NLRMP - HARYANA

Cadastral Survey/Re-survey using HRSI: Haryana Experience

Sponsor Agency:
DOLR, GOI &DLR-Haryana

Executing Agency:
Haryana Space Applications Center (HARSAC)
DST, Govt. of Haryana

Dr. Sultan Singh, Sr. Scientist, NRDMS- HARSAC, Hisar
State Project Coordinator- NLRMP Haryana
Sultan_harsac@yahoo.co.in

February 17, 2014

HARSAC

- Registered Society under DST, GoH
- Established: 1986
- Projects Completed : 115
  Ongoing : 25

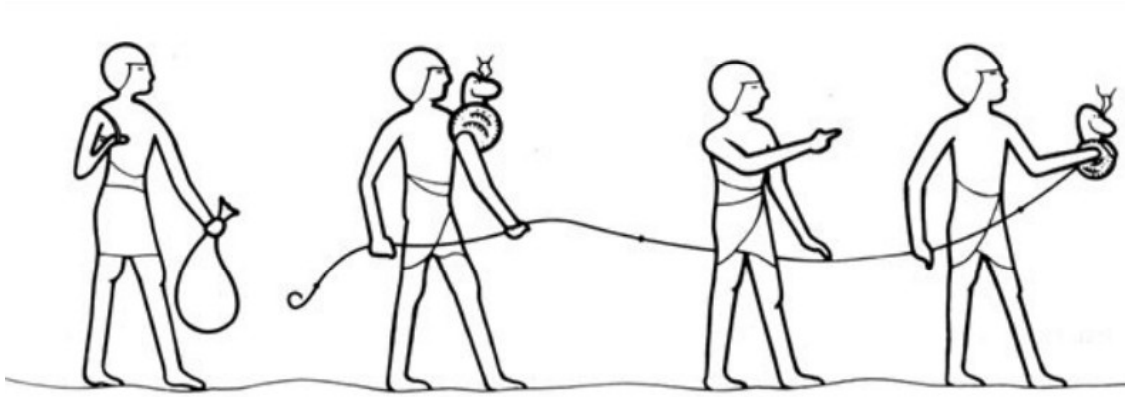
VISION

- Promoting G- Governance

MISSION

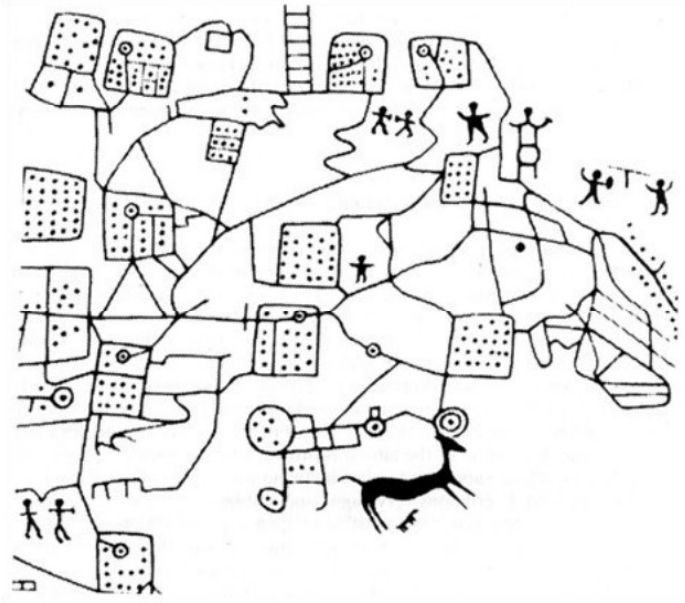
- Act as a Nodal Agency for Geospatial Applications
- Management of Natural Resources
- Promoting Education & Training in RS & GIS

Surveying in the Early days:

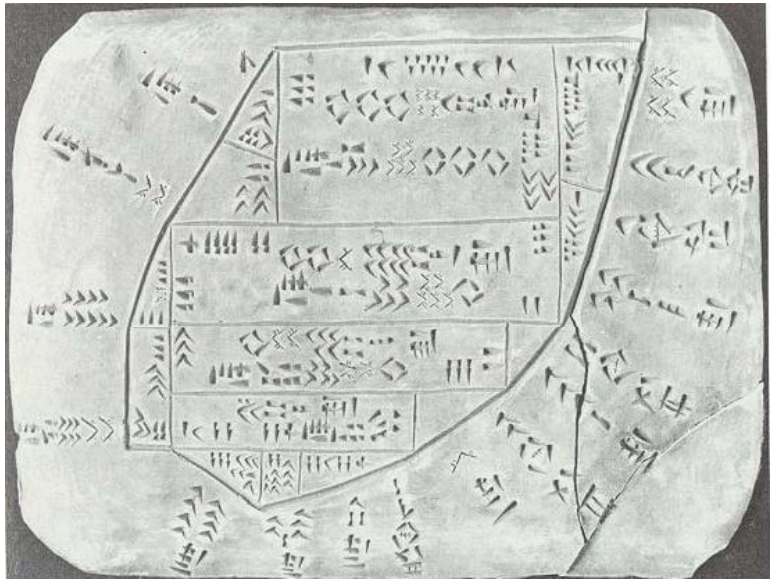


Egyptian Surveyors at work Source: Land Registration and Cadastral Systems (Gerhard Larsson)

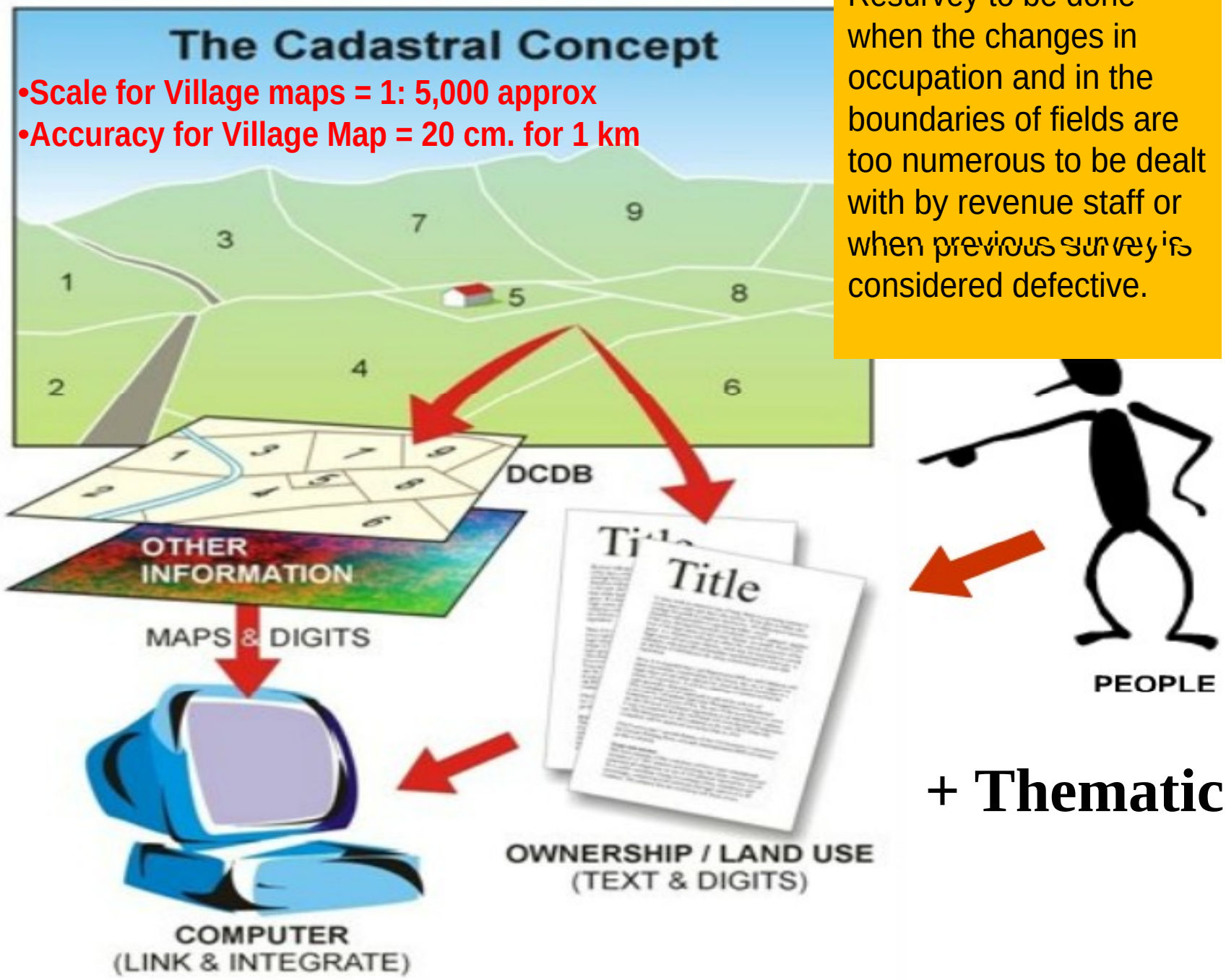
Plan made about 1600 – 1400 bc



Source: Land Registration and Cadastral Systems (Gerhard Larsson)



Cadastral Plan - Mesopatamia - 1700 BC


The Cadastral Concept
•Scale for Village maps = 1: 5,000 approx
•Accuracy for Village Map = 20 cm. for 1 km
1
2
3
4
5
6
7
8
9
DCDB
OTHER INFORMATION
MAPS & DIGITS
COMPUTER
(LINK & INTEGRATE)
Title
OWNERSHIP / LAND USE
(TEXT & DIGITS)
PEOPLE
Resurvey to be done when the changes in occupation and in the boundaries of fields are too numerous to be dealt with by revenue staff or when previous survey is considered defective.
+ Thematic

Suitable Methodology Depends on

- Existing records and their condition
- Budget & Time
- Area extent to be surveyed
- Capacity available
- Accuracy required
- Terrain conditions
- Land value
- Land use & Land cover (built up, forest, water body etc.)

Cadastral Resurvey Technologies

- **Ground Based**
  - **Total Station**
  - **GPS**
- **Aerial Photogrammetry**
  - **Improved with Kinematic GPS , Computer Controlled Navigation (CCNS) and Inertial Measurement Unit (IMU)**
  - **Differential GPS for control survey**
  - **Automated aero-triangulation**
  - **DTM & Orthorectification**
- **Satellite Photogrammetry**
  - **High resolution satellite data availability**
  - **Differential GPS for rectification**
  - **DTM & Orthorectification**

Satellite Photogrammetry

1. High resolution satellites started a new era of earth observation and digital mapping
2. Ikonos, Quickbird, Cartosat-1 & 2, Geo Eye-1, Worldview-1&2, Kompsat and many more

Launch of above satellites has opened up a new horizon of applications like :

- Cadastral mapping with accuracy in cm.
- DEM/ DTM mapping for revenue lands
- Minimum Control Points Required for land demarcation
- Urban planning
- Transportation…..

Details of High resolution satellites

	KOMPSAT	Quickbird	Cartosat-2/2B	Worldview-1/2	GeoEye-1
Launch	May 17,2012	Oct 18, 2001	Jan 12, 2007 July 12, 2010	Oct 8 , 2009	Sep 6, 2008
Pixel size	PAN – 0.7 m MX – 2.8 m	PAN -0.61 m MX - 2.44 m	PAN – 0.8 m	PAN – 0.46m MX – 1.84m	PAN- 0.41 m MX- 1.65 m
Swath	17 km	16.8 km	9.6 km	16.4 km	15.2 km
Quantization	14 bit	11 bit	10 bit	11 bit	11 bit
Stereo Acquisition	Yes	Yes	Yes	Yes	Yes

Advantages of using Satellite data

- Area coverage is more
- Less Ground work
- Data acquisition is faster
- Data processing is faster
- Minimum ground control required
- Cost and time effective
- More accurate, precise 3D and 2D mapping
- Error due to slope is removed
- Permanent record of physical features for verification of data and future reference
- Easy data updating
- Existing Network of GPS stations established can be used for network survey

THE REQUIREMENT OF POSITIONAL ACCURACY HAS TO BE UNDERSTOOD AND WE NEED TO TAKE NOTE OF FEATURE SIZE WHEN COMPARED TO ACCURACY NEEDED AND THE MAGNITUDE OF HUMAN ERRORS INTRODUCED IN POINT IDENTIFICATION ON THE FIELD.

ROAD MAP FOR NLRMP IN HARYANA

DLR

HARSAC

Service Provider

NLRMP's Objectives

NLRMP will:

- Build a transparent and integrated system of online real-time land records (including maintenance and updating of textual records, maps, survey and settlement operations and registration)
- Ensure cadastral records mirror the ground reality
- Ensure Automatic Mutation
- Make necessary legal changes/amendments to facilitate the modernization of land records process
- Facilitate conclusive titling system to minimize land/property disputes

What is gap in Indian system

No title records: Revenue records presumptive (Title awarded only through adjudication based on circumstantial evidence)

Deed Registration System: Registration doesn't convey title

Urban records & Registration: separate systems

Multiple handling agencies – lack of coordination

Old and outdated, incomplete and inaccurate cadastral records – graphical + textual

Non updating : Gaps among various records

Solution is Only NLRMP

Where are we

Insecure Title :1.3% loss in India's GDP growth rate due to unclear land titles :World Bank report says

Title & Boundary Dispute :
Costly litigation
- 2% of rural areas, 5% of urban areas, 28% of peri urban areas

Single Task-Multiple Processes, Difficult accessibility to public and interest groups

Resurvey – Not done in last 60 years, – Records don't represent ground reality

Solution is Only NLRMP

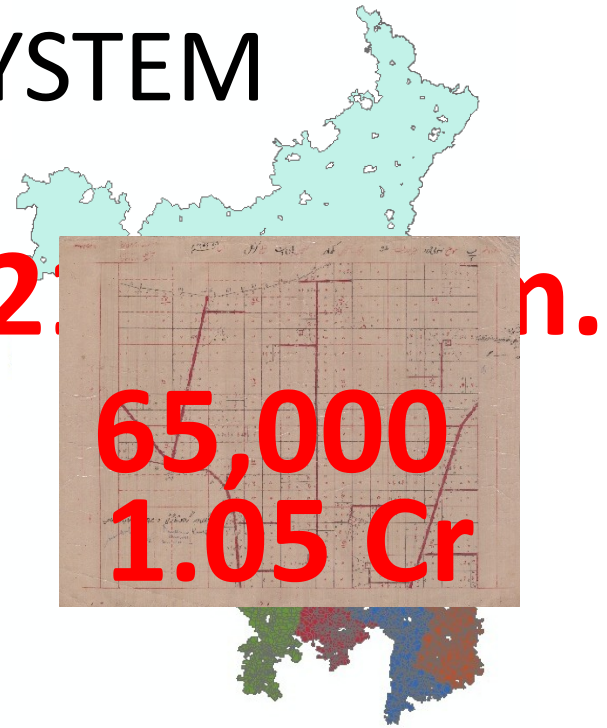
Why NLRMP for Haryana

- Registrations in Year 2010 : >4 lakh
- Revenue Earning for 2010 : 1700 crore
- Registrations in Year 2011 : >6 Lakh
- Revenue Earning for 2011 : 2400 crore
- Registrations in Year 2012 : >7 Lakh
- Revenue Earning for 2012 : 3600 crore

HARYANA REVENUE SYSTEM

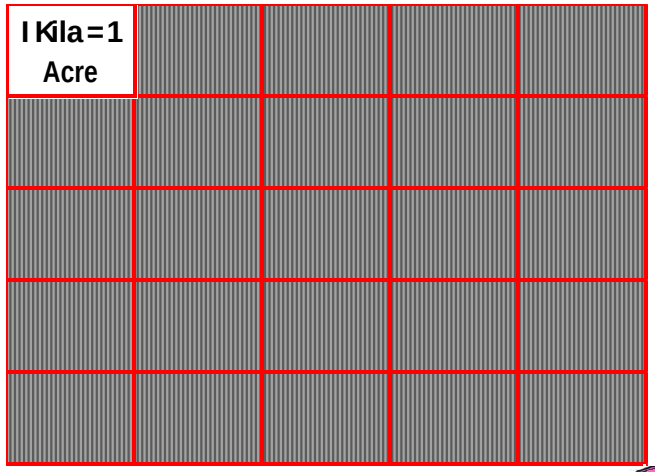
- Statistics

Survey and Settlement 1907-13
Re-Survey for Consolidation 1957-61



- Area — 44,212 Sq. Km.
- Villages — 7085
- Musavies — 65000
- Min. Parcels — 1.05 Cr

- Fairly evolved Land Record System
  - Divided into uniform grids of 1 acre each called Kilas
  - Each 25 Kila grid is called a Murraba
  - 1 Kila = 40*36 Karam
  - 1 Karam = 5.5 feet



Haryana Revenue Setup

- **Number of Divisions: 4**
- **Number of Districts: 21**
- **Number of Sub-Divisions: 56**
- **Number of Tehsils: 74**
- **Number of Sub-Tehsils: 48**
- **Number of Kanoongo Circles: 256**
- **Number of Patwar Circles: 2691**
- **Number of Villages: 7085**
- **Total Geographical Area of State: 44212**

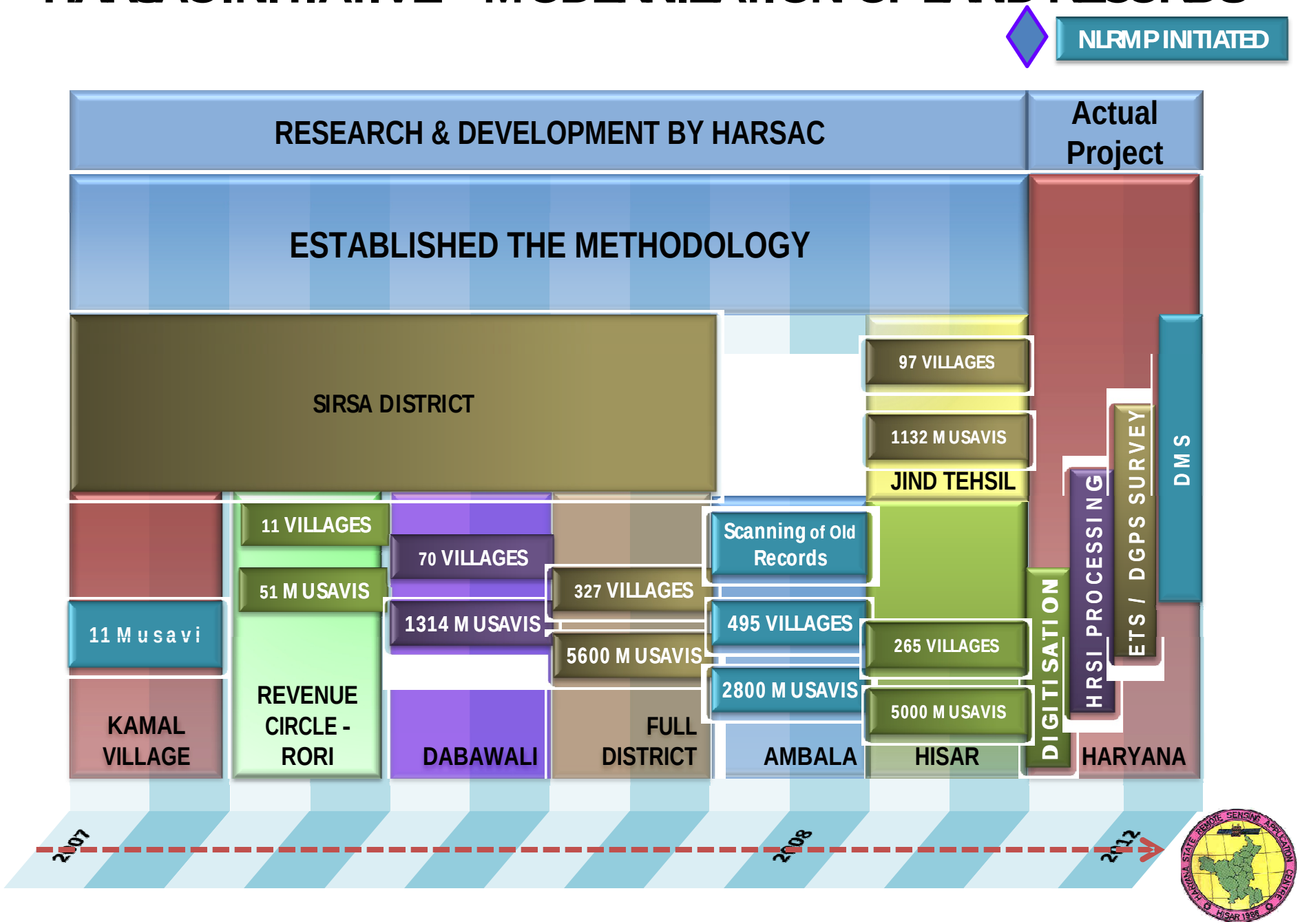
(Sq. Kms.)

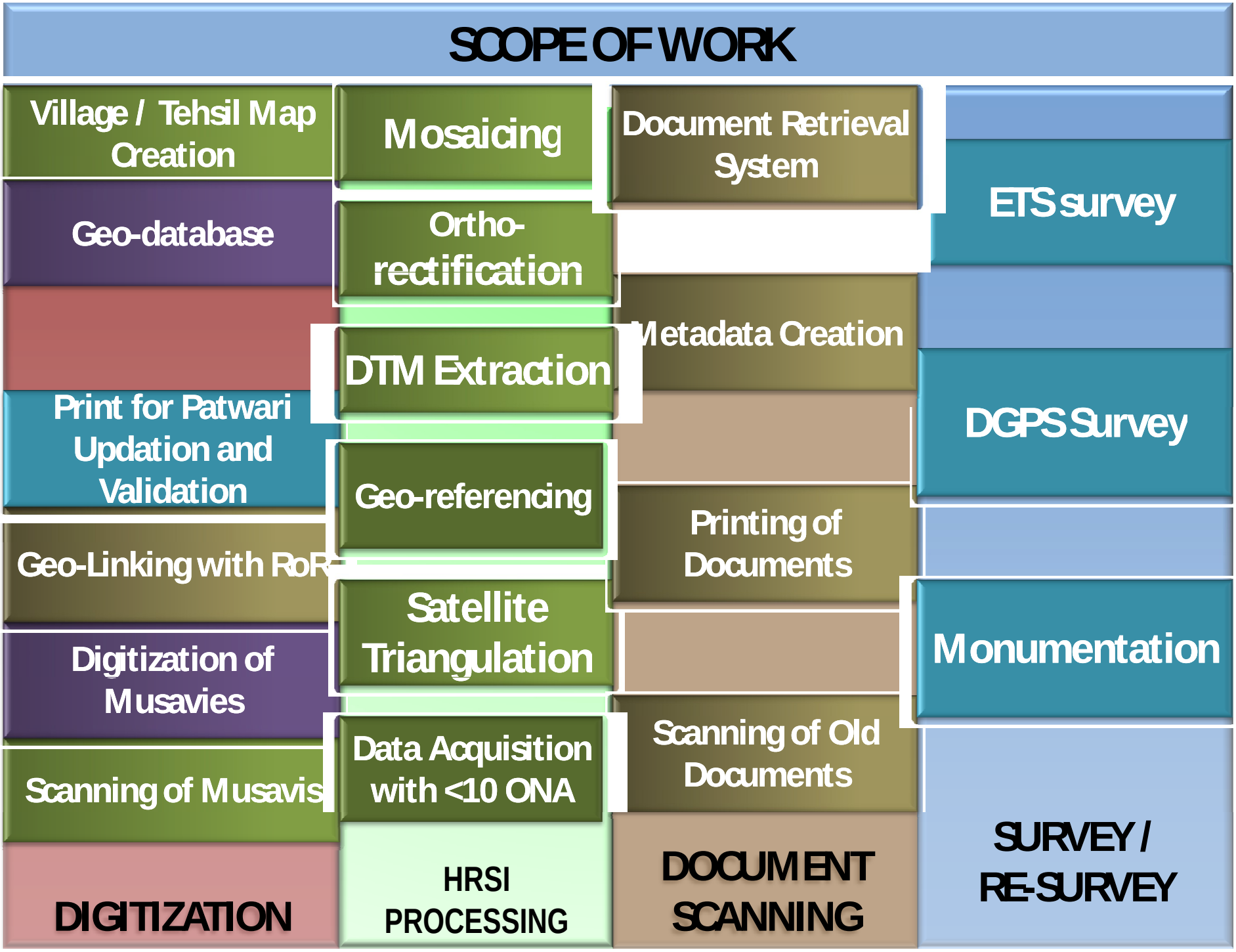
NLRMP-Haryana Physical Status		No.
Mussavies Digitization and Printing		
	No of Mussavies Collected and Scanned	**64288**
	No of Mussavies Digitized	**64288**
	No of Mussavies Created *(In case of missing/ Damaged)*	**1085**
	No. of Mussavies Printed on Matt Film	**64288**
Mussavies Updation and 11B/11C status:		
	Total No of Villages	**7030**
	No. of Villages where 11B completed by Patwari (as per DRO report)	**5754**
	No. of Villages where 11C completed by Patwari	**5754**
	No. of villages where Mussavies Updated	**5417**
	11B accepted by vendor (No of villages)	**4879**
Scanning of Revenue documents (DMS) Total documents as per RFP		**49500000**
	Documents Scanned pages	**>5000000**
Stereo Satellite Data Collection : Acquisition of satellite data has been done by NRSC and supplied to HARSAC		
	Survey/Resurvey using village identified	**510**
	No of Villages where Survey/Resurvey completed	**12**
	Jalsa-E-Aam completed village	**6**
	Jalsa-E-Aam Schedule	**15**

Monumentation and DGPS Survey

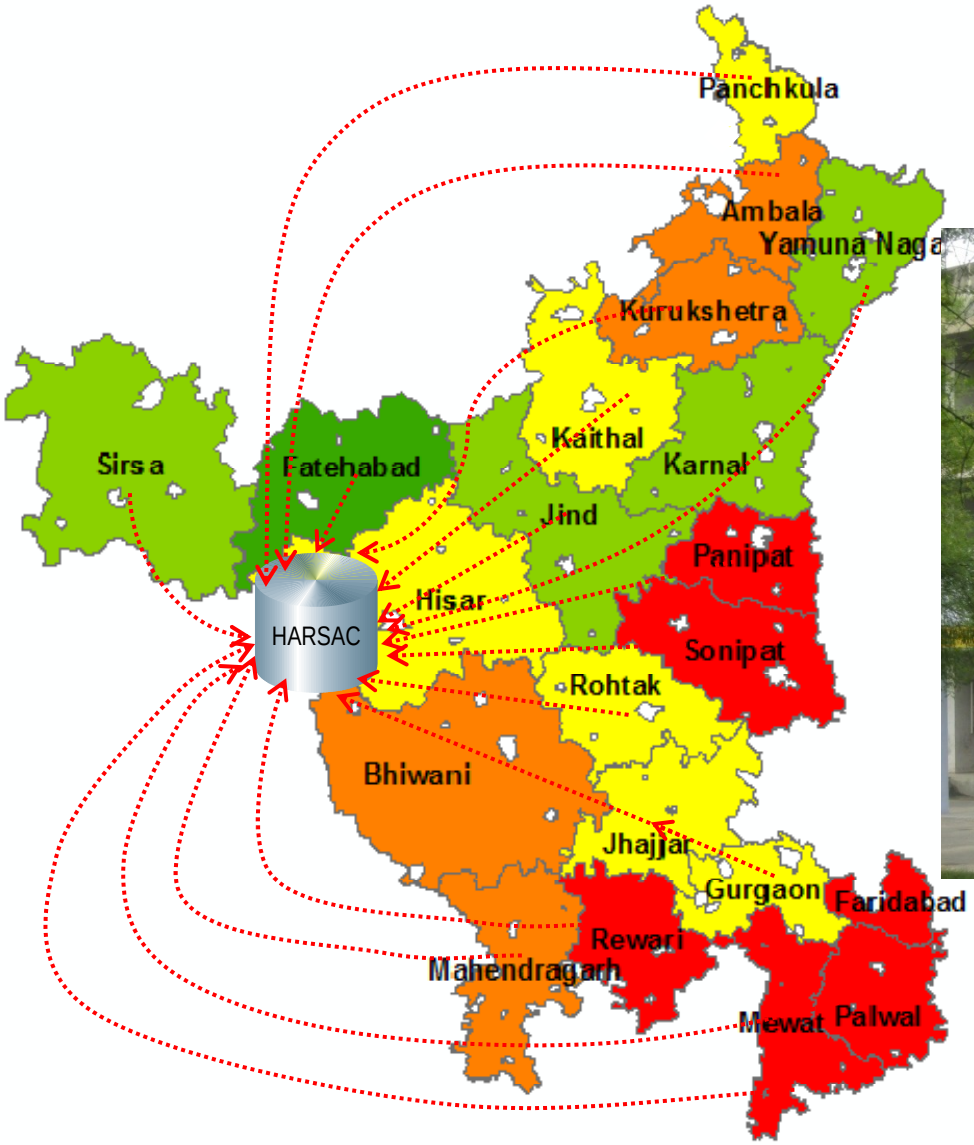
Control Points Installation	
Primary Control Point (PCP)	121
Secondary Control Point (SCP)	589
Tertiary Control Points (TCP)	3000 (out of 18757)
Total	**3710**
Control Points DGPS Survey	
SOI-PCP	35
Primary Control Point (PCP)	121
Secondary Control Point (SCP)	589
Tertiary Control Survey(TCP)	3000(out of 18757)
Total	**3745 Points**

HARSAC INITIATIVE – MODERNIZATION OF LAND RECORDS



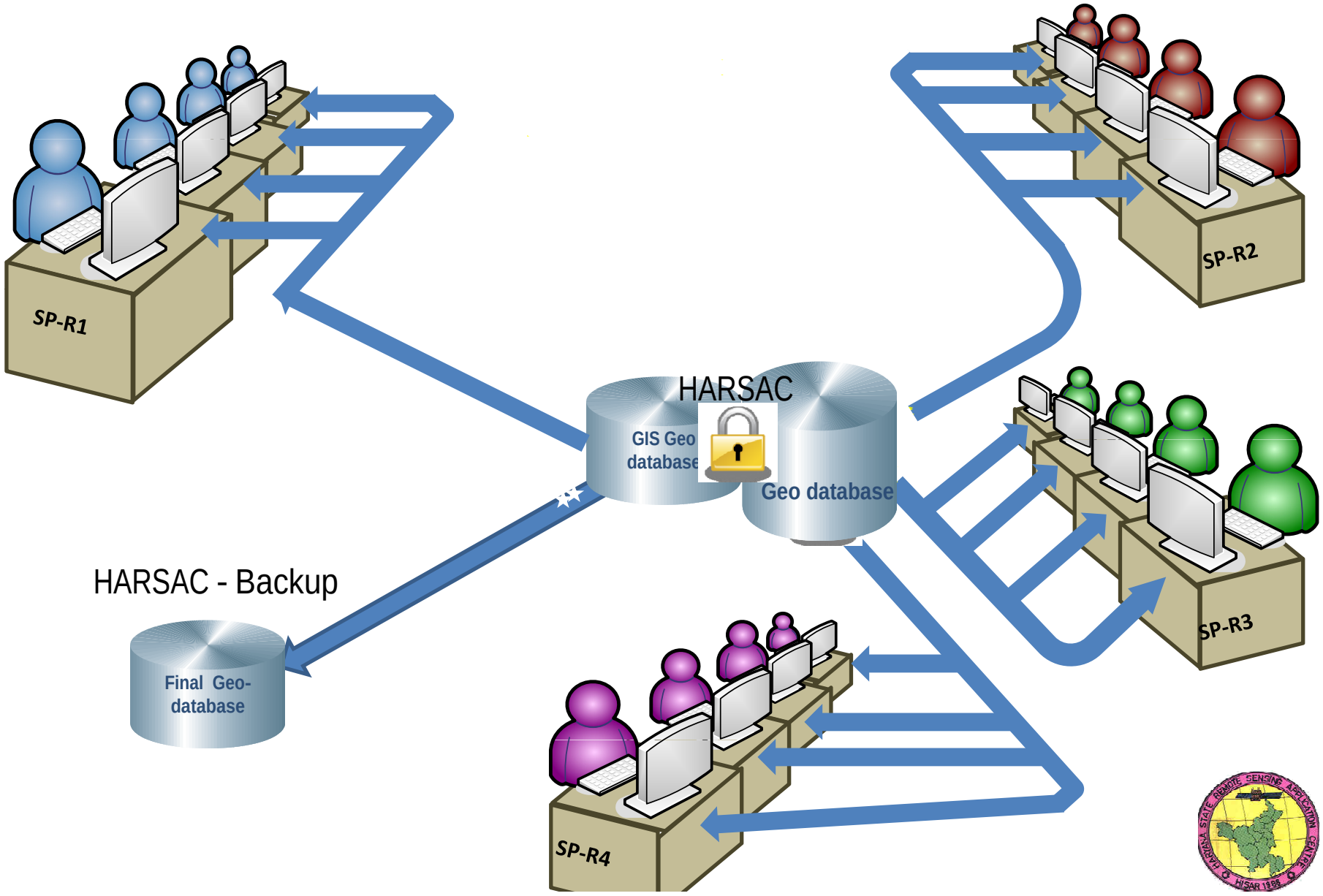

SCOPE OF WORK
Village / Tehsil Map Creation
Mosaicing
Document Retrieval System
ETS survey
Geo-database
Ortho-rectification
Metadata Creation
DTM Extraction
DGPS Survey
Print for Patwari Updation and Validation
Geo-referencing
Printing of Documents
Geo-Linking with RoR
Satellite Triangulation
Monumentation
Digitization of Musavies
Data Acquisition with <10 ONA
Scanning of Old Documents
Scanning of Musavis
DIGITIZATION
HRSI PROCESSING
DOCUMENT SCANNING
SURVEY / RE-SURVEY

NLRMP
HRYANA BUSINESS PROCESSING UNIT (H-BPU)

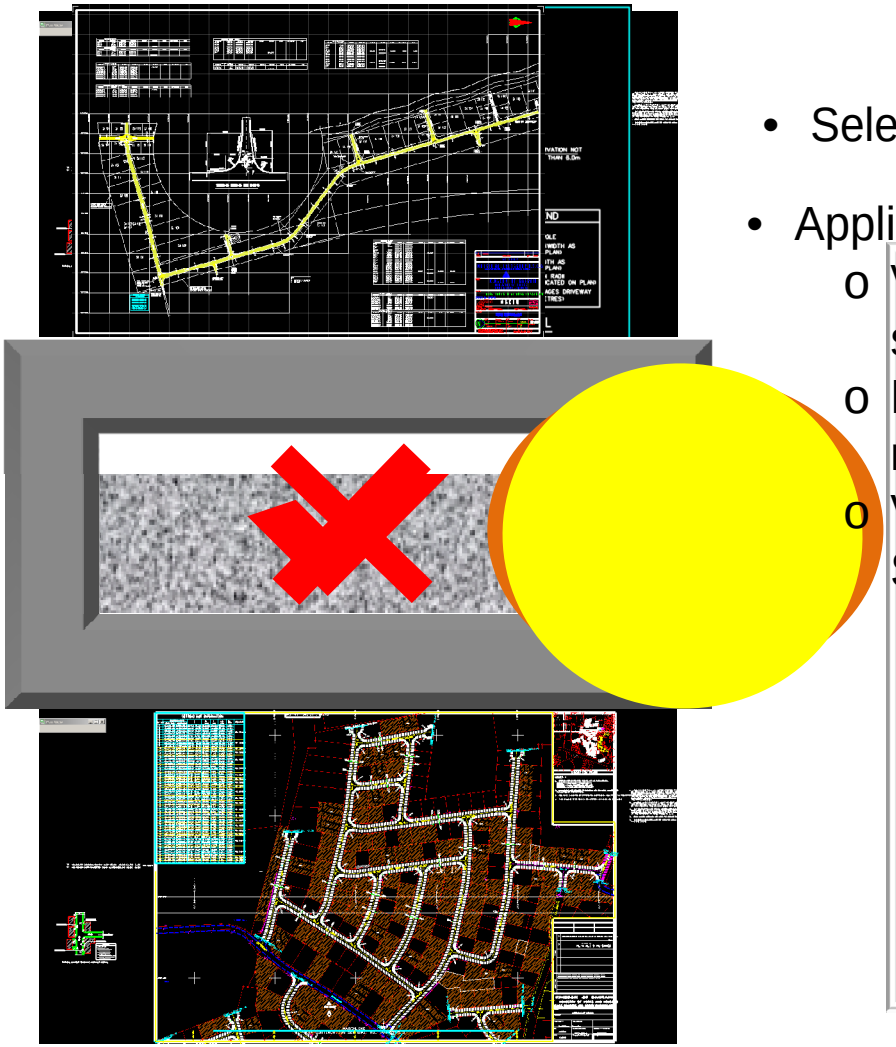


NLRMP

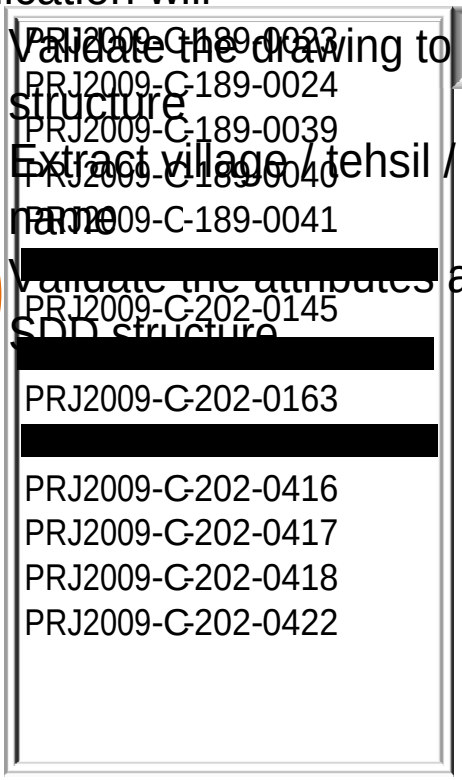
HARYANA BUSINESS PROCESSING UNIT



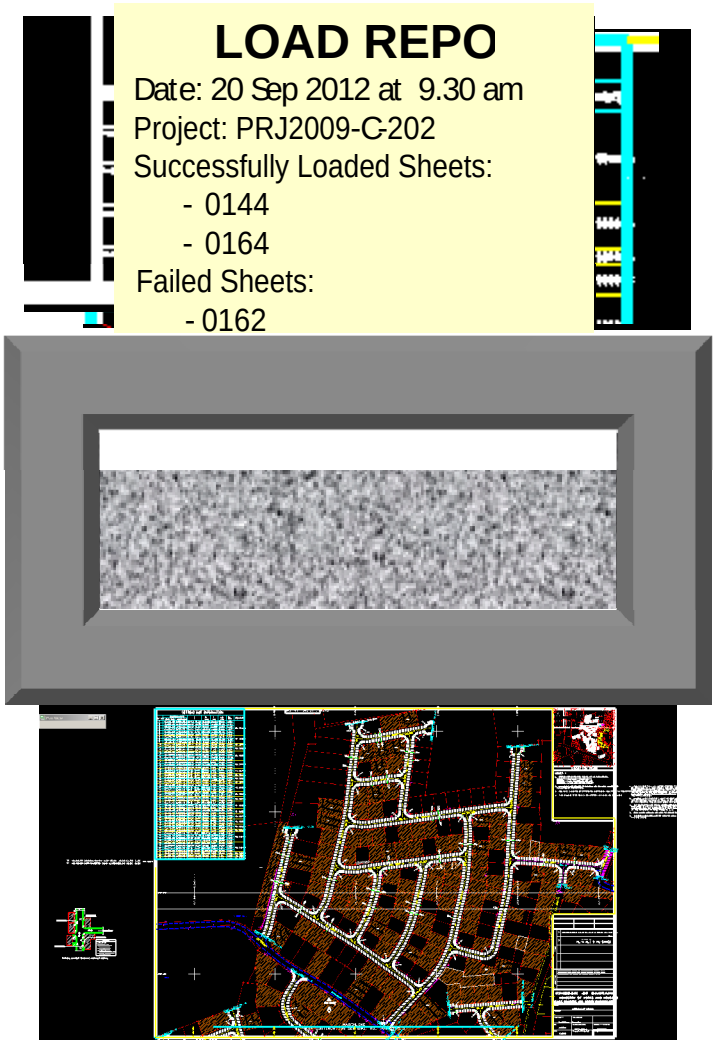
IMPORTING & QUALITY CHECK OF DIGITIZED DATA INTO GEODATABASE



- Select one or more for loading
- Application will
  - Validate the drawing to the SDD structure
  - Extract village / tehsil / district name
  - Validate the attributes are as per SDD structure



IMPORTING & QUALITY CHECK OF DIGITIZED DATA INTO GEODATABASE



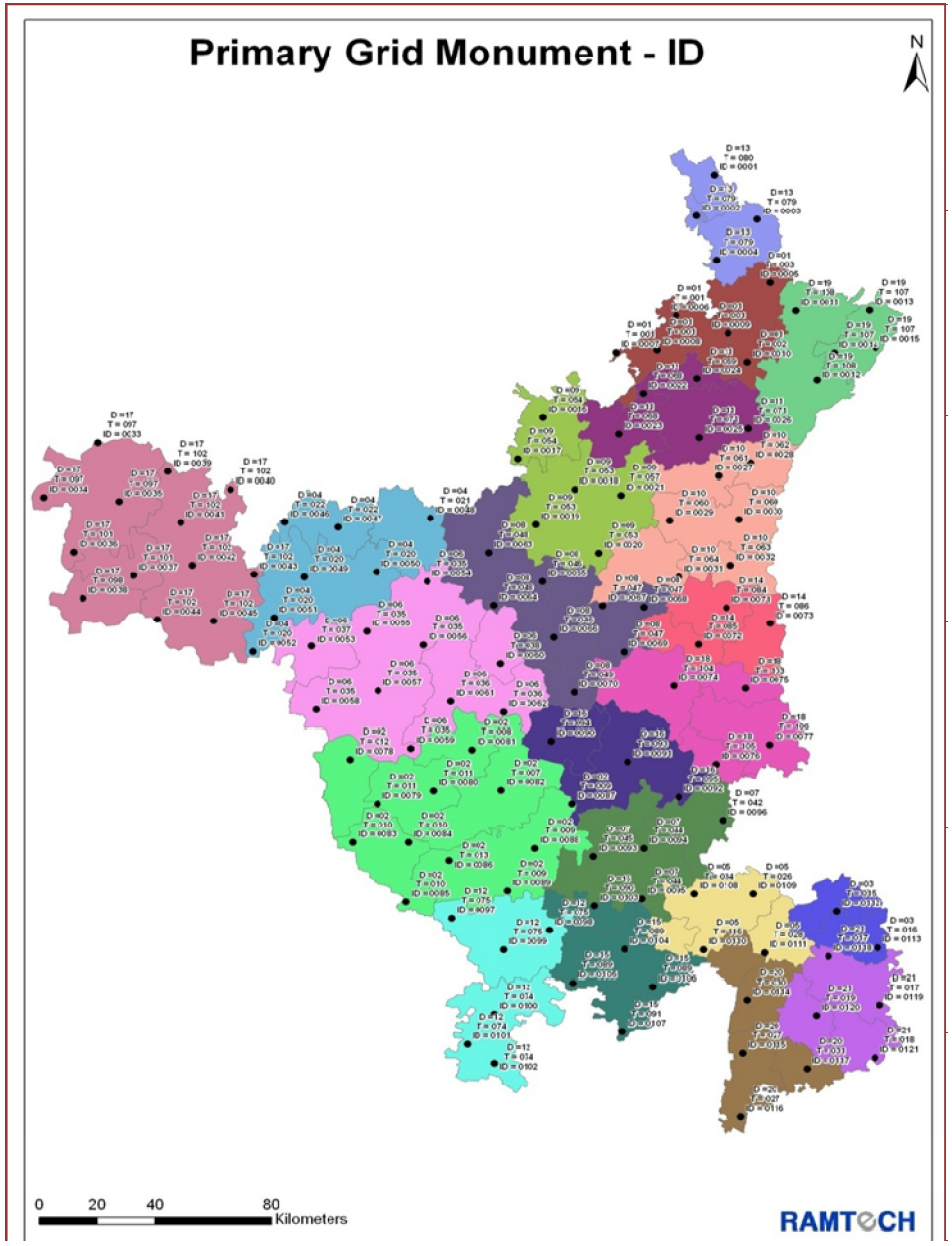
Now, the application will:

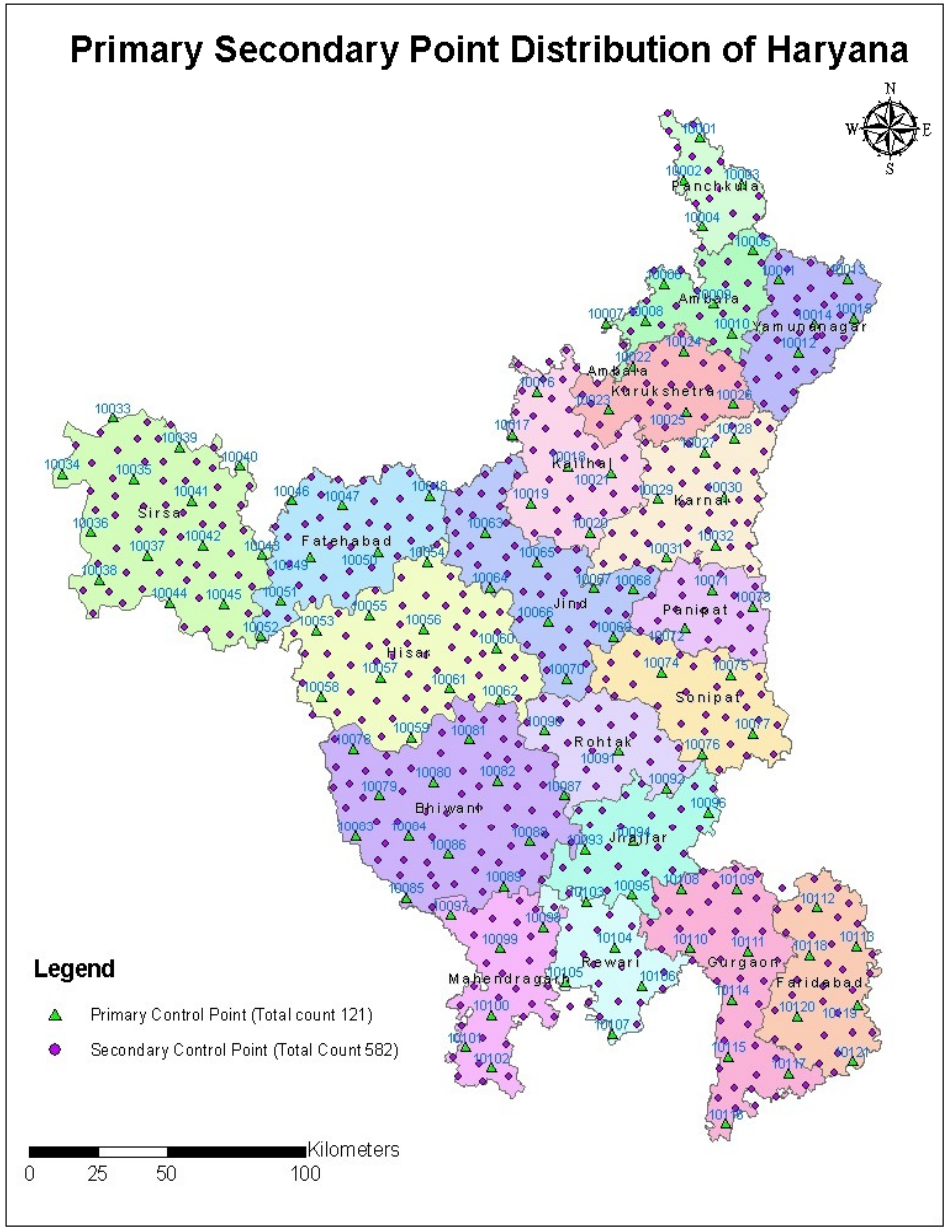
- Split the data out into various parts (e.g. geographic features, table records, etc.)
- Append them to the appropriate layers and tables in the database
- Update all project management records

MONUMENTATION-PLANNING

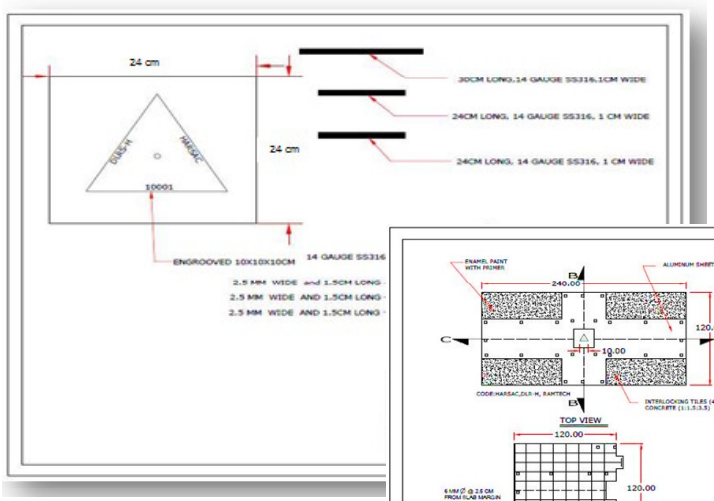
- **To create a state wide network of monuments HARSAC has finalized the distribution of monuments as**
  - **SOI Master Control Points: 35 Nos.**
  - **Primary Network- 20 kms interval: 121 points**
  - **Secondary Network- 8 kms interval 589 points**
  - **Tertiary Network – on shehda points (Village tri-junctions): Approximately 20,000**
  - **Auxiliary Points – To be placed for survey wherever sufficient controls are not available**

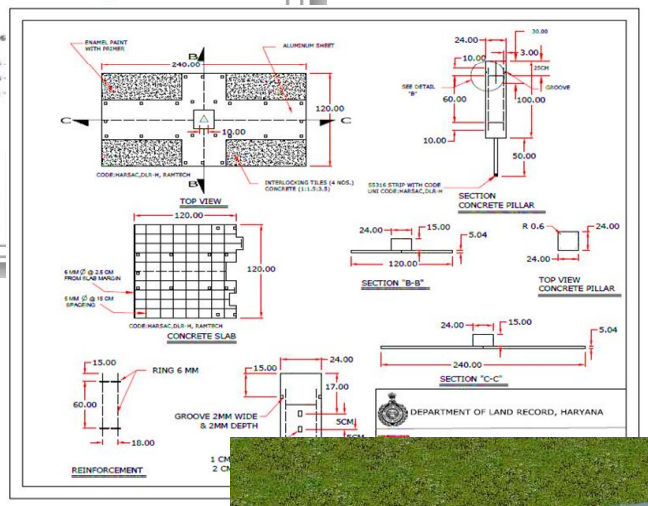
PRIMARY & SECONDARY CONTROL

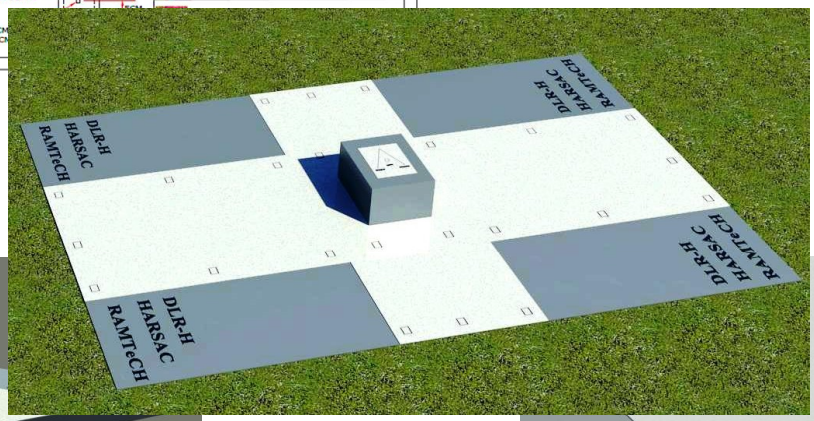


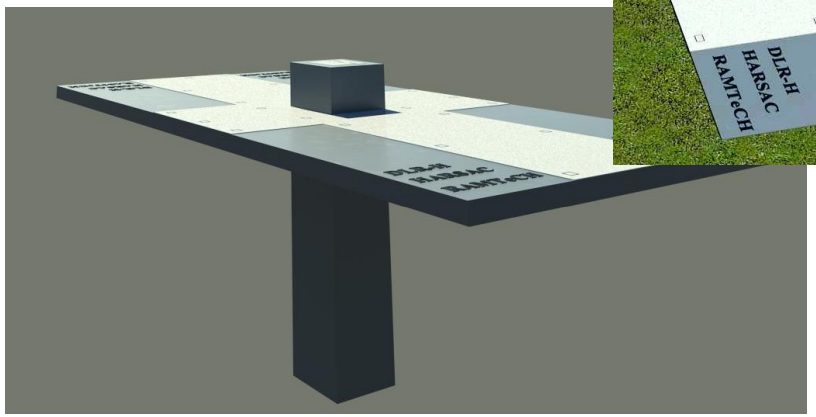


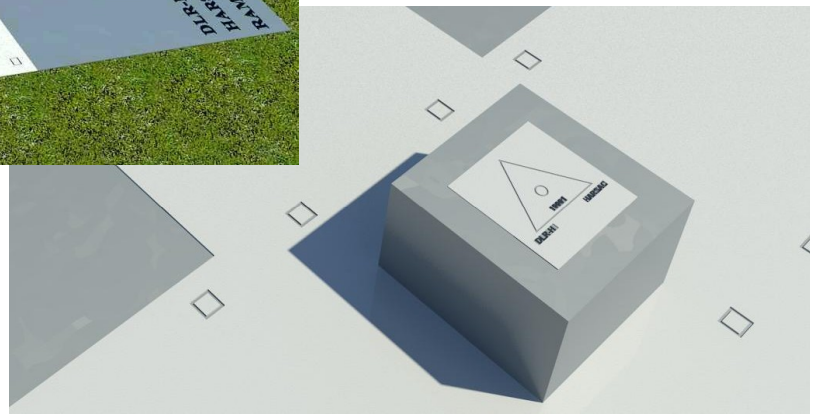
MONUMENTATION - DESIGN



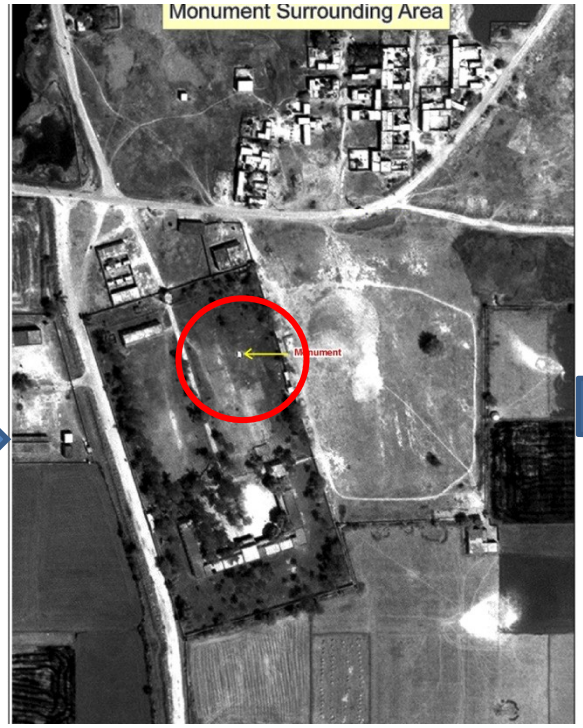


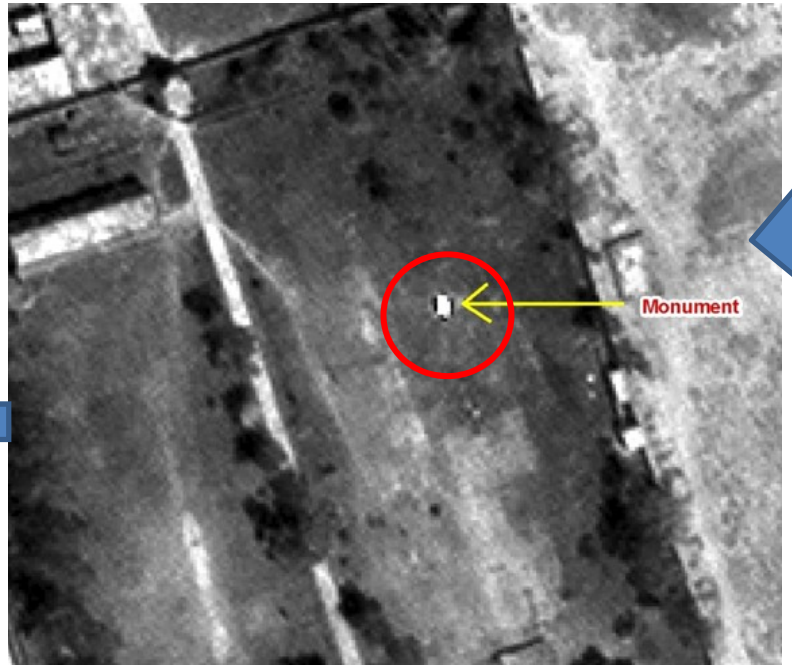


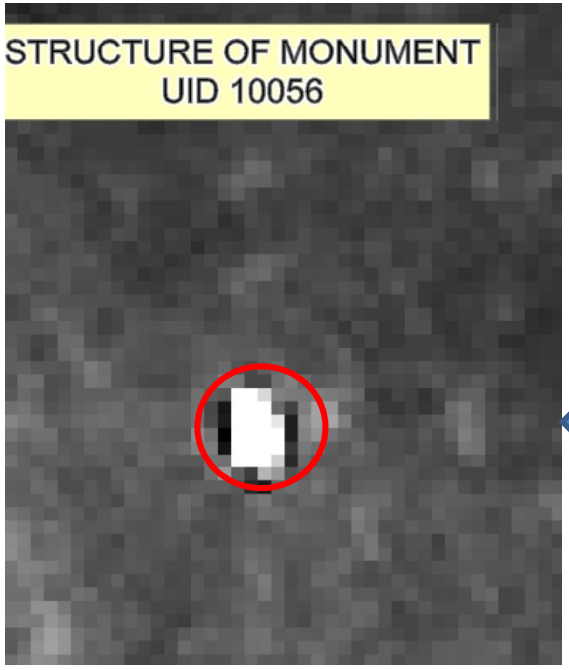




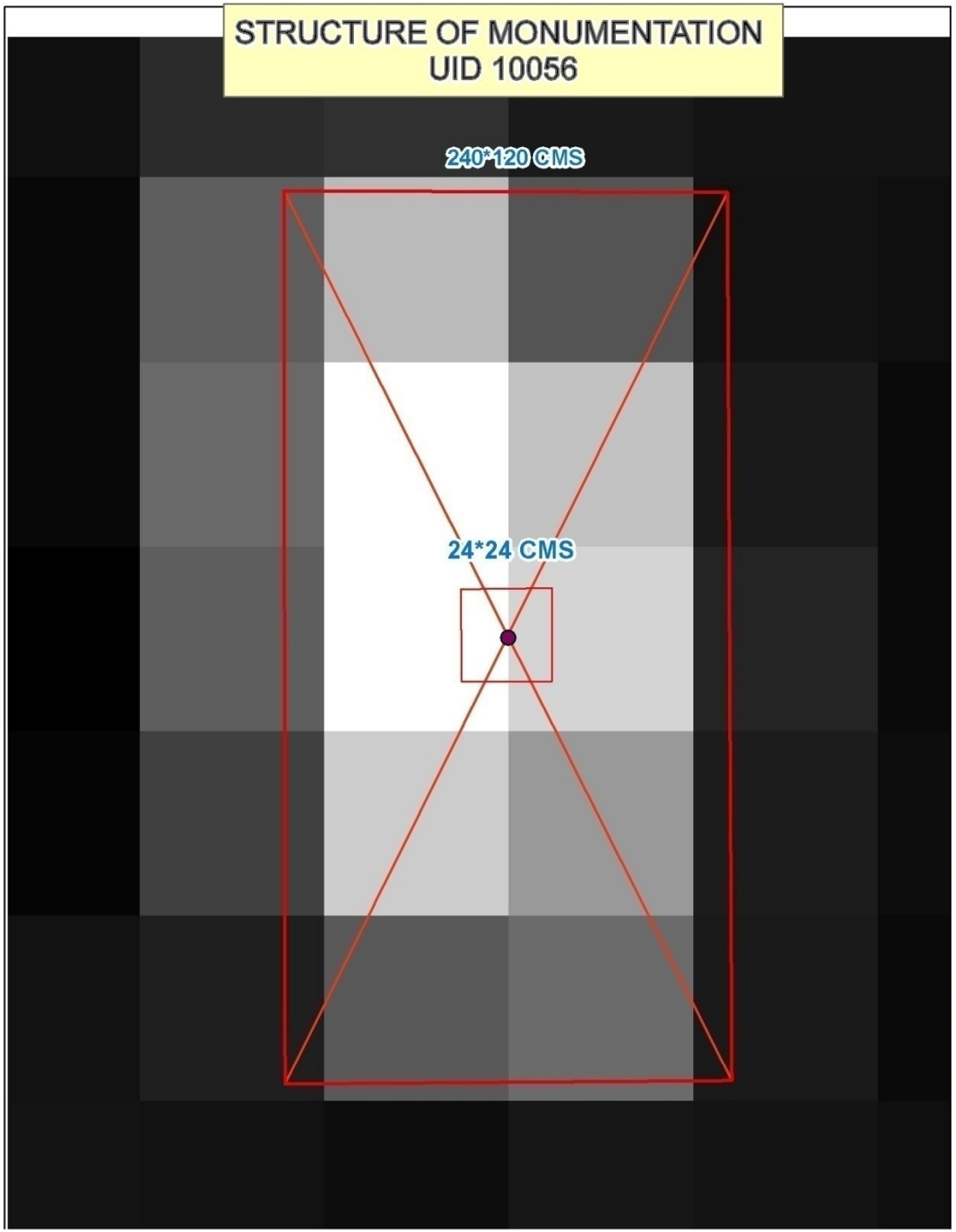

Monument in Rajli Village
Rajli
Monument

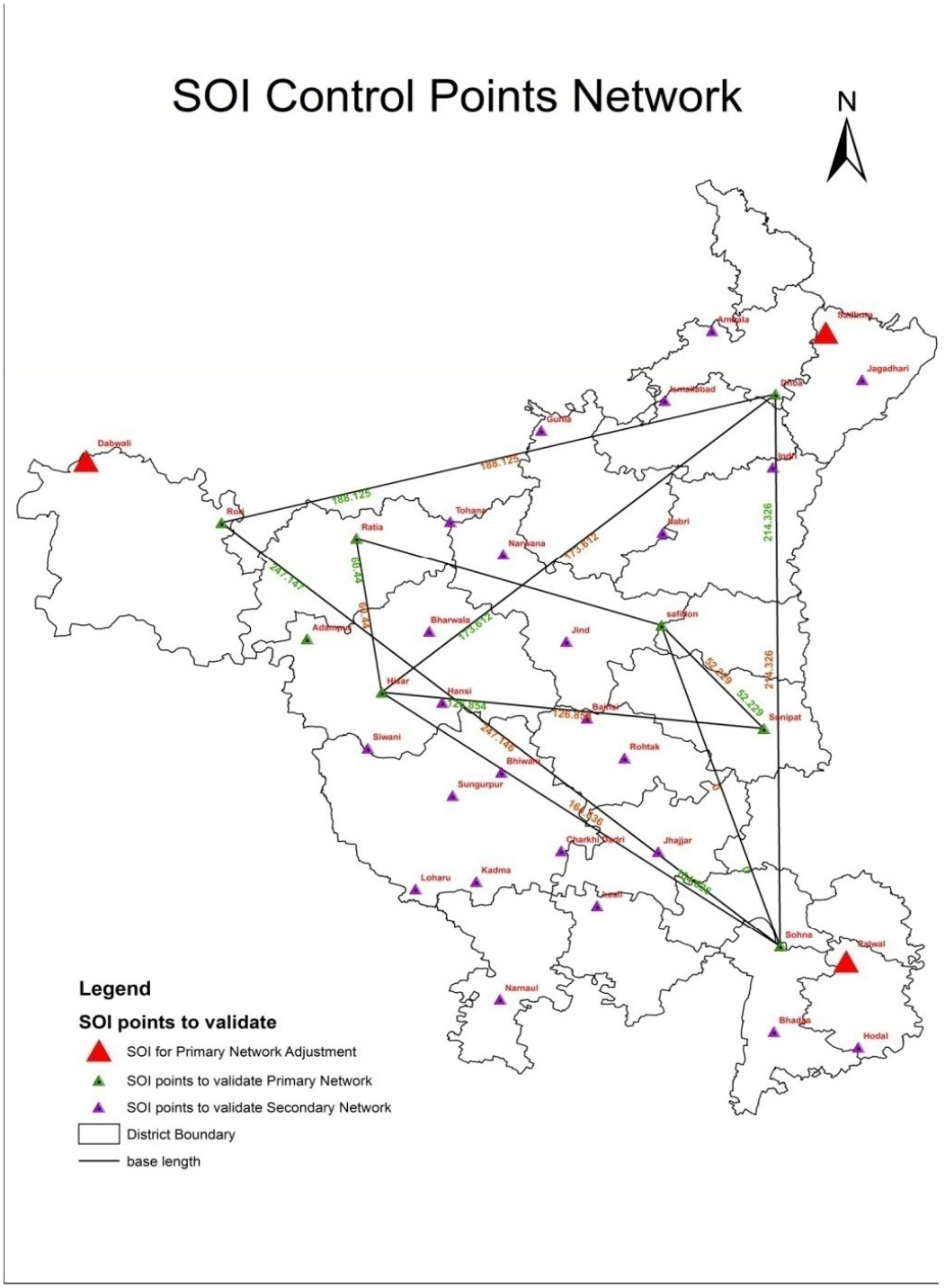

Monument Surrounding Area
Monument


Monument

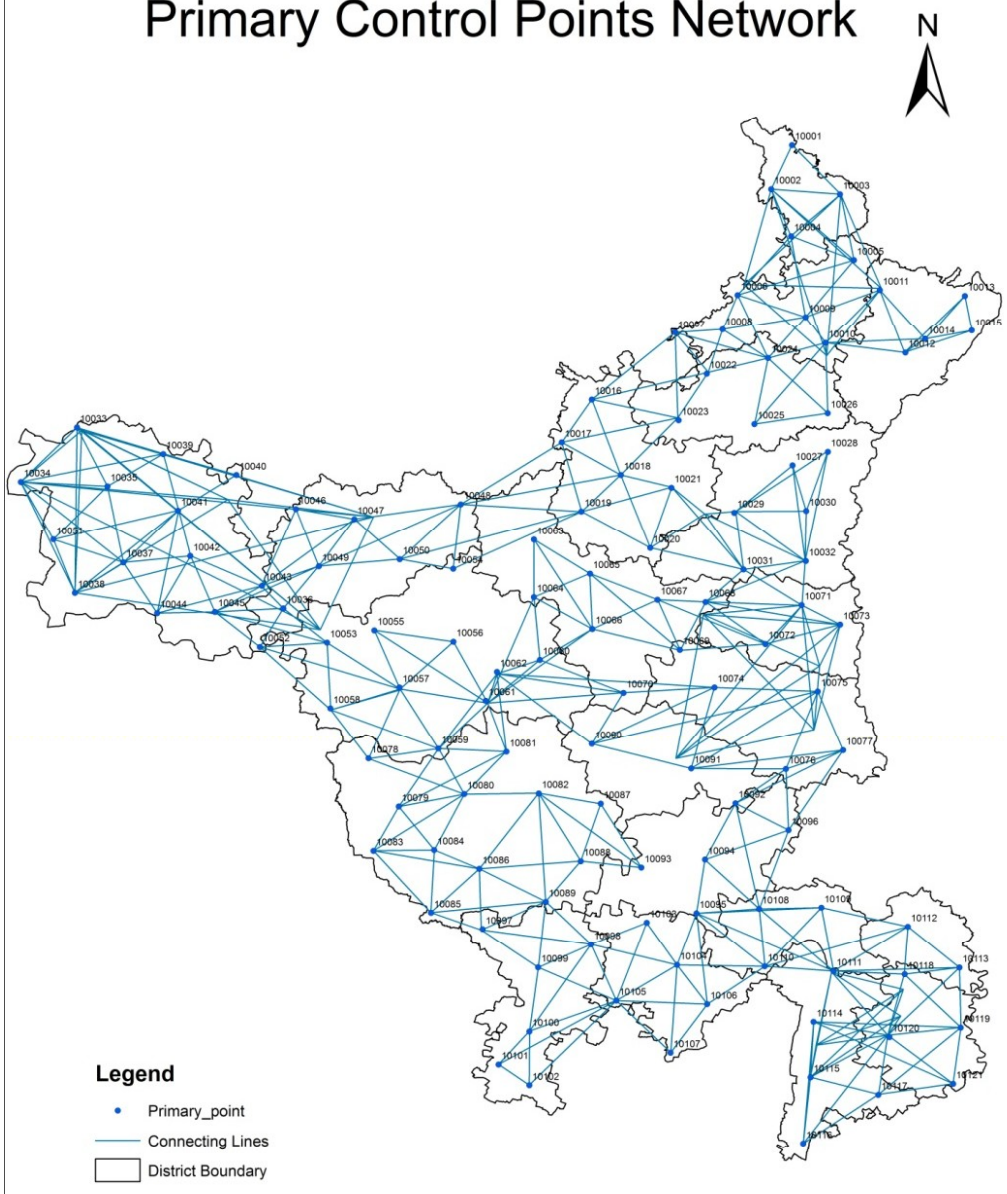

STRUCTURE OF MONUMENT
UID 10056

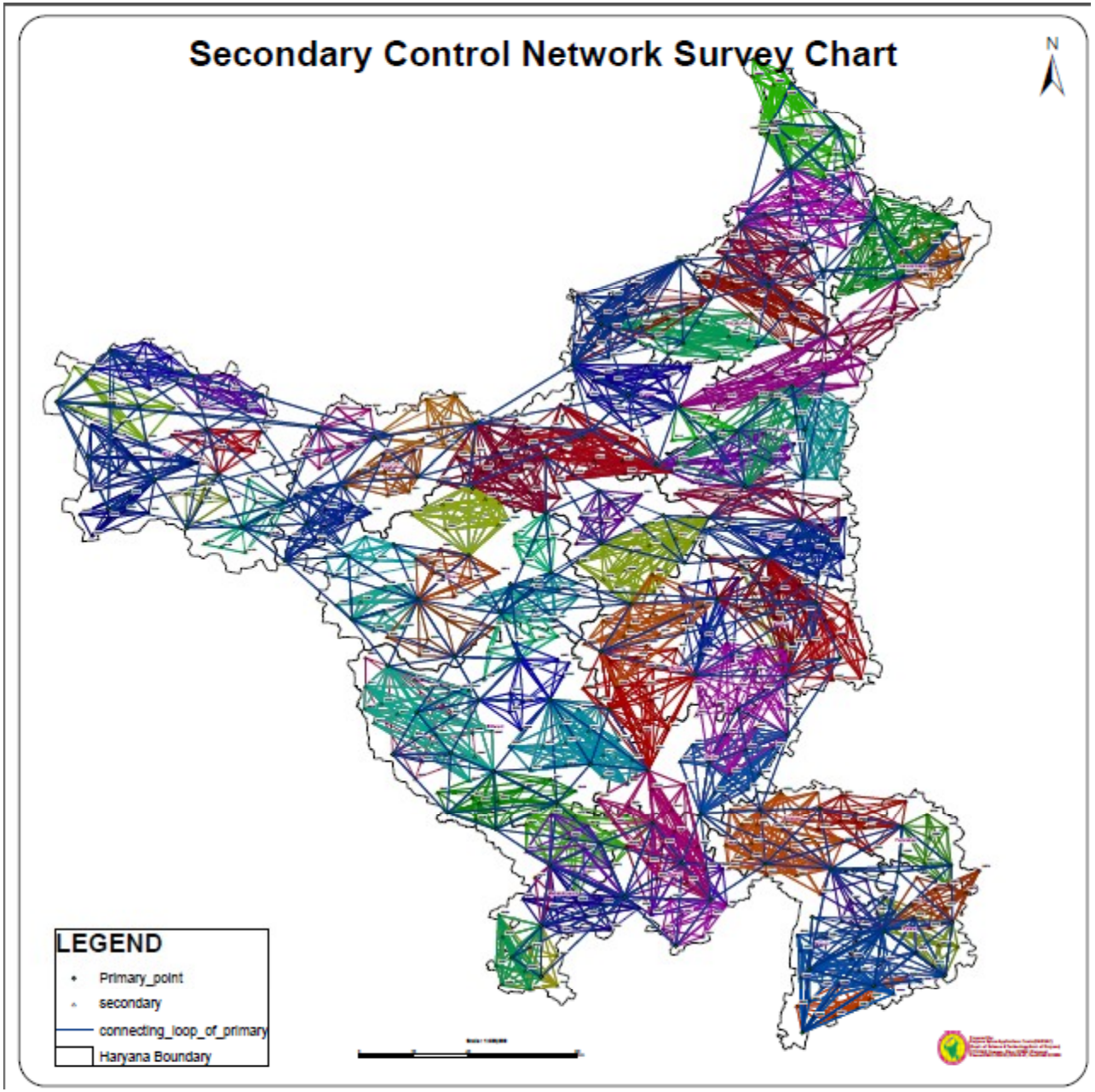
STRUCTURE OF MONUMENTATION
UID 10056




SOI Control Points Network
N
Ambala
Jagadhari
Ismailabad
Guhla
Dabwali
Jind
Rohtak
Tohana
Ratia
Narwana
Jabri
Bharwala
Jind
safidon
Adampur
Hisar
Hansi
Bawal
Sonipat
Siwani
Rohtak
Bhiwani
Sungurpur
Charkhi Dadri
Jhajjar
Loharu
Kadma
Sohna
Rajwal
Narnaul
Bhadas
Hodal
188.125
247.141
173.612
214.326
52.229
Legend
SOI points to validate
SOI for Primary Network Adjustment
SOI points to validate Primary Network
SOI points to validate Secondary Network
District Boundary
base length

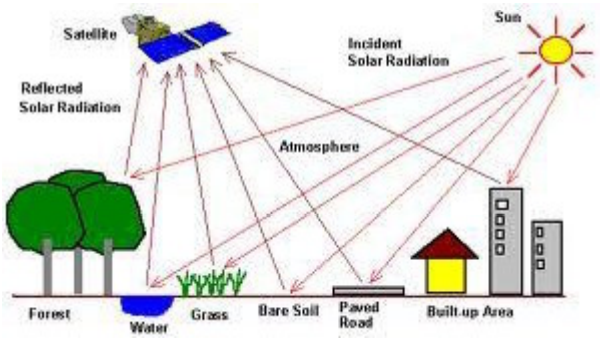
Primary Control Points Network




Secondary Control Network Survey Chart
N
LEGEND
Primary_point
secondary
connecting_loop_of_primary
Haryana Boundary

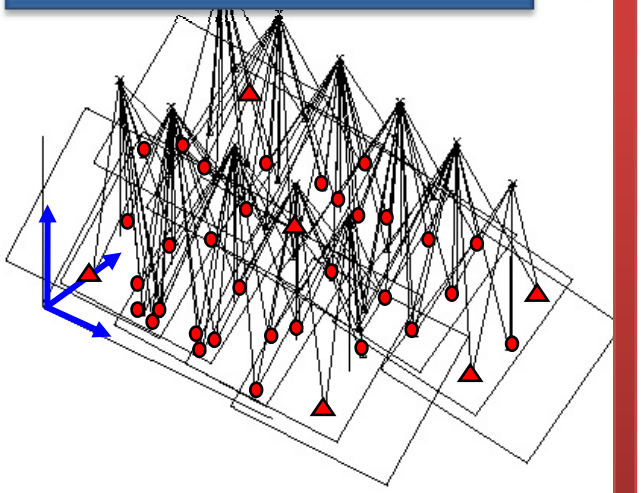
PHOTOGRAMMETRY - PROCESS

Acquisition Of Imagery

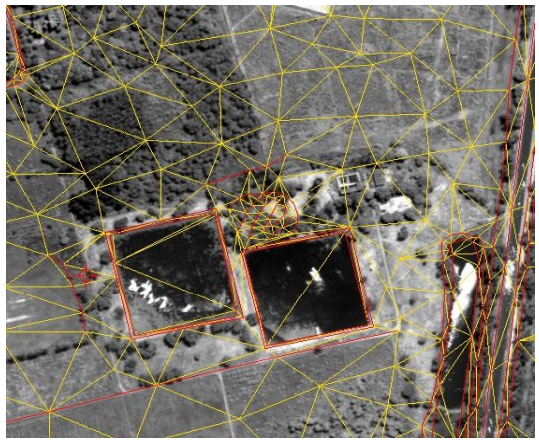


Satellite Imagery

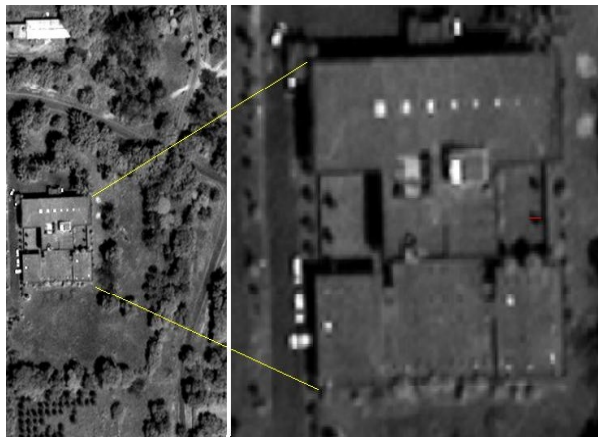
Triangulation



Digital Terrain Model

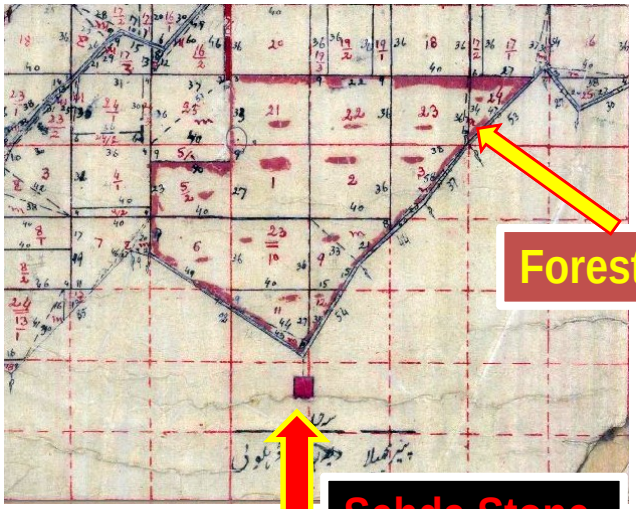


Ortho Rectification



Mosaic

ETS Pre-Field Activities



Forest Area

Sehda Stone

Identify points from available records like:

- Sehda Stone, Triangulation points or other prominent features
- Overlaid identified points over HRSI to get their tentative location

ON GROUND IDENTIFICATION

- Sehda Stone/ Prominent Features
- Establishment of Base Station



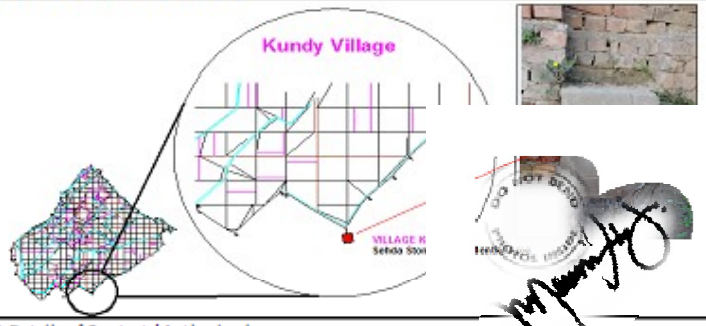


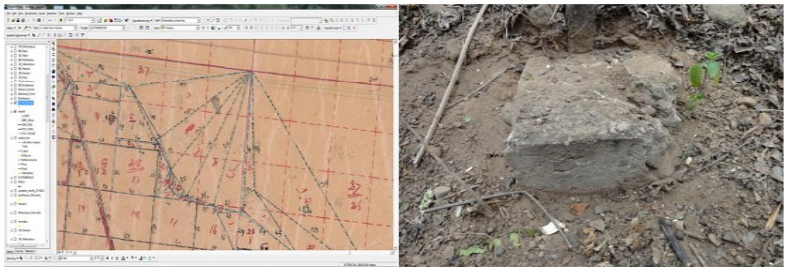

Validation &Certification by DRO Officials

National Land Record Modernization Program-Haryana

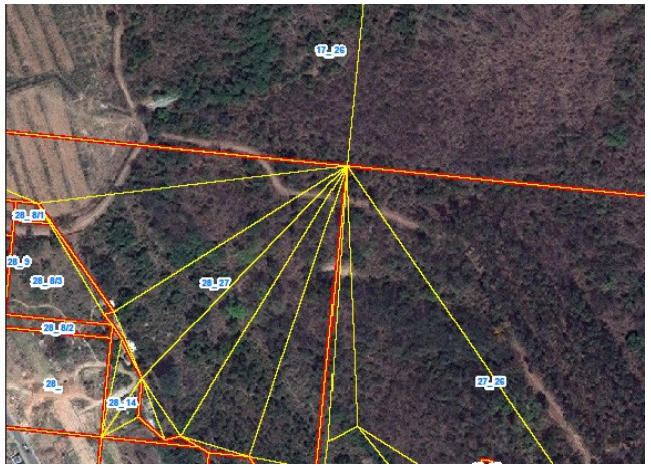
Identification of Old Sehda Monument

	Identification of Old Sehda Monument						
1	Name of Project	Moderanization of Land Record for 20 District of Haryana					
2	Primary Control Point Code:						
3	Locational Information						
	Name of District	Panchkula	Name of Tehsil / Village	Panchkula/ Kundi			
	Name of Department						
	Name of Building						
	Name of the Surveyor		Date of Installation From			To	
4	Monumentation Site Inspection Detail		Remarks				
	Photograph Taken (Panormic View) (specify Number/ serial No. of Photograph in Camera)		Yes / No				
	Monument Specification						
	Monument Specification		As per the approved drawing				
5	Schematic Sketch of the Location/ Site						
6	Contact Details of Contact / Authorized person						
	Name of Authorized person / Contact						





Murba Stone Identified on Musavi and Ground

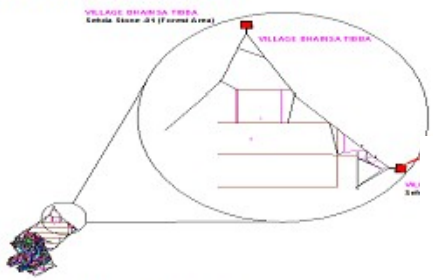


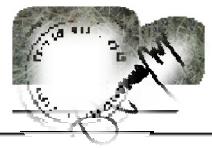
Validation &Certification by DRO Officials

National Land Record Modernization Program-Haryana

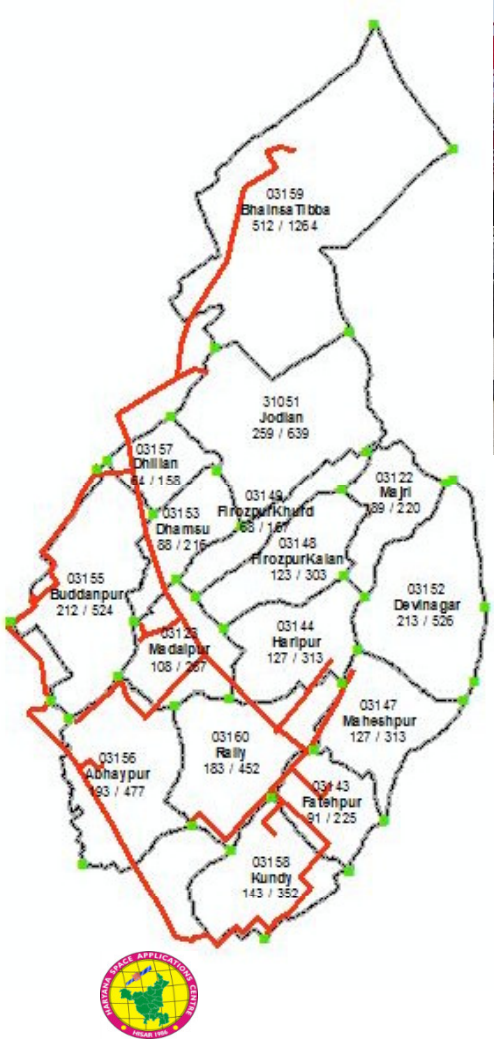
Identification of Old Sehda Monument

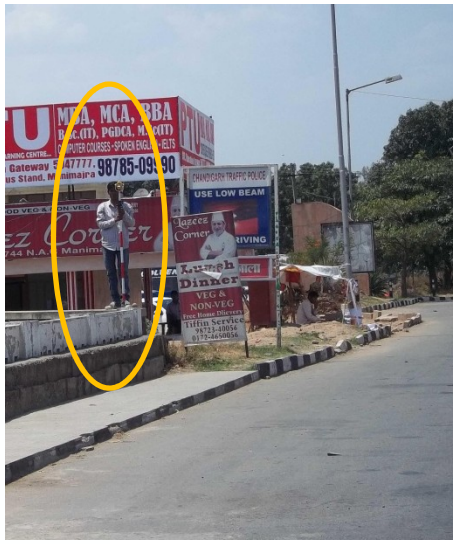
	Identification of Old Sehda Monument				
1	**Name of Project**	Moderanization of Land Record for 20 District of Haryana			
2	**Primary Control Point Code:**				
3	**Locational Information**				
	Name of District	Panchkula	Name of Tehsil / Village	Panchkula/ Bhainsa Tibba	
	Name of Department	Defence Area			
	Name of Building				
	Name of the Surveyor		Date of Installation From		To
4	**Monumentation Site Inspection Detail**		**Remarks**		
	Photograph Taken (Panormic View) (specify Number/ serial No. of Photograph in Camera)		Yes / No		
	Monument Specification				
	Monument Specification		As per the approved drawing		
5	**Schematic Sketch of the Location/ Site**				
6	**Contact Details of Contact / Authorized person**				
	Name of Authorized person / Contact Person at Tehsil / Village				

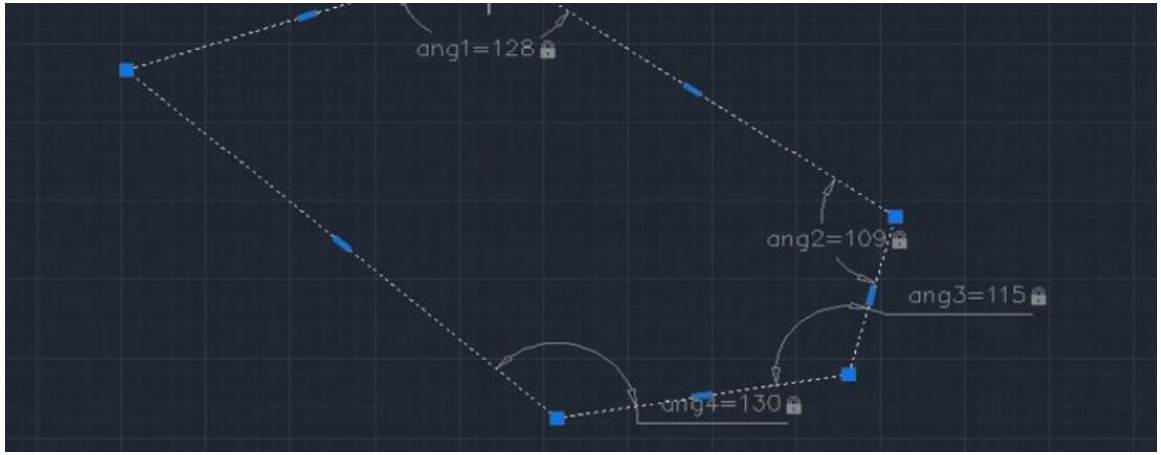




- Traverse around Priority Villages of Panchkula using ETS &
- Correction of Traverse Closing Error.

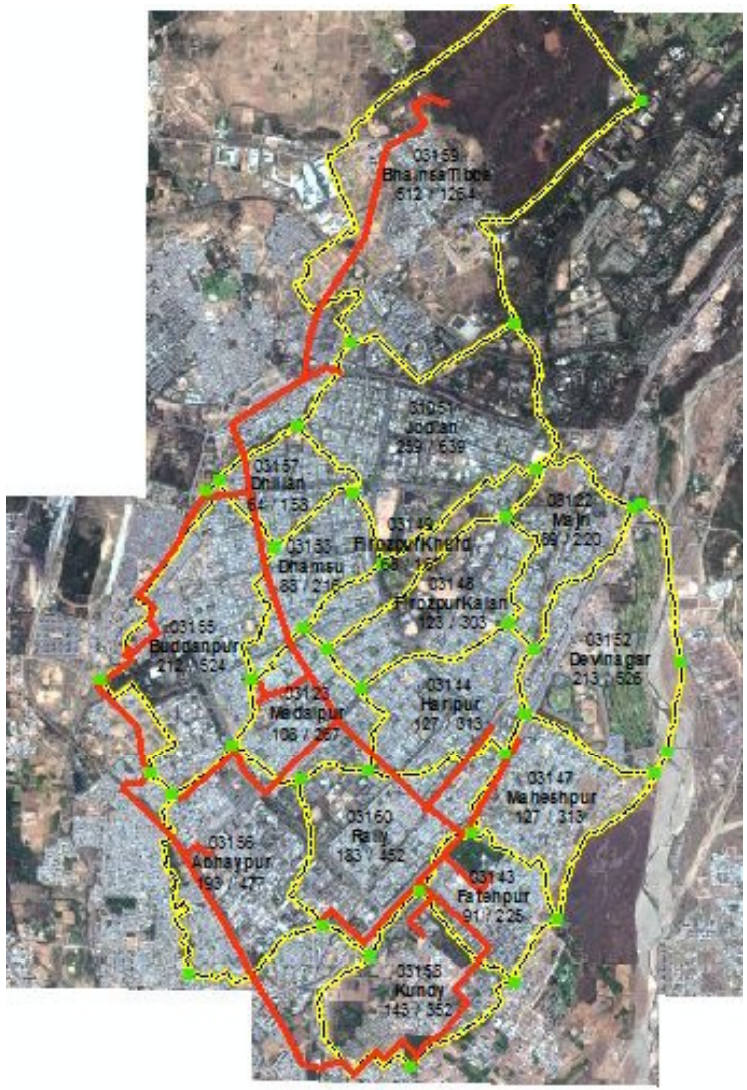




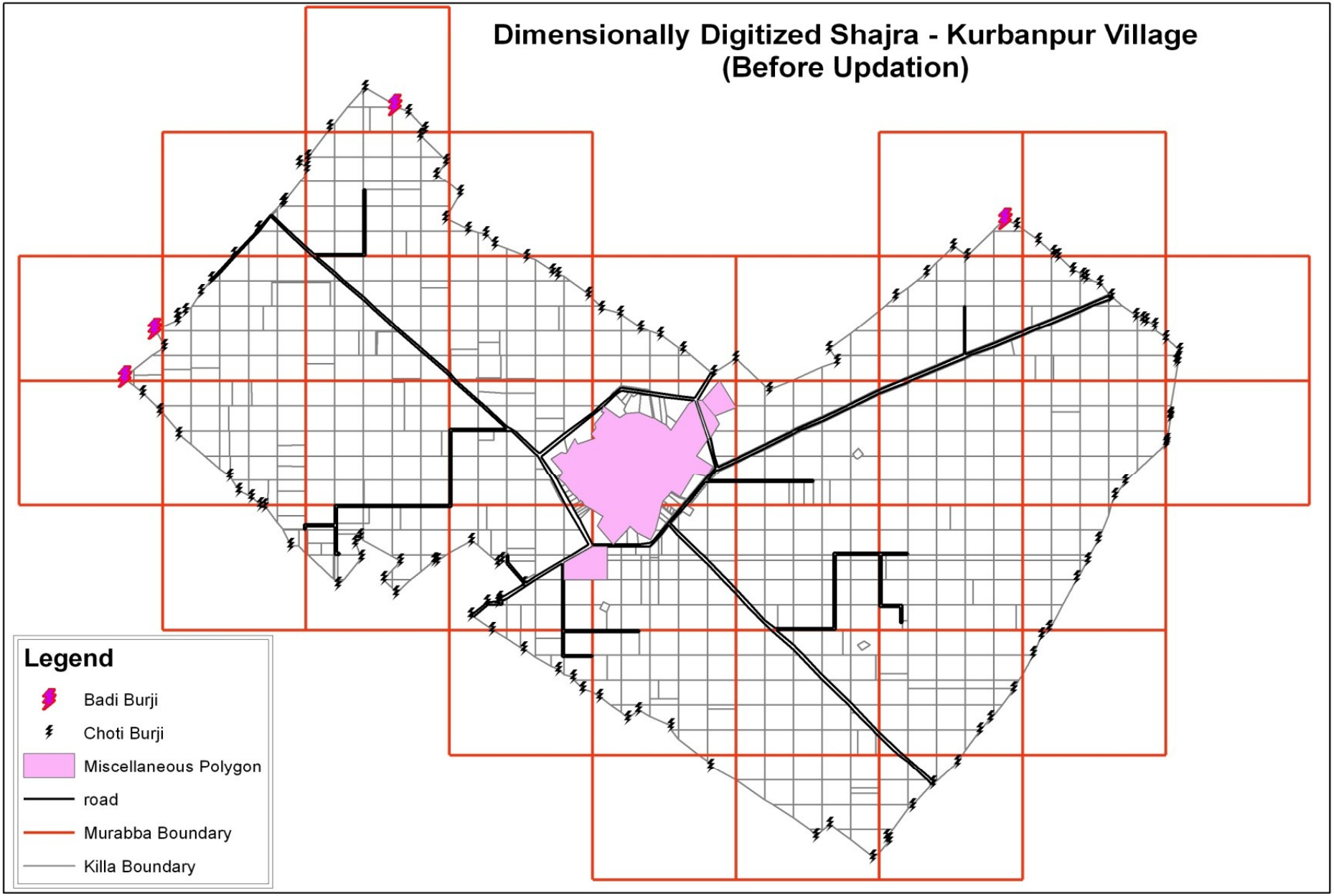


- Traverse around Priority Villages of Panchkula using ETS
- Special Care is taken while selecting GCP on ground so that it can be easily located on Satellite Data.

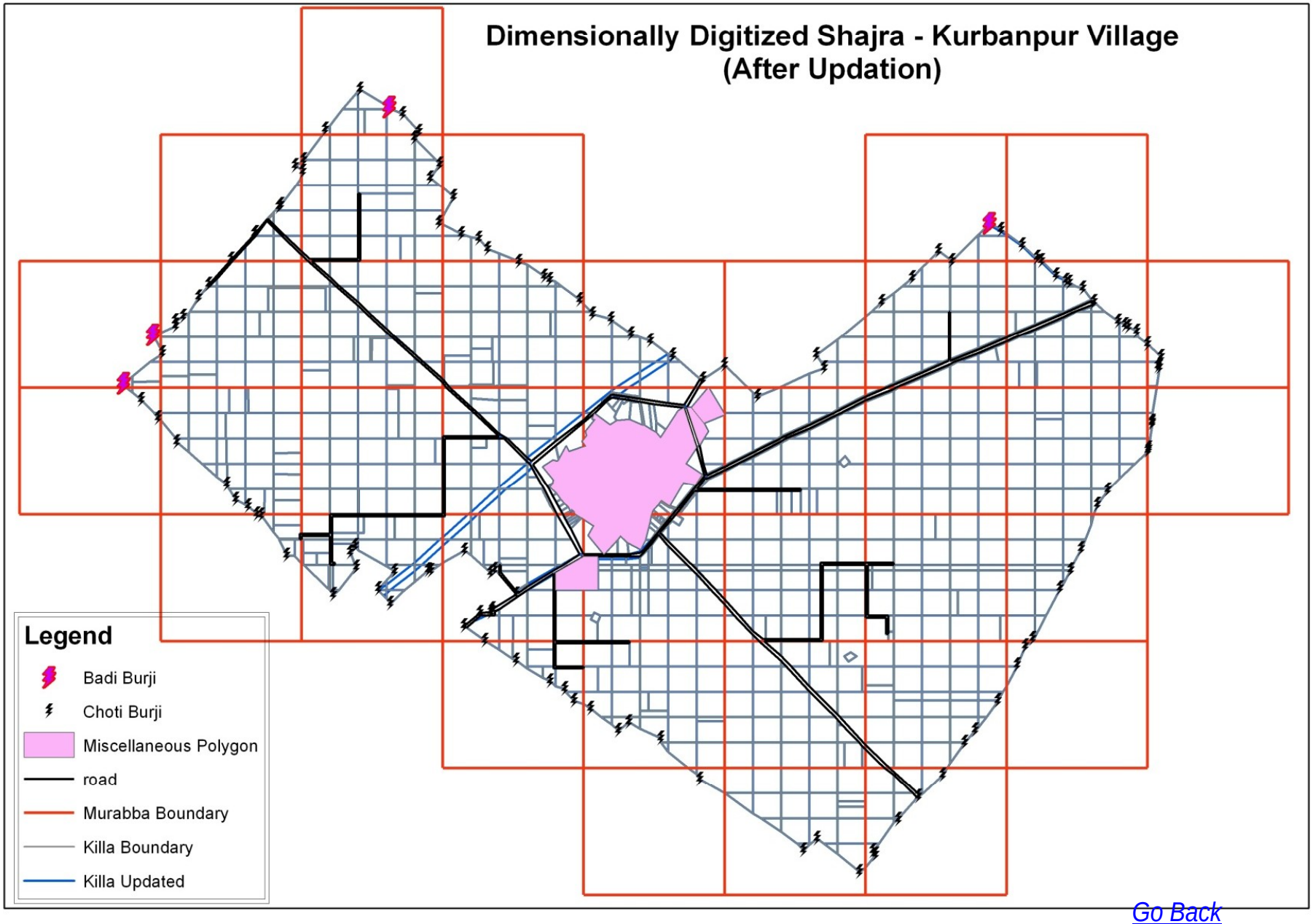
- Geo-referencing of High Resolution Satellite Data Using Auxiliary Point ESTABLISHED during ETS Traverse.
- Check Points are also established during Traverse



Digitized Sajara before Updation

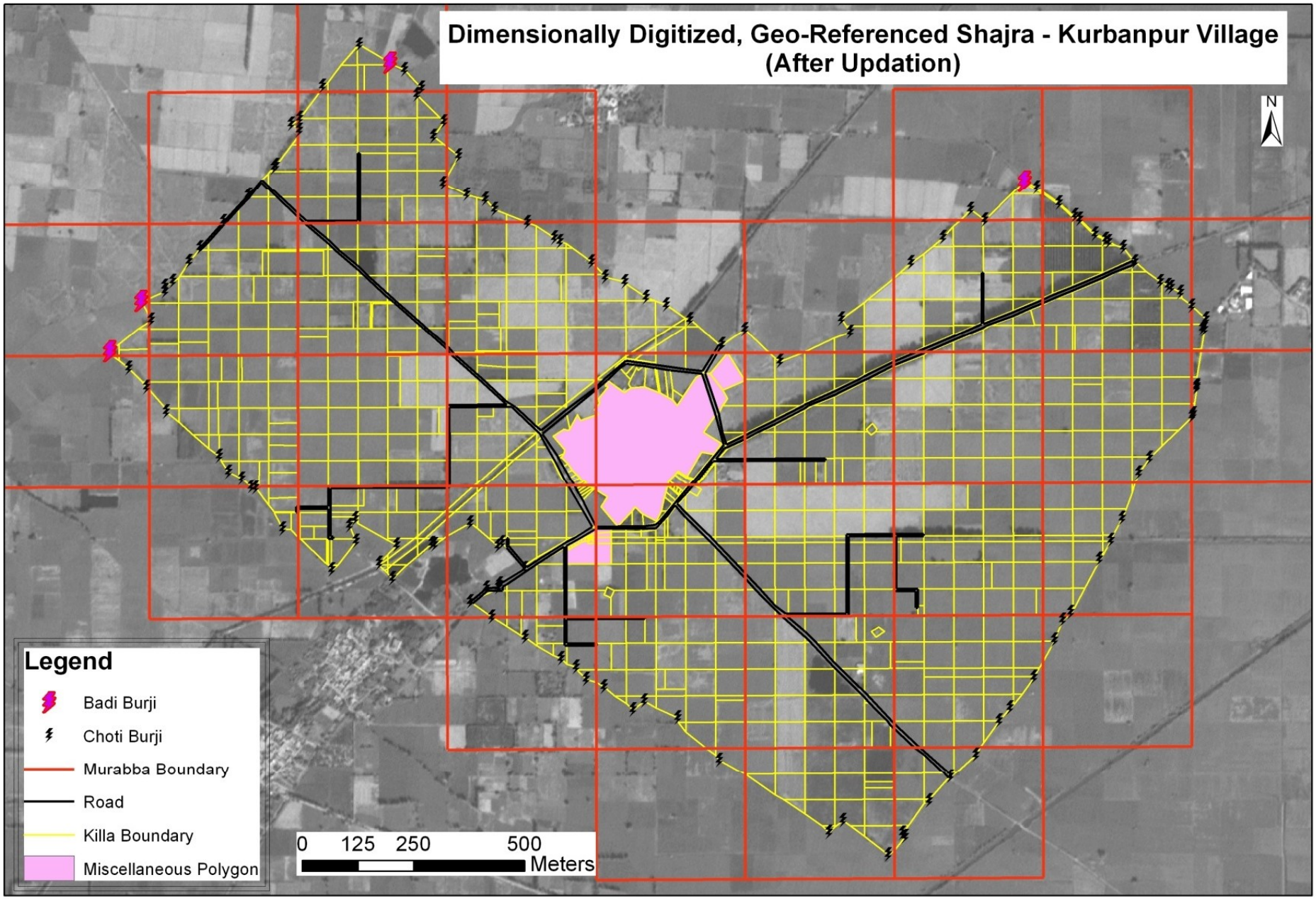


Digitized Sajara after Updation

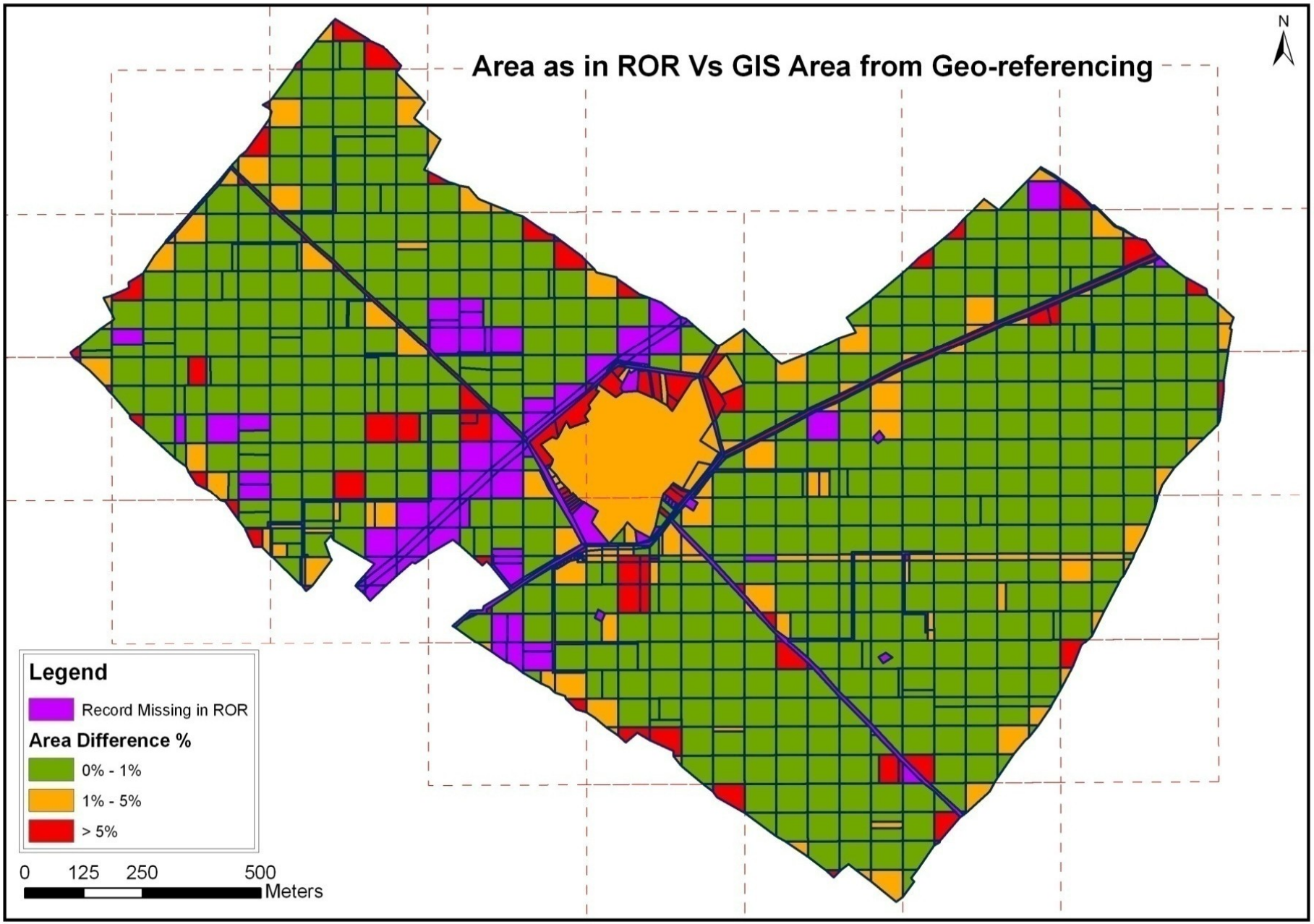


Go Back

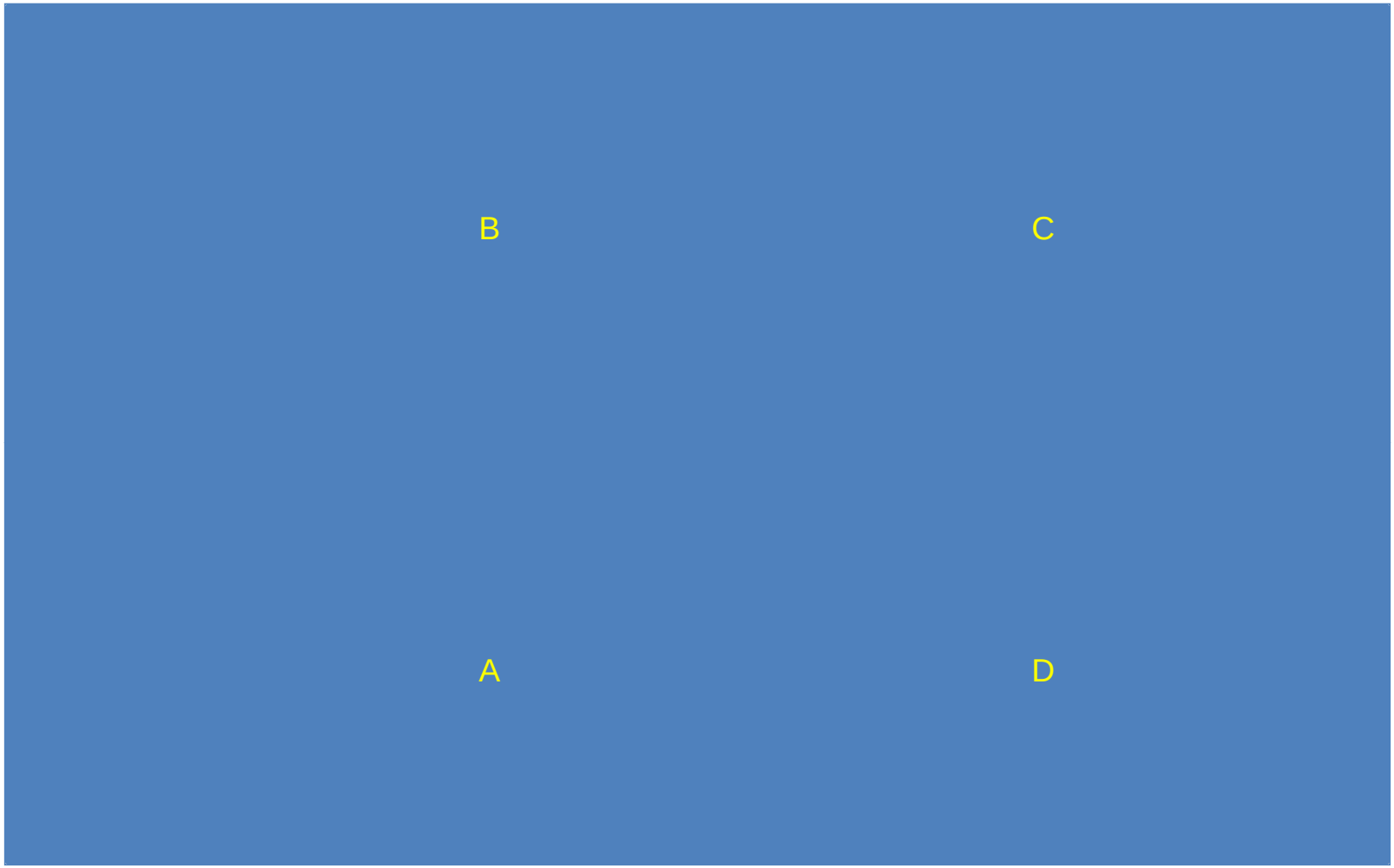
GEO-REFERENCING AND OVERLAYING WITH HRSI



Analysis of Area Differences



ERROR ASSESSMENT: MUSSAVI WITH GEO-REFERENCED VECTORS



	Mussavi dimension(m)	Vector After geo-reference (m)	Difference due to geo-reference (m)	Difference in (%)
AB	60.35	60.37	0.02	0.03
BC	67.06	66.91	0.15	0.22
CD	60.35	60.37	0.02	0.03
DA	67.06	66.91	0.15	0.22

ERROR ASSESSMENT: MUSSAVI WITH GEO-REFERENCED IMAGE

	Mussavi dimension(m)	Digitization from geo-reference Image	Difference (m)	Difference (%)
AB	60.35	60.01	0.34	0.56
BC	67.06	66.84	0.21	0.32
CD	60.35	60.16	0.19	0.31
DA	67.06	66.87	0.19	0.28

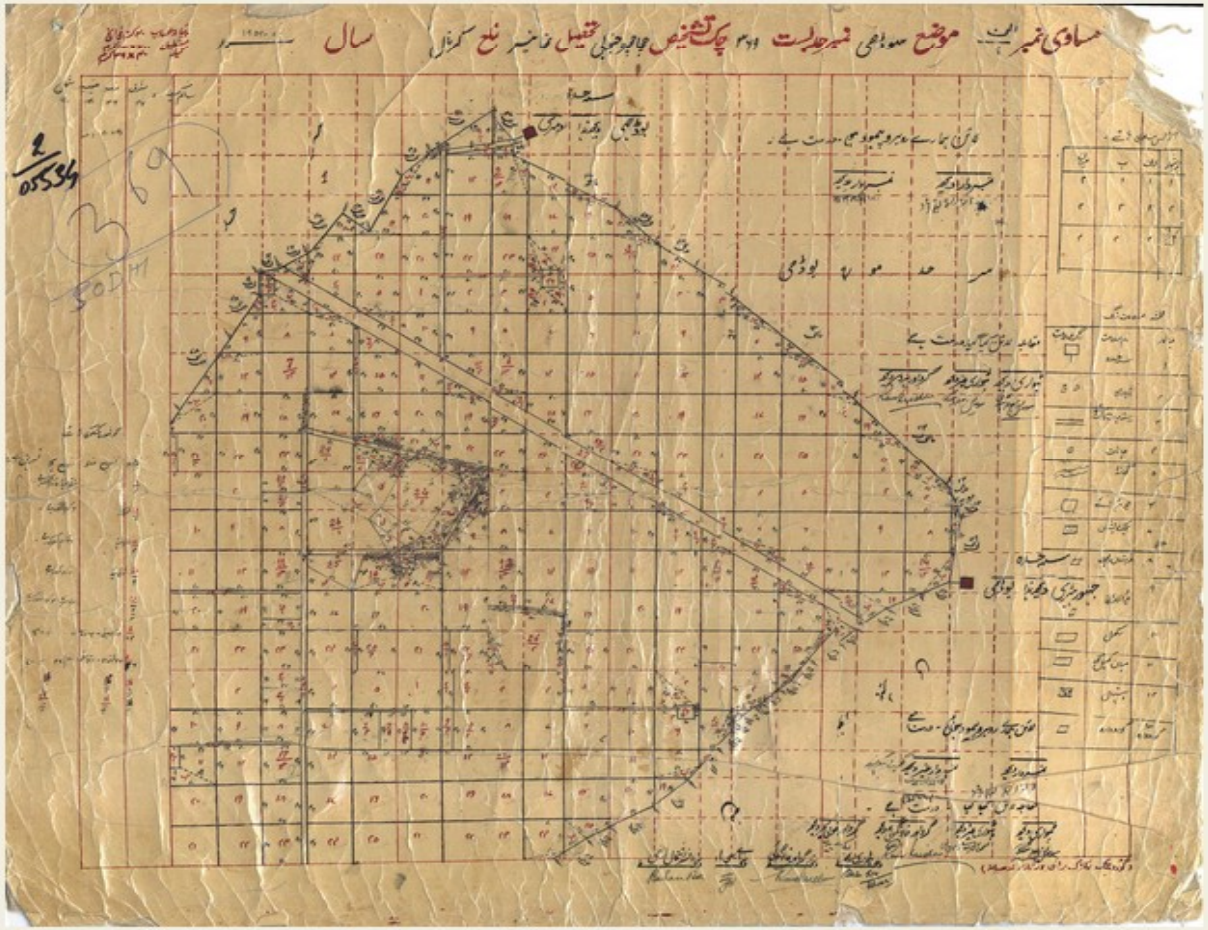

HLRDMRS
UNDER THE PROVISION OF:
Haryana Space Applications Centre
Department of Land Resources
Government of India
About Us
Services
Contacts
haryana
land records
Haryana Land Record Document Management & Retrieval System
Haryana state has taken a lead in the modernization of land records in the state by digitizing the cadastral maps for better land management in the state. Under the newly launched centrally sponsored program called National Land Record Modernization Programme (NLRMP) being funded by Ministry of Rural Development, GOI, entire revenue record of the state will be digitized and updated using the high resolution satellite imageries and GPS surveys.
HARSAC developed the methodology and initiated the digitization work of Cadastral Maps (Mussavies) for Sirsa and Ambala districts in the state, where all the mussavies have been converted into GIS format at the true to scale. Encouraged by the success of the digitization work by HARSAC, Revenue Department, Haryana subsequently decided to outsource the work under the project through HARSAC, Hisar which is the nodal agency in the state for remote sensing and GIS related work. The Project is being implemented by HARSAC though identified vendors in a time specific manner.
Sign In
Username:
Password:
Remember me next time.
Submit
HARSAC
Haryana Space Applications Centre
HARSAC a nodal agency of the Department of Science & Technology, Government of Haryana for Remote Sensing and GIS applications, has been established in the year 1986 and has become operational in the year 1989.....
More Details
DOLR
Department of Land Resources
The Land Reforms (LR) Division was implementing two Centrally Sponsored Schemes viz.: Computerisation of Land Records (CLR) & Strengthening of Revenue Administration and Updating of Land Records (SRA&ULR).....
More Details
GOI
Government of India
India is referred to as the largest democracy in the world, by virtue of the fact that it has the largest electing population among democratic countries. The country has a federal form of government and .....
More Details
Powered by RAMTeCH

DRS - Mussavi

HLRDMRS

UNDER THE PROVISION OF:
Haryana Space Applications Centre
Department of Land Resources
Government of India

DRS Home | Map | Upload | View Remarks | Profile | Logout

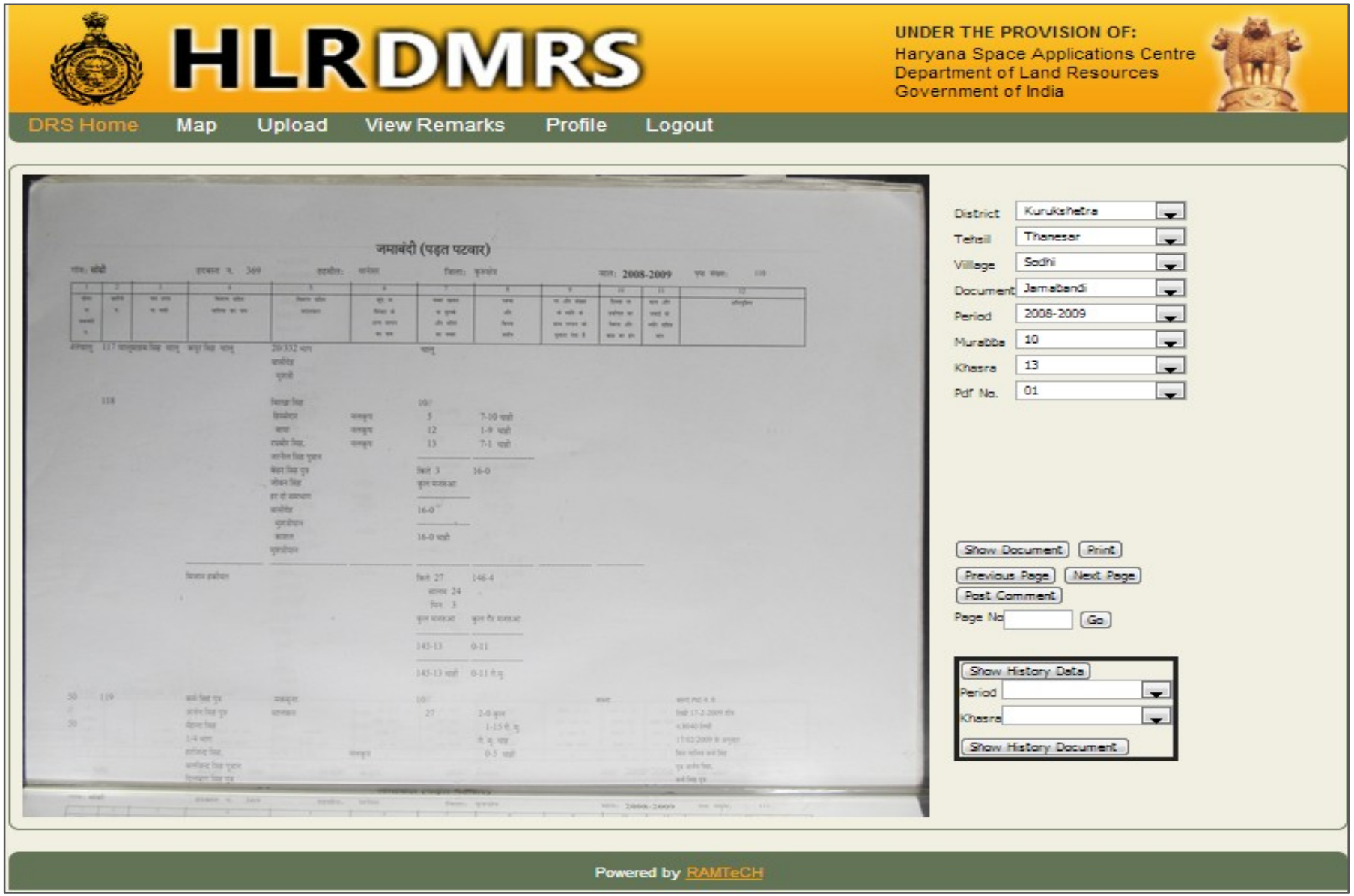


District: Kurukshetra
Tehsil: Thanesar
Village: Sodhi
Document: Musavis
Period: 1962-1963
Musavis: 001

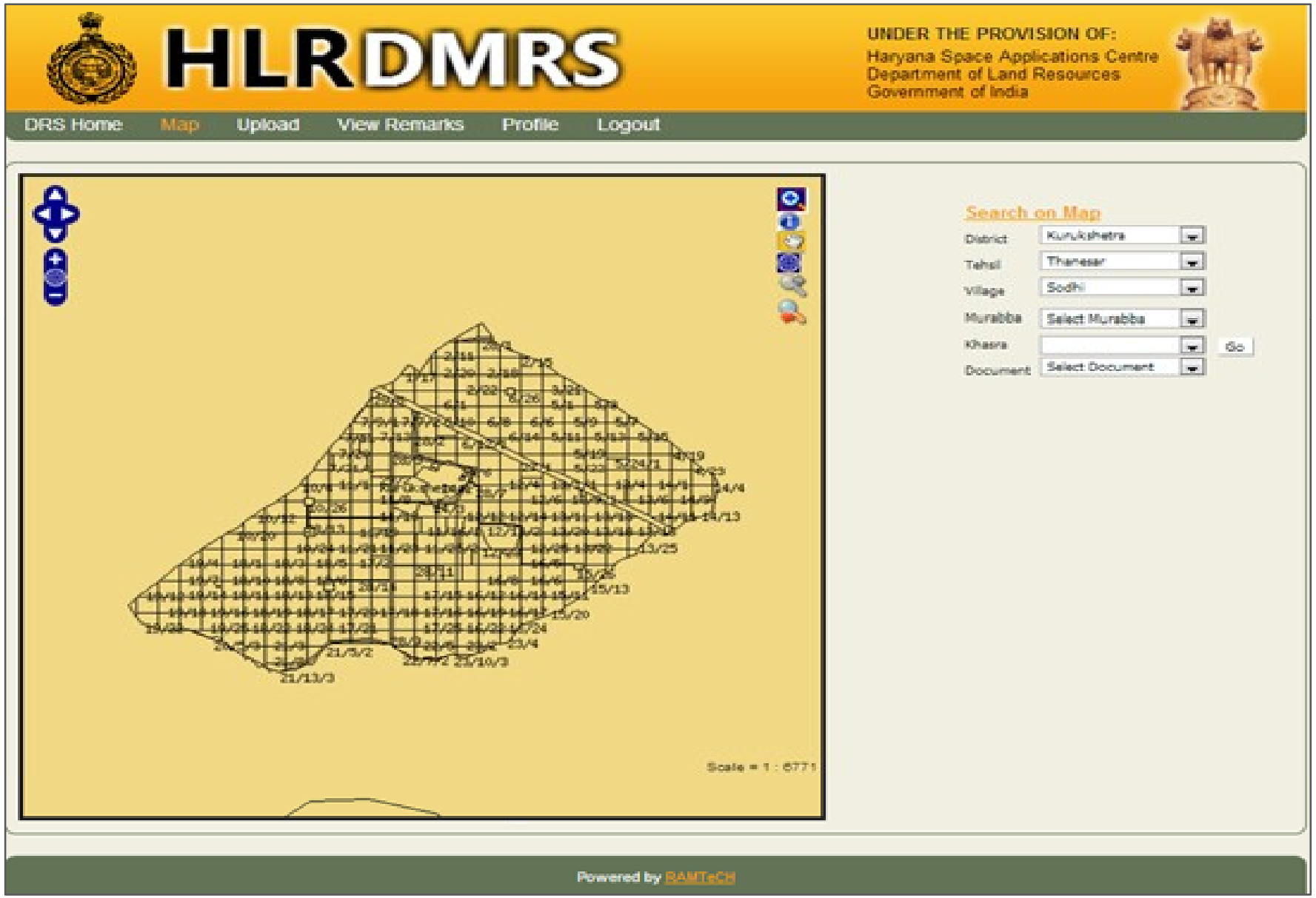
Show Document | Print
Previous Page | Next Page

Powered by RAMTeCH

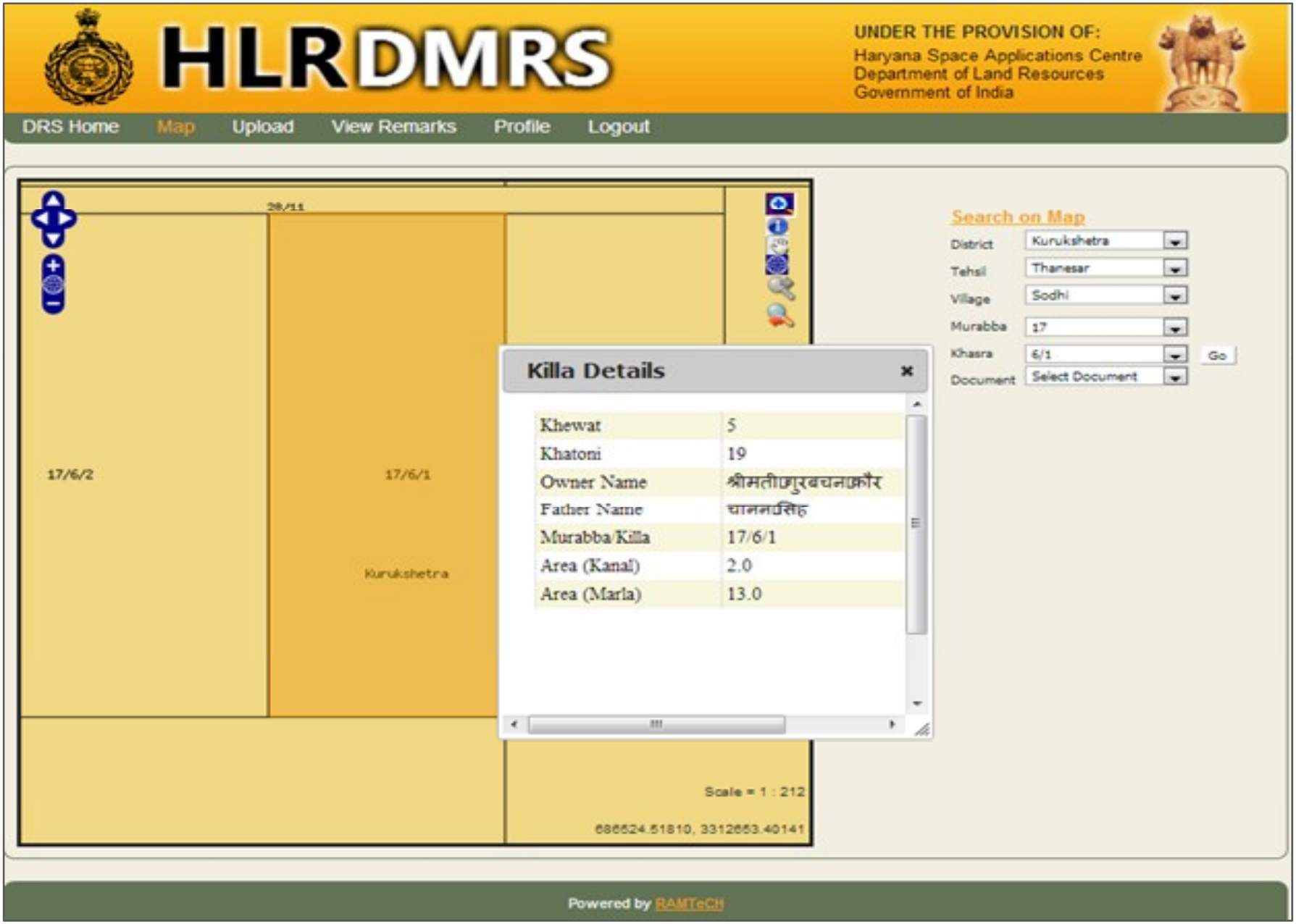
DRS - Jamabandi



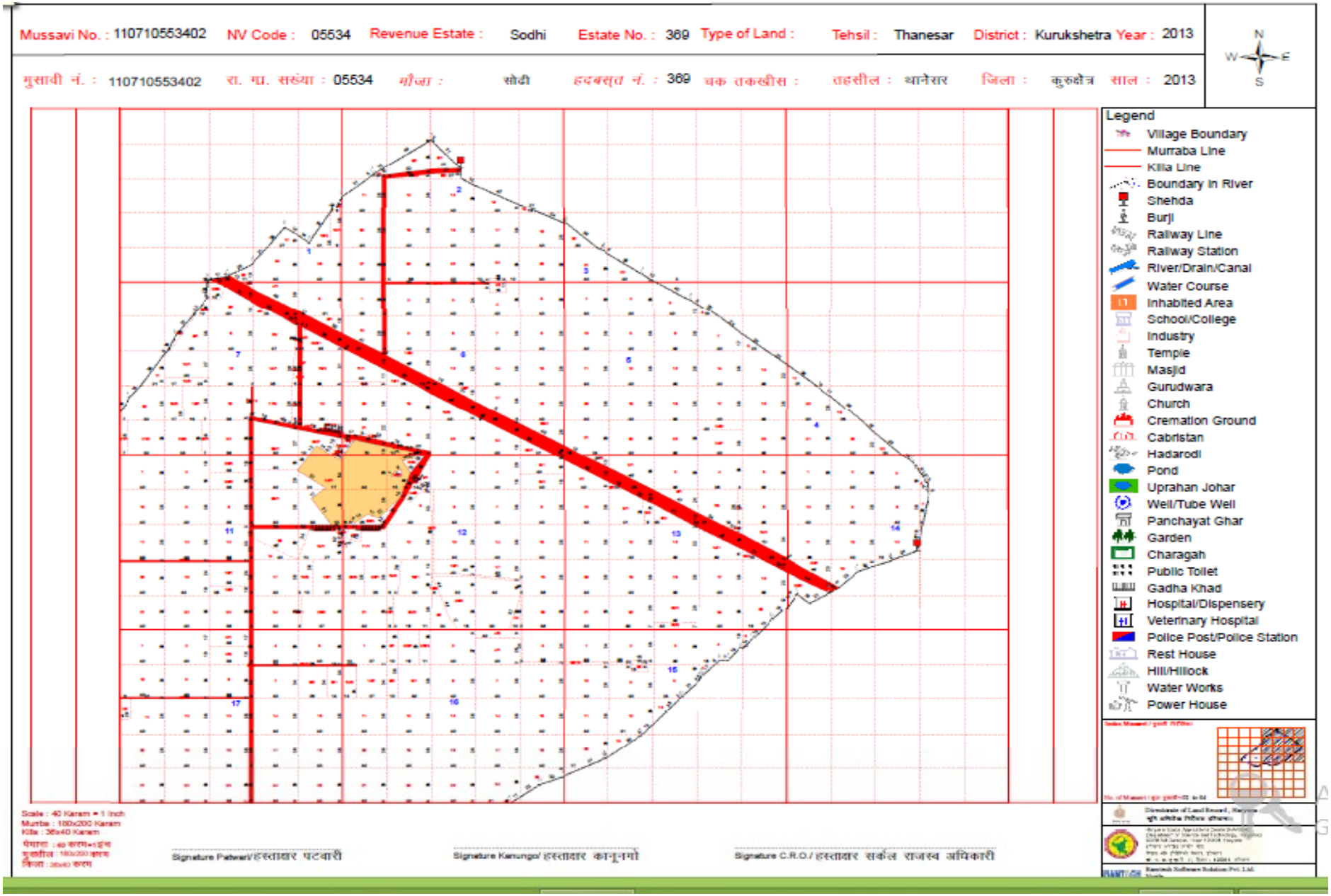
MAP - Village


HLRDMRS
UNDER THE PROVISION OF:
Haryana Space Applications Centre
Department of Land Resources
Government of India
DRS Home
Map
Upload
View Remarks
Profile
Logout
Search on Map
District
Kurukshetra
Tehsil
Thanesar
Village
Sodhi
Murabba
Select Murabba
Khasra
Go
Document
Select Document
Scale = 1 : 6771
Powered by BAMTeCH

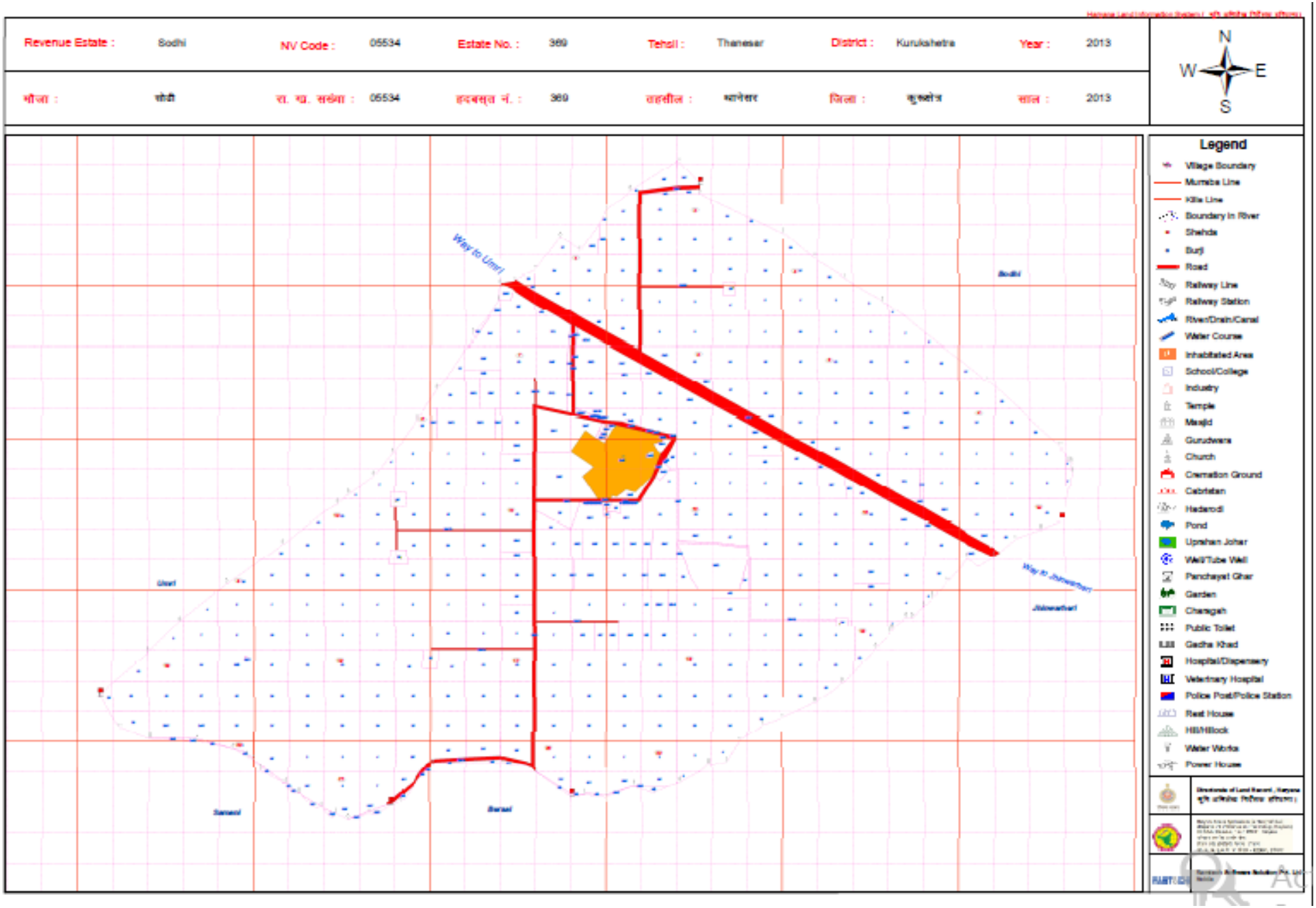
MAP – Identify



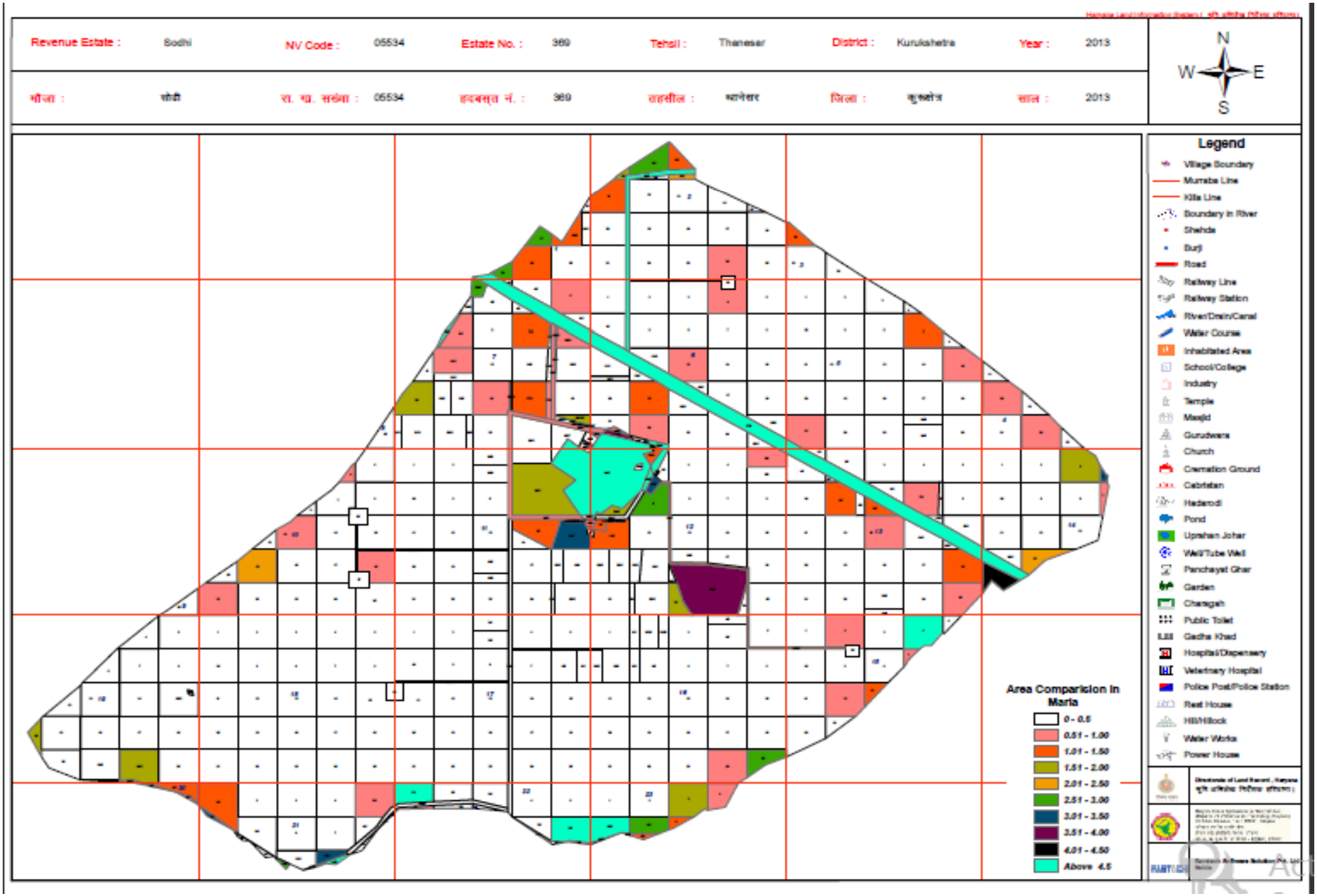
DIGITIZED MUSSAVI



SAJRA MAP OF SODHI VILLAGE



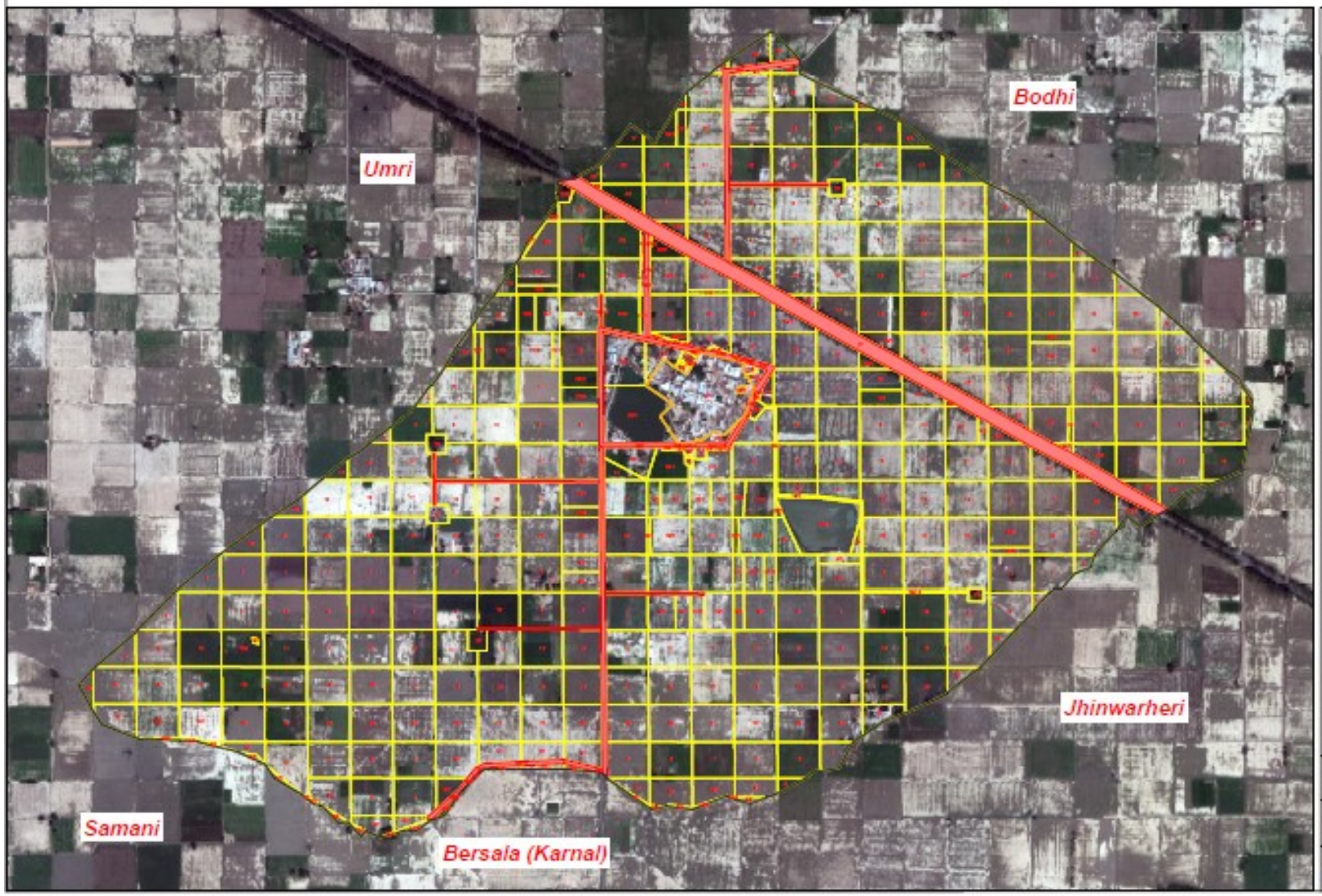
COMPARISION RoR & MUSSAVI AREA



GEOREFRENCED OF SODHI VILLAGE

Revenue Estate :	Sodhi	NV Code :	05534	Estate No. :	369	Tehsil :	Thanesar	District :	Kurukshetra	Year :	2013
गाँव :	सोढी	रा. ख. संख्या :	05534	हदबस्त नं. :	369	तहसील :	थानेसर	जिला :	कुरुक्षेत्र	साल :	2013

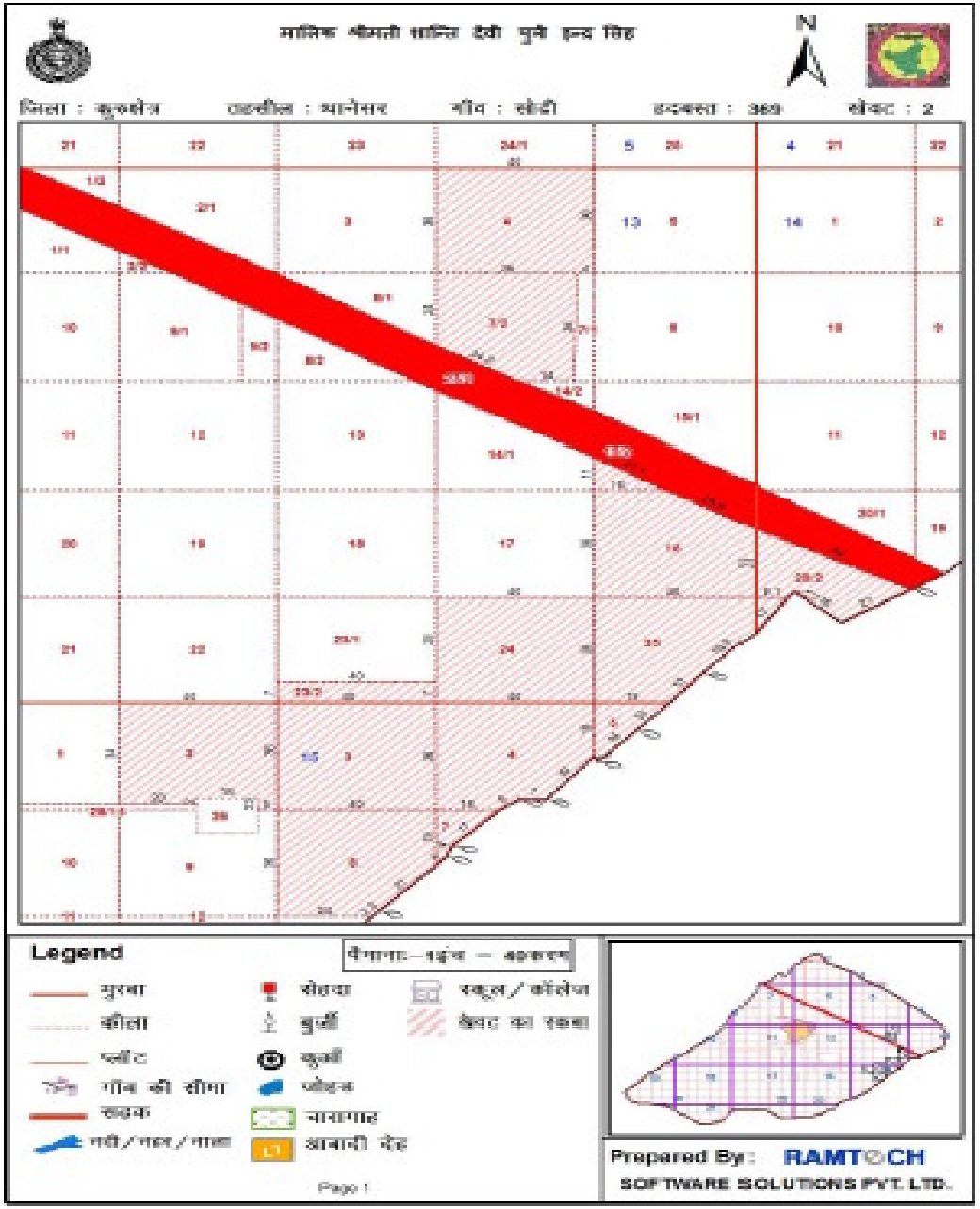
N
W E
S



Legend

- Village Boundary
- Murraba Line
- Killa Line
- Boundary in River
- Shehds
- Burji
- Road
- Railway Line
- Railway Station
- River/Drain/Canal
- Water Course
- Inhabitated Area
- School/College
- Industry
- Temple
- Masjid
- Gurudwara
- Church
- Cremation Ground
- Cabristan
- Nadaroli
- Pond
- Upraheri Johar
- Well/Tube Well
- Panchayat Ghar
- Garden
- Chaupal
- Public Toilet
- Gadha Khad
- Hospital/Dispensary
- Veterinary Hospital
- Police Post/Police Station
- Rest House
- Hill/Hillock
- Water Works
- Power House

KHEWAT WISE MAP



Jalsa e- Aam

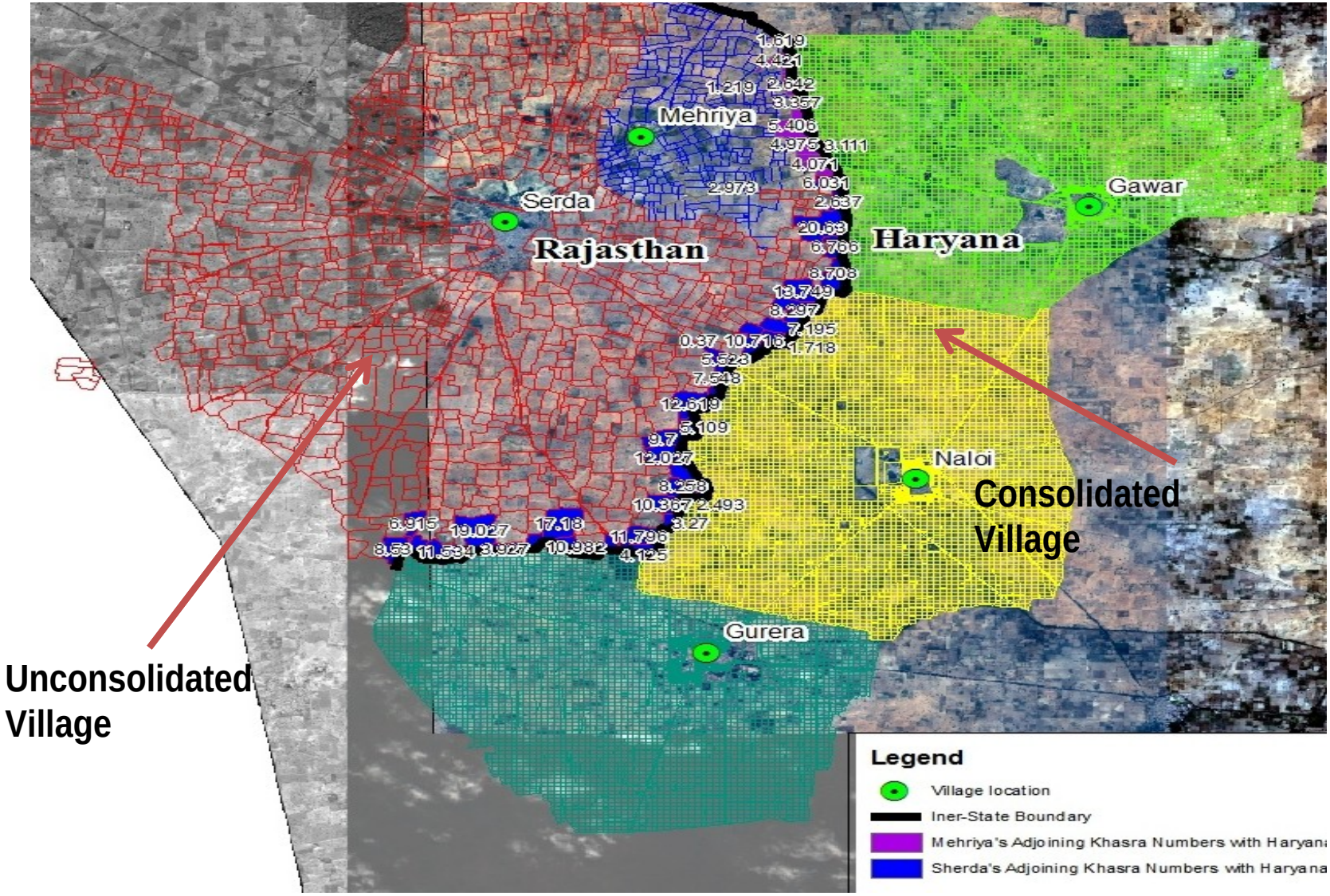

NLRMP HARYANA
(National Land Record Modernization Programme)
Jalsa - E- Aam
" जलसा – ए–आम "
Revenue Estate Kurbanpur (HB-259) Tehsil & District Ambala
Organised By:
District Administration Ambala
LR. GOI
DLR. HRY.
HARSAC
NIC
Haryana
RAMTECH
Ramtech Software

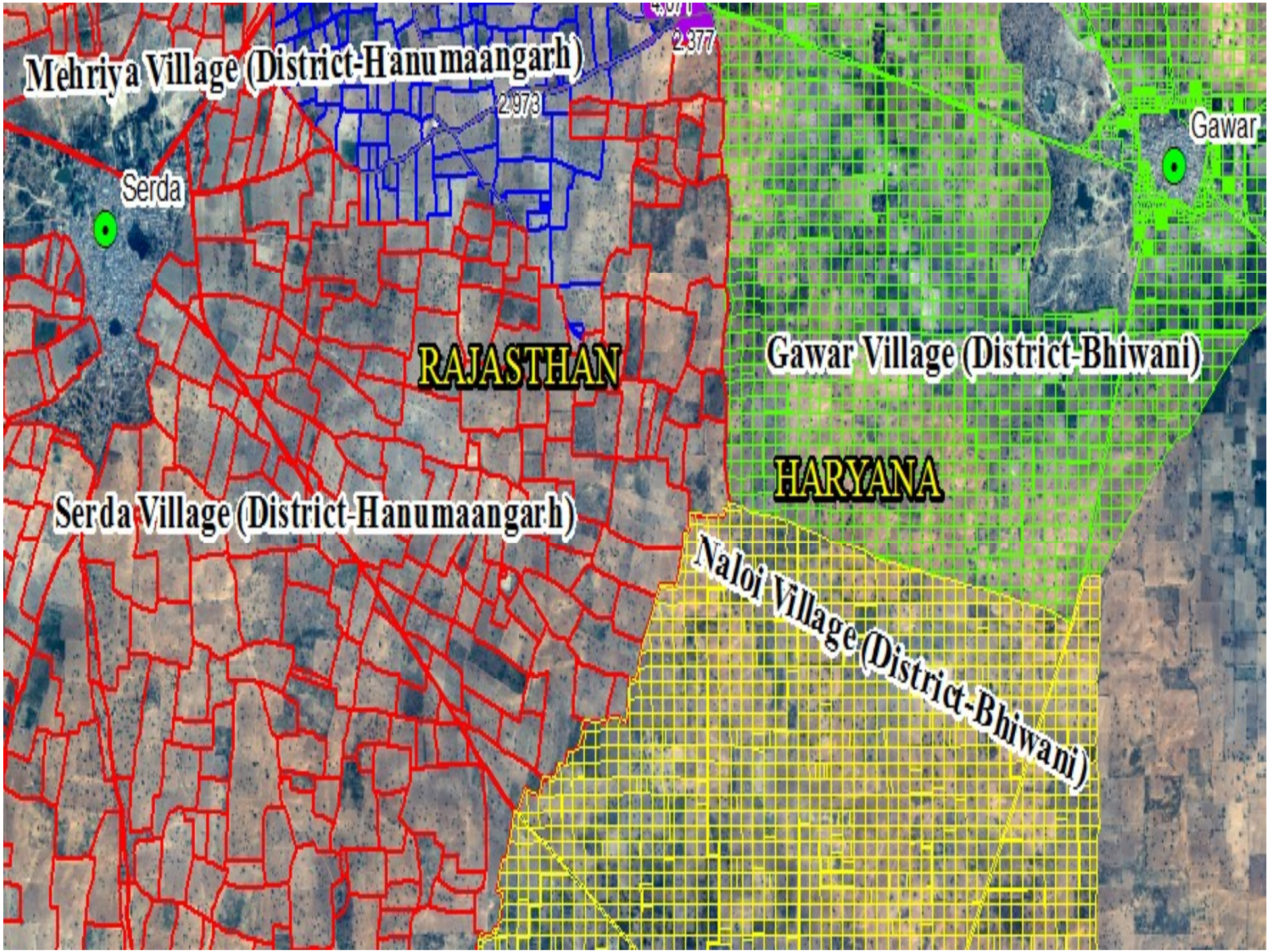
JALSA-E – AAM

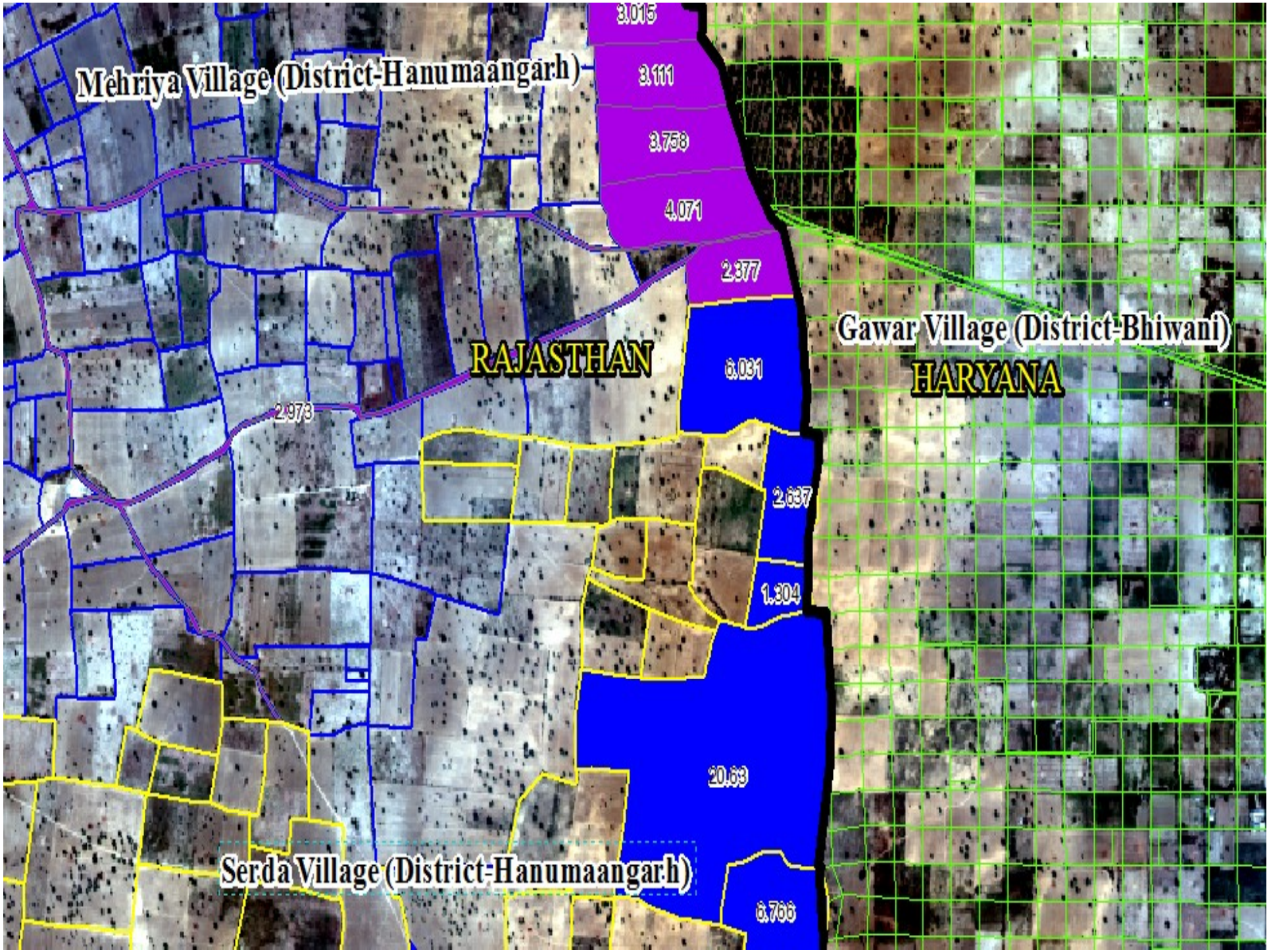
Village Bhandhaheri Distt. Hisar

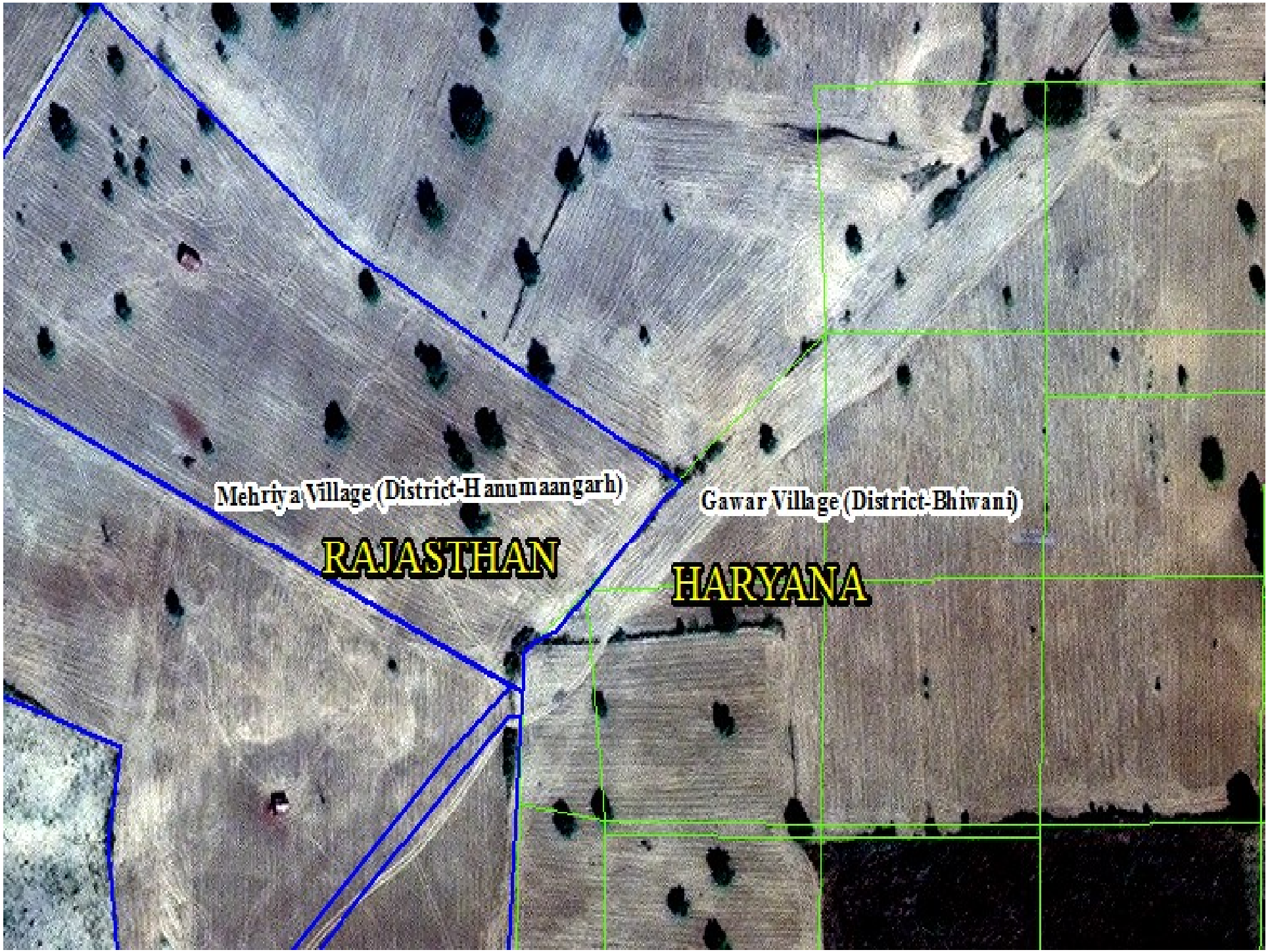
JALSA-E – AAM
Village Bhandhaheri Distt. Hisar

INTERSTATE CADASTRAL MAPPING ACCURACY ASSESSMENT




Mehriya Village (District-Hanumaangarh)
2.377
2.973
Serda
Gawar
RAJASTHAN
Gawar Village (District-Bhiwani)
HARYANA
Serda Village (District-Hanumaangarh)
Naloi Village (District-Bhiwani)


Mehriya Village (District-Hanumaangarh)
3.015
3.111
3.758
4.071
2.377
RAJASTHAN
6.031
2.973
2.637
1.304
20.69
Serda Village (District-Hanumaangarh)
6.766
Gawar Village (District-Bhiwani)
HARYANA


Mehriya Village (District-Hanumaangarh)
Gawar Village (District-Bhiwani)
RAJASTHAN
HARYANA

INTERSTATE COMPARISON OF AREA

Village- Mehriya **Tehsil- Bhadra** **District-Hanumaangarh**

Total Area in hect. as per ROR	Total Area from scale based Map(sajra)	Area Differnce in hect. (ROR-Map)	Area Difference in % (ROR-Map)	Total Area in Hect. From Satellite Data	Area Differnce in hect. (ROR-Image)	Area Difference in % (ROR-Image)	Area Differnce in hect.(Map-image)	Area Difference in % (ROR-image)
663.23	660.451	2.779	0.419009997	657.195	6.035	0.909940745	3.256	0.493

Village- Sherda **Tehsil- Bhadra** **District-Hanumaangarh** **Division-Bikaner**

Total Area in hect. as per ROR	Total Area from scale based Map(sajra)	Area Difference in (ROR and Map)	Area Difference in % Hec (ROR	Total Area in Hect. From Satellite Data	Area Difference in Hec (ROR and Image)	Area Difference in % (ROR and	Area Difference in Hec (Map and Image)	Area Difference in % (Map and Image)
4401.54	4365.18	36.36	0.82607451	4370.09	31.450	0.715	4.910	13.504

Way Forward For

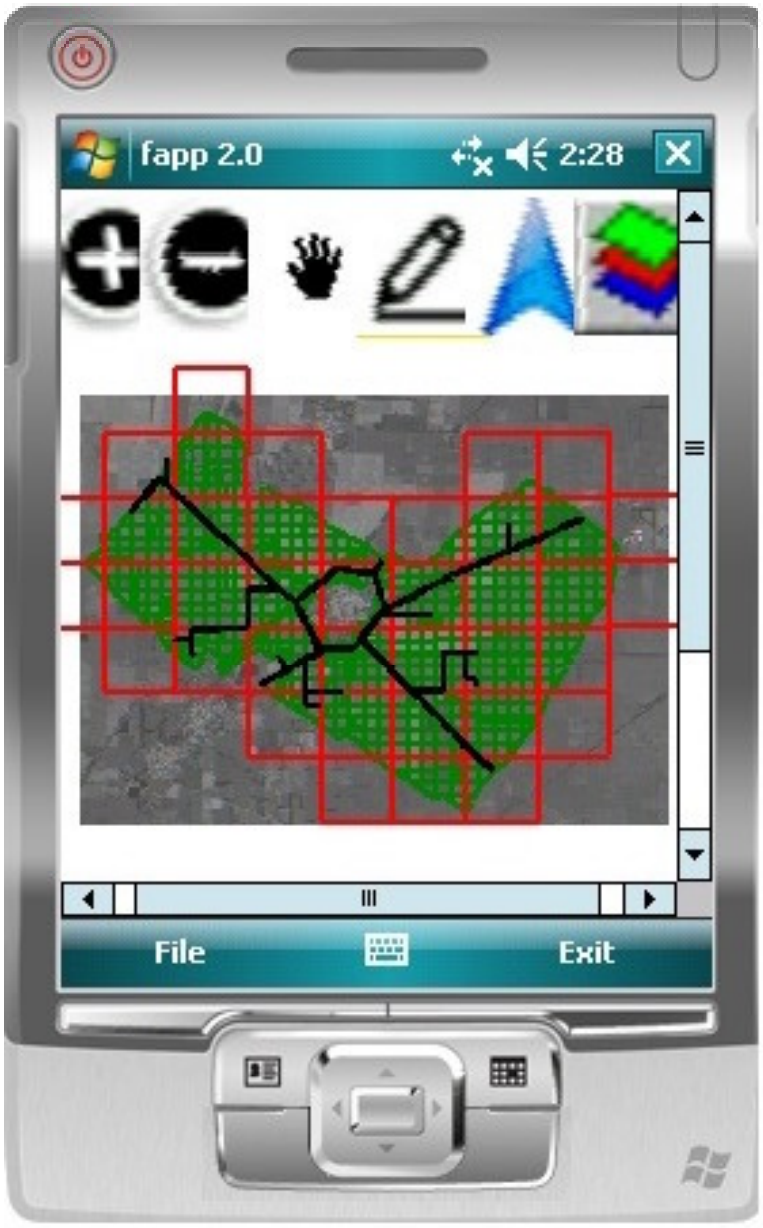
SUCCESSFUL IMPLEMENTATION OF NLRMP

1. Identification of PMC as a technical agency having expertise NLRMP and geo-spatial technologies for monitoring and quality control of the NLRMP.
2. Designing of an elaborate FRS document
3. Identification of suitable technically qualified service providers having expertise in NLRMP & Geo-spatial techniques
4. Designing of a full proof system design document
5. Development of a proof of concept
6. **Declare state priority : allocate resources**
7. **Enact the law**
8. **Take up large scale resurveys / supplemental surveys**
9. **Set up admin infrastructure : *empowered state authorities***
10. **Rewrite processes : write software**
11. **R & D and capacity building: set up state institute**
12. **Build awareness : create demand**
13. **Needs high political and administrative will –**

Conclusion

- A real time 'Land Record Database' will maintain the image of the real world.
- Traditional databases are not efficient in dealing with dynamic data that constantly changes.
- As systems evolve, more complex applications can be handled by RTDB
- Citizen can check real time land records online
- Government can generate ' Land Title'
- Real-time cadastral reports can be generated for land use, disaster management, land acquisition, rehabilitation and resettlement, planning etc.

Future-ICT Patwari for Haryana




Small Efforts May Lead to Big Results
THANKS