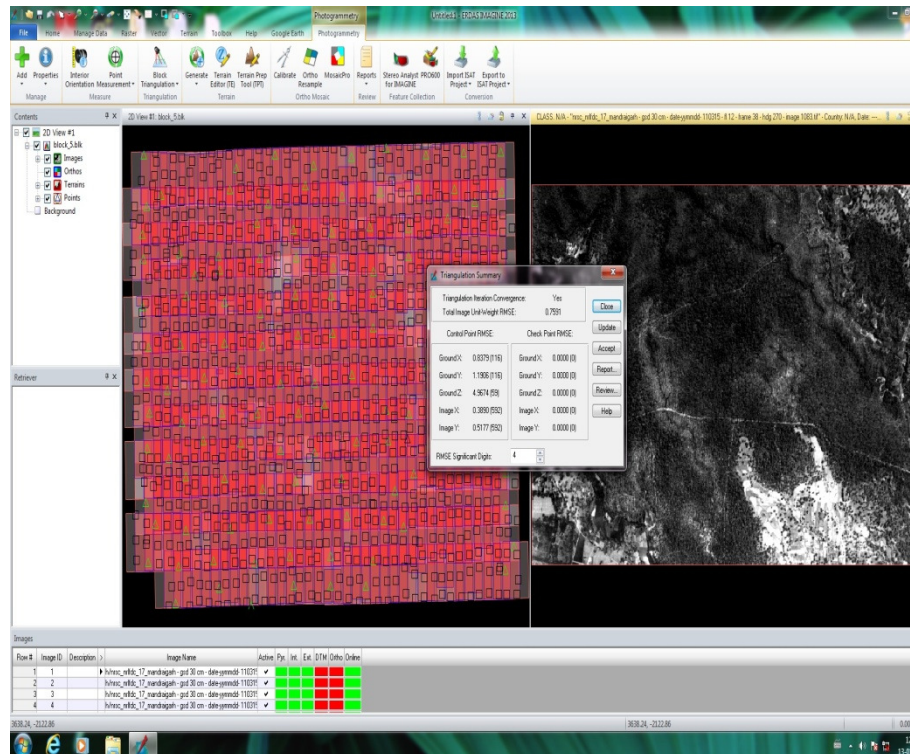
Note:

1. DEMs from LPS include heights of building, trees and other heightened features etc. thus are Digital Surface Models(DSM). Therefore, DEMs got edited to obtain Digital Terrain Models (DTMs) which together with Morphological features used for generation of contour lines.
2. 2D feature extraction from Ortho-photo was not found suitable in hilly area thus a hybrid method was resorted to. All linear & area features were extracted by 3D Digitization & Point features by 2D digitization.

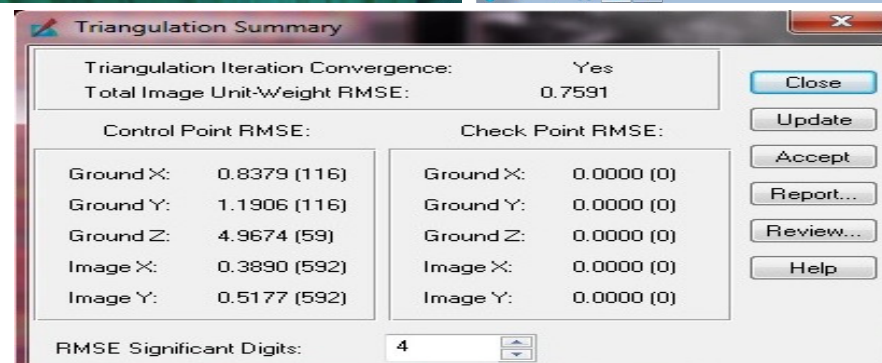
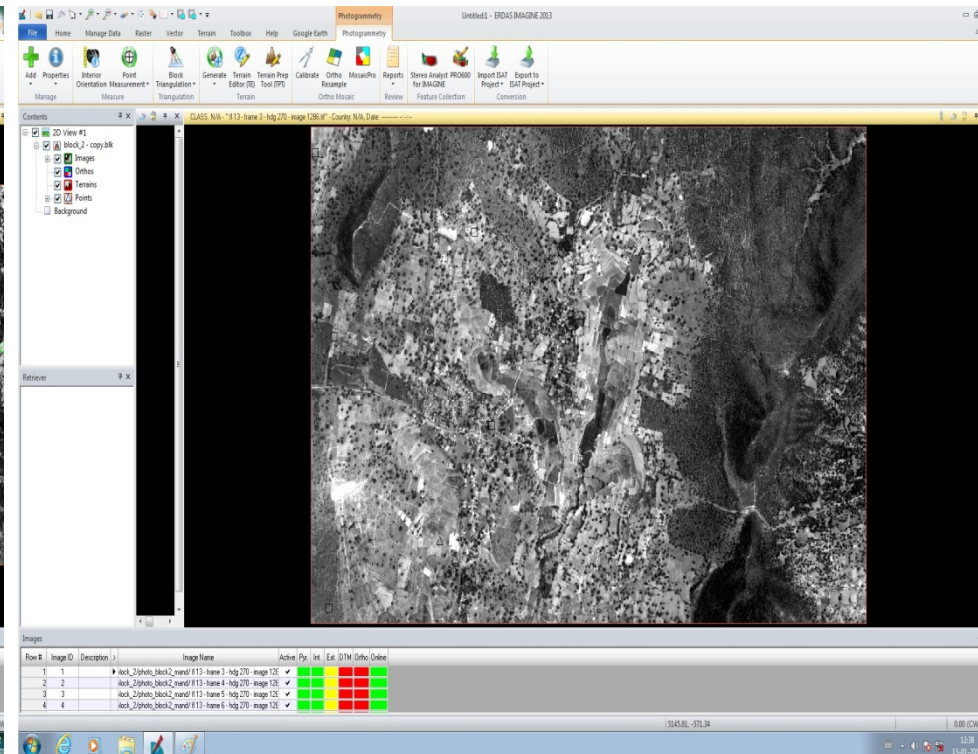


Contd....

BLOCK ADJUSTMENT



STREO MODEL



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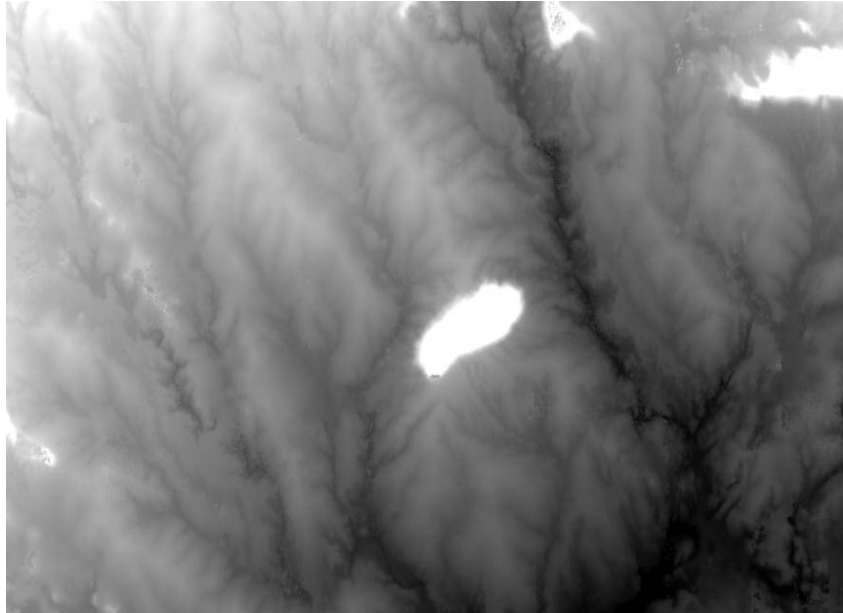
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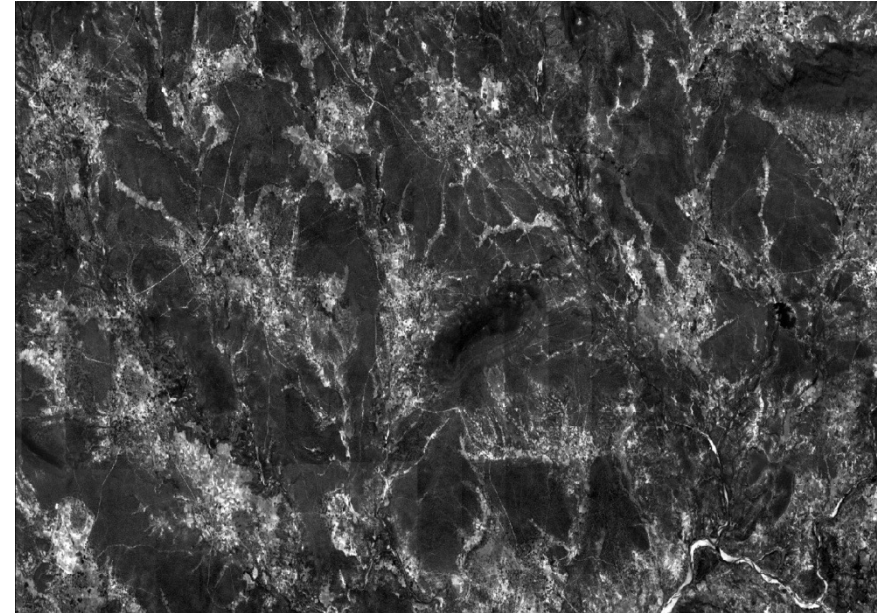


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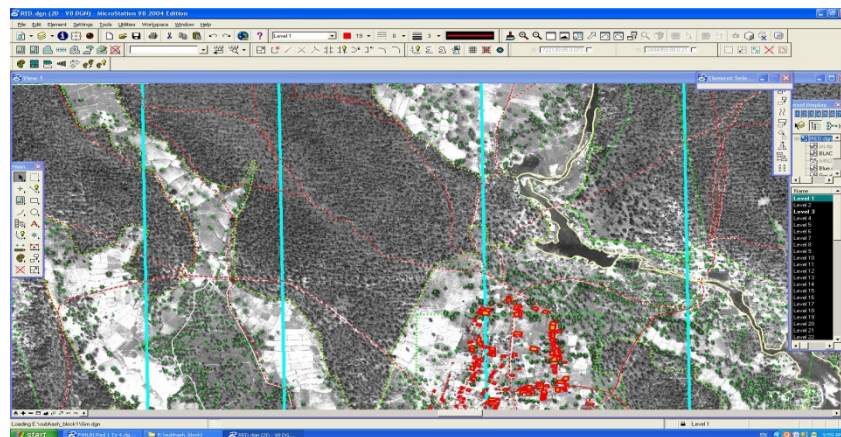
DTM



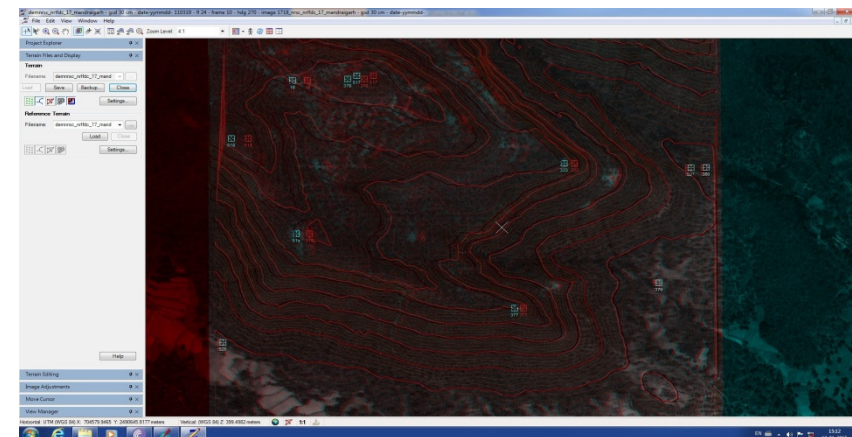
ORTHOPHOTO



2D DIGITIZATION



CONTOUR GENERATION & EDITING USING DPWS



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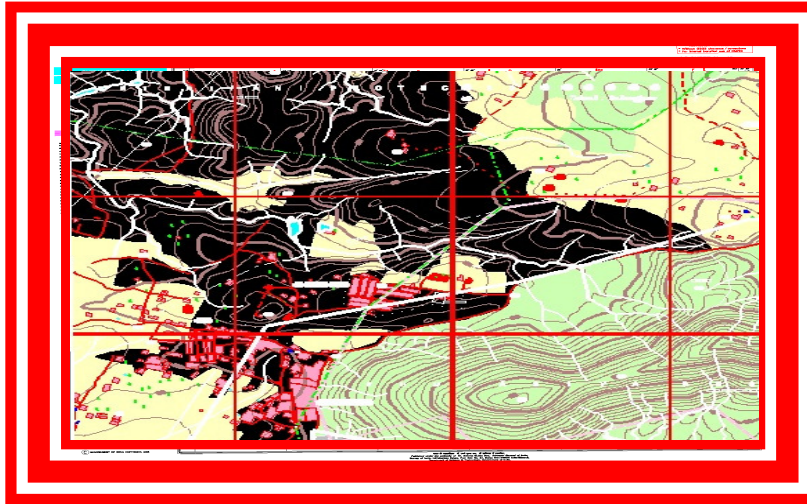
Field Verification & Final Map Creation:-

- Ground Truthing of Vector data in 1:5,000 scale Map Sheets .
- Features of Map Sheets checked for photogrametric misinterpretation, omissions etc. and corrected.
- Textual Information viz names of features & administrative boundary information etc. were also recorded meticulously.
- DTDBs were corrected with respect to the field verified data/records.
- Digital Cartographic Symbolization of Corrected DTDBs for symbolised Hard Copy Maps sheets in 1:5,000 scale with Contour Interval 2 & 5 metres.
- Conversion of Corrected DTDBs in CAD format into seamless GIS ready data.

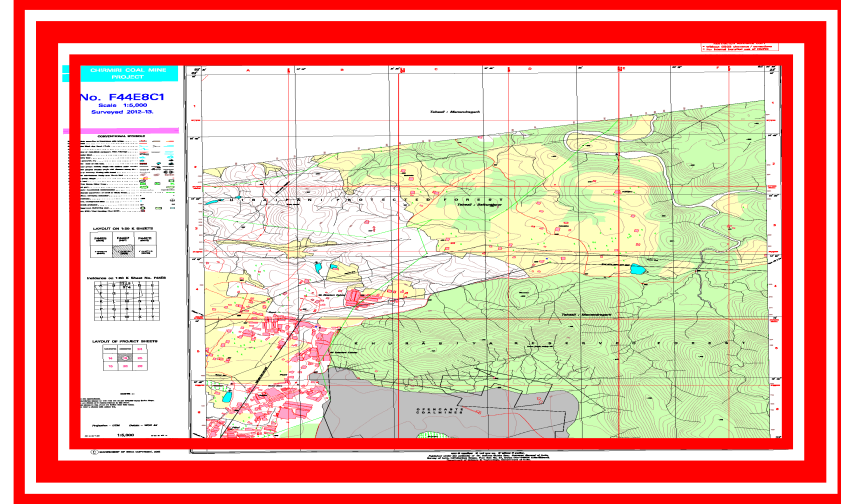


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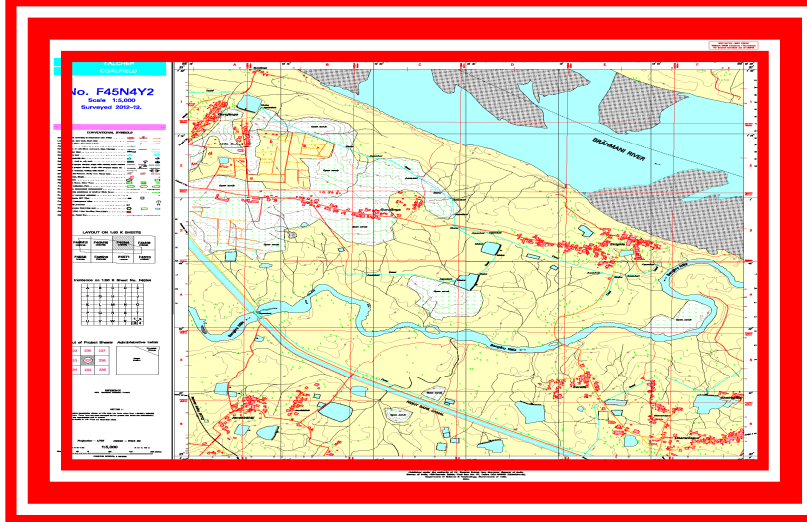
Final DTDB



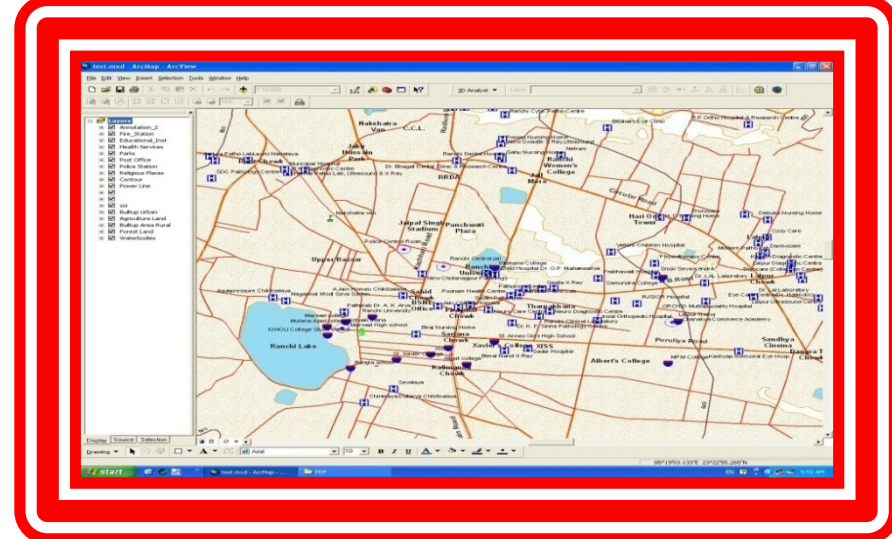
Field Verification Plot



Final Hard Copy Map (Exhibit in Sol Enclosure)



Seamless GIS Ready Data





Conclusion:-

- ✓ DTDBs are scale free but its accuracy depends on the Source Scale i.e. the scale in which the basic data has been acquired.
- ✓ Source Scale of DTDBs of this project is 1:5K thus being described as Large Scale DTDB.
- ✓ Large Scale Geospatial Data most suitable for micro level sustainable planning as visualised by CMPDI, an eminent and efficient user of Geospatial Data & services.
- ✓ SOI is in the process of classifying this data set as “Unrestricted” to facilitate Data Sharing.
- ✓ Non-duplication of Surveying & Mapping activities & Data Sharing is promoted by Govt. of India through NSDI.



Contd....

- ✓ This DTDBs being in UTM Projection & WGS-84 Datum facilitates easy integration of organisation specific features collected by Hand held /Differential GPS etc.
- ✓ Availability of Large Scale DTDB will prompt all to use geospatial technology in their field of operations adding value to the data.
- ✓ Large Scale DTDB creation , which contains great amount of features in small area needs thorough ground truthing and thus, substantiates SOI's claim **“Sol knows every inch of the nation because it maps every inch of it”**.

**LET US PROMOTE GEOSPATIAL APPLICATION FOR
NATIONAL DEVELOPMENT**



INTERNATIONAL MAP YEAR 2015-16

- ICA (International Cartographic Association) has been endorsed by UN-GGIM (United Nations Global Geospatial Information Management) to run 2015-16 as International Map Year.
- Aim is to highlight the role of modern maps, and all types of Geo-information in society, economy and policy making.

LET US PROMOTE GEOSPATIAL APPLICATION FOR NATIONAL DEVELOPMENT



Feedback/Suggestions

Welcome

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