

Ultra Resolution UAV based Geo-ICT enabled **PROPERTY TAX MANAGEMENT** for Municipal Council Bhiwani (MCB)

Applied in 'Category 6 - Excellence in Adopting Emerging Technologies

Date : 27.02.2019

District Administration and
Municipal Council of Bhiwani



Haryana Space
Applications Centre

2015



PROJECT UDAAN IMAGE:5 CM



FREQUENT
DRONE CRASHES

WHY UAV? THE JOURNEY DURING LAST FOUR YEARS

- Our efforts on standardizing UAV flights for governance applications
 - The property tax assessment: Importance and problems
 - Addressing solution
- The spin-offs and other applications from our efforts
 - Mining, Agriculture, Industry (Cluster devpt)

PROBLEM

MUNICIPAL
COUNCIL
BHIWANI

70 square kilometres

60,000+ known properties

21.75% avg tax collection

struggling with property tax assessment

many properties not assessed

huge revenue losses

Problems of addresses

CAUSES

MUNICIPAL
COUNCIL
BHIWANI

- Lack of legacy data of properties incl. dimensions
- Rampant corruption & rent seeking during survey
- Faulty assessment & addresses leading to arrear accumulation
- No system available to penalize defaulting owners
- Manual preparation of demand notices & bills
- Manipulation of records, tampering & omissions in sending demand notices.

MUNICIPAL COUNCIL OF BHIWANI
IS NOT THE ONLY ONE FACING
THESE PROBLEMS.....

ULTRA RESOLUTION UAV BASED GEO-ICT ENABLED PROPERTY TAX MANAGEMENT SYSTEM

OBJECTIVES:

- Cost-effective UAV based Aerial Mapping
- Geo-ICT enabled fresh Property Tax Survey
- Real-time Tax Collection / Payment Status
- Monitoring Tax Collection ward wise on a Dashboard
- Payment Gateway implementation as at citizen centric service
- Implementation of Grievance Redressal System

METHODOLOGY

Acquisition of ortho-rectified images from a 42-MP camera on a hybrid vertical takeoff & landing drone.

The outputs of the process:

- 5 cm ultra-high res 3-band true colour orthomosaic
- 5 cm High resolution digital surface model
- 5 cm High resolution digital terrain model
- Contours with 50 cm interval

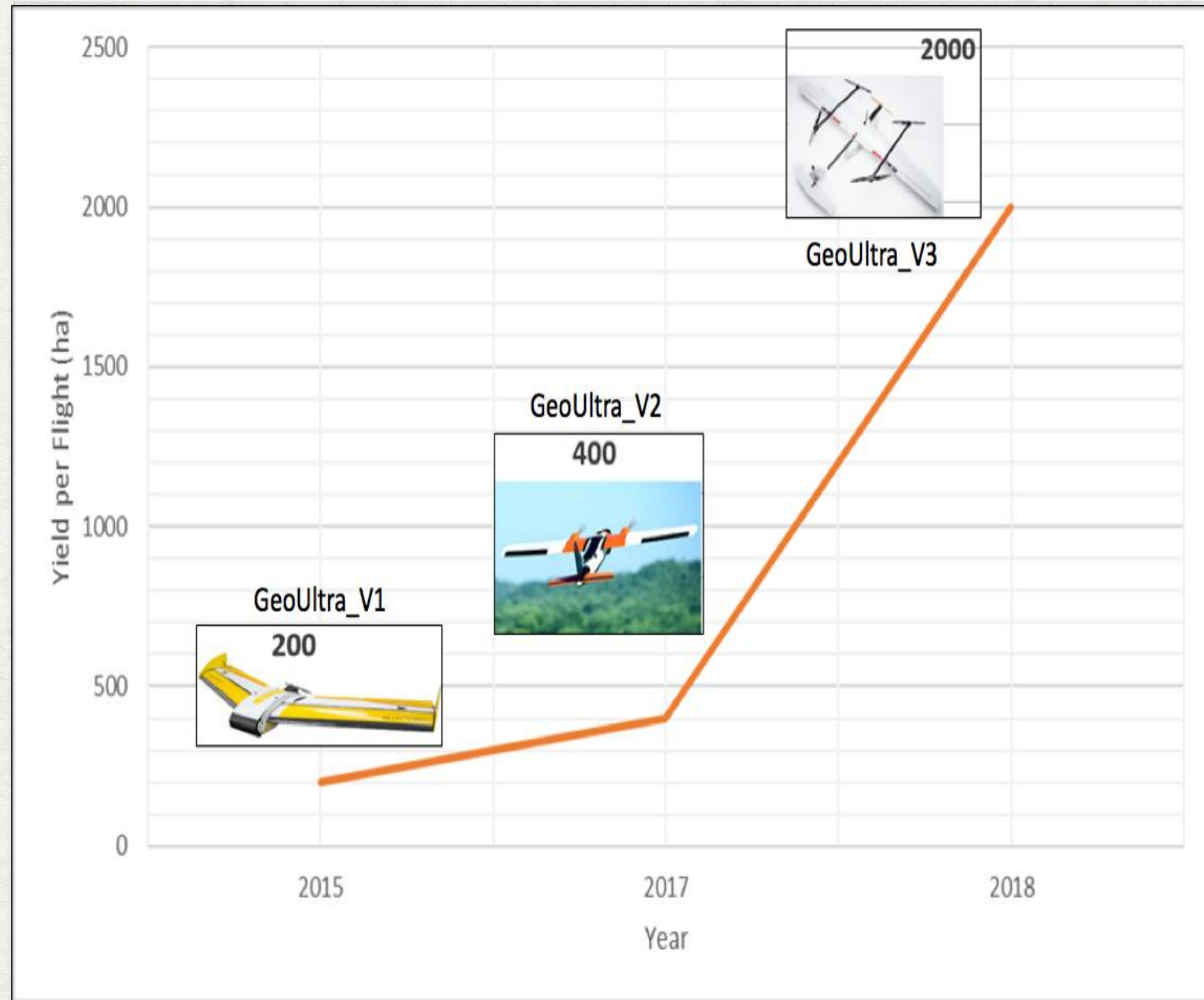
METHODOLOGY

- A smartphone-based solution from ESRI named Collector for ArcGIS was used for the survey purposes.
- A feature access service with sync enabled technique to work in offline mode was deployed using cloud technology.
- An ArcSDE based geodatabase was created with the necessary domains and fields to facilitate the survey team to allow them to collect the data with minimum entry efforts.

STAGE-1
UAV
SURVEY

OCT-NOV
2017

SURVEY FINISHED IN 15 DAYS



Yield: Coverage of 90 Km² in two days

Accuracy:

Horizontal : +/- 10 cm
cm

Vertical: +/- 26

Endurance: +90 minutes

Wind Resistance: 8 m/s (~ 29 Km/h)

COST: Rs. 11,000 per Sq.Km.

RECORD BREAKING PERFORMANCE

UAV INNOVATION

- HARSAC along with Science & Technology Park, Pune (DST, GOI) have evolved the process of UAV data capturing, processing and handling.
- Efforts to standardize the UAV protocol started in 2015 with 200 ha's of coverage per flight to 2000 ha's of coverage in 2017-18.

STAGE-1
UAV
SURVEY

OCT-NOV
2017

UAV INNOVATION

2015

Fixed wing UAVs Project
UDAN - Gurugram



Low endurance, RTK Based,
24 MP Sensor

Electro-magnetic Fields from
High Tension Wires

Accuracy Depends
on Line of Sight

Rs. 35,000/km
200Ha/flight



Take-off and Landing

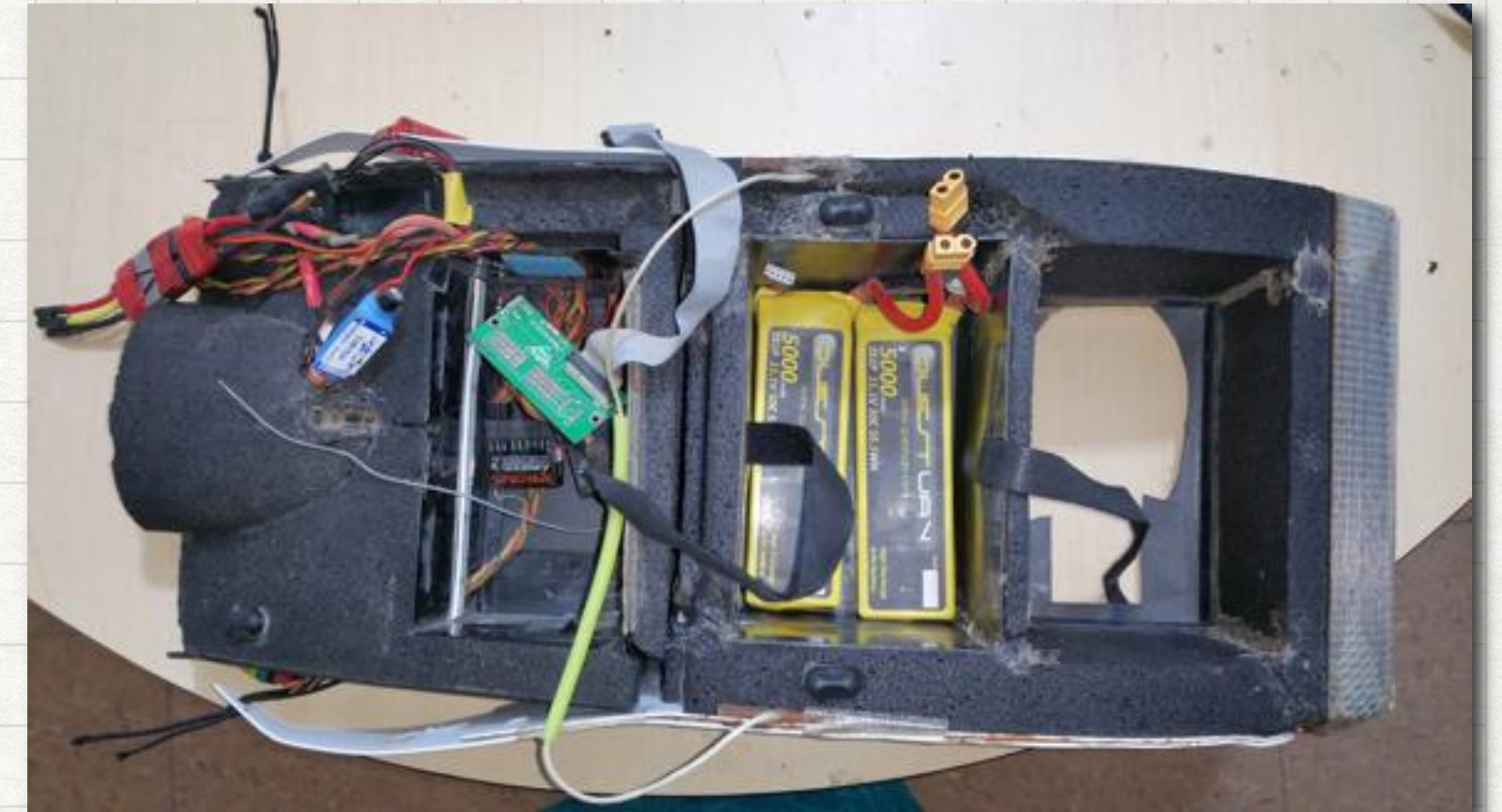
STAGE-1
UAV
SURVEY

OCT-NOV
2017

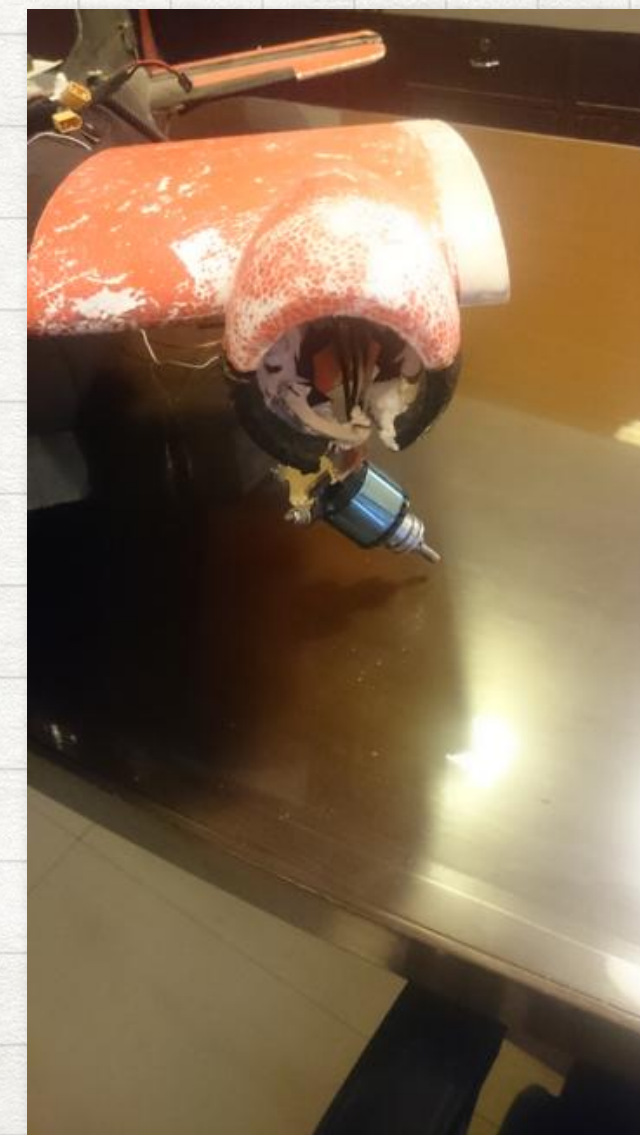
UAV INNOVATION

2015

Fixed wing UAVs Project
UDAN - Gurugram



**HIGH
CRASH
RATE**



STAGE-1
UAV
SURVEY

OCT-NOV
2017

UAV INNOVATION

2016

Dual Propeller

UAV



Low endurance, RTK Based ,
24 MP Sensor

To avoid EMF from High
Tension Wires

Accuracy Depends
on Line of Sight

Rs. 18,000/km
400Ha/flight

TAKE-OFF

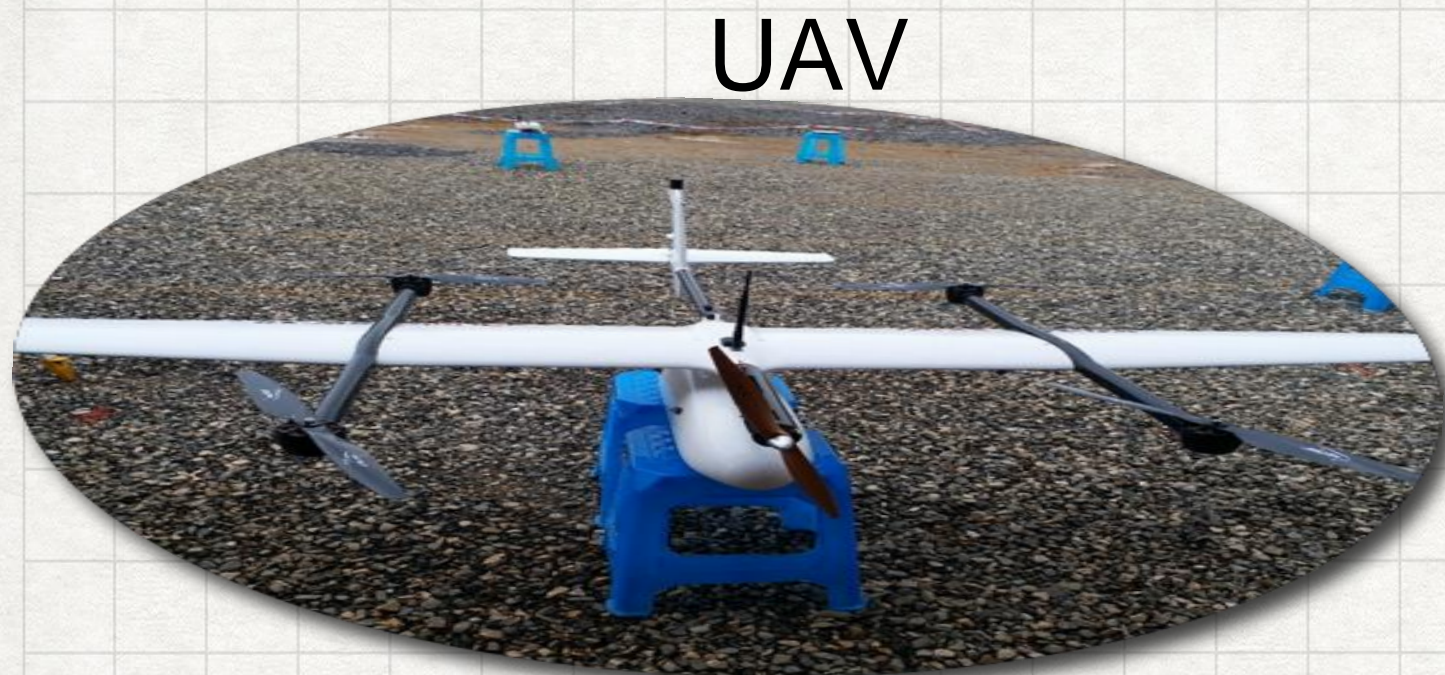
Take-off and Landing

STAGE-1
UAV
SURVEY

OCT-NOV
2017

UAV INNOVATION

2017
Hybrid VTOL



High endurance, 42 MP
Sensor

PPK - Provide 10 cm & better
accuracy without dependency
of line of sight

Rs. 11,000/km
2000Ha/flight

- Substantially increase safety
- Hybrid Vertical Take Off and Landing
- Stabilized 42 Megapixel Sensor
- On board Post Processing Kinematics (PPK)

STAGE-1
UAV
SURVEY

OCT-NOV
2017

UAV INNOVATION

2017

Hybrid VTOL

UAV



High endurance, 42 MP
Sensor

PPK - Provide 10 cm & better
accuracy without dependency
of line of sight

Rs. 11,000/km
2000Ha/flight

- Safety: Vertical take off and landing – practically operate from 10 x 10 meters site
- Superior image quality due to 42 MP stabilised sensor
- PPK substantially reduces the need for high number of Ground Control Points (GCPs) – reduces time and costs
- Easy of Operation

STAGE-1
UAV
SURVEY

OCT-NOV
2017

UAV INNOVATION

2017
Hybrid VTOL

UAV

High endurance, 42 MP
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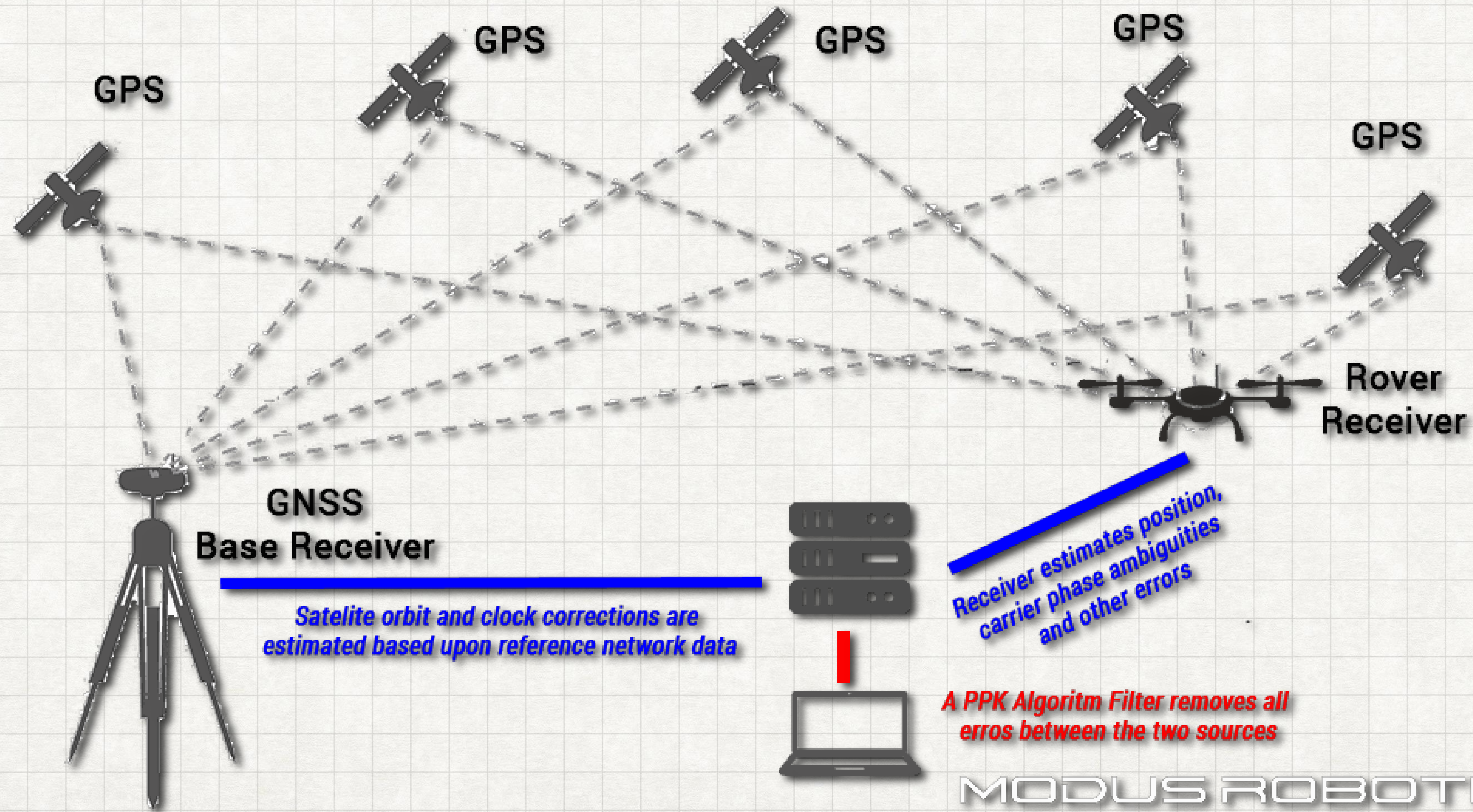


Take-off

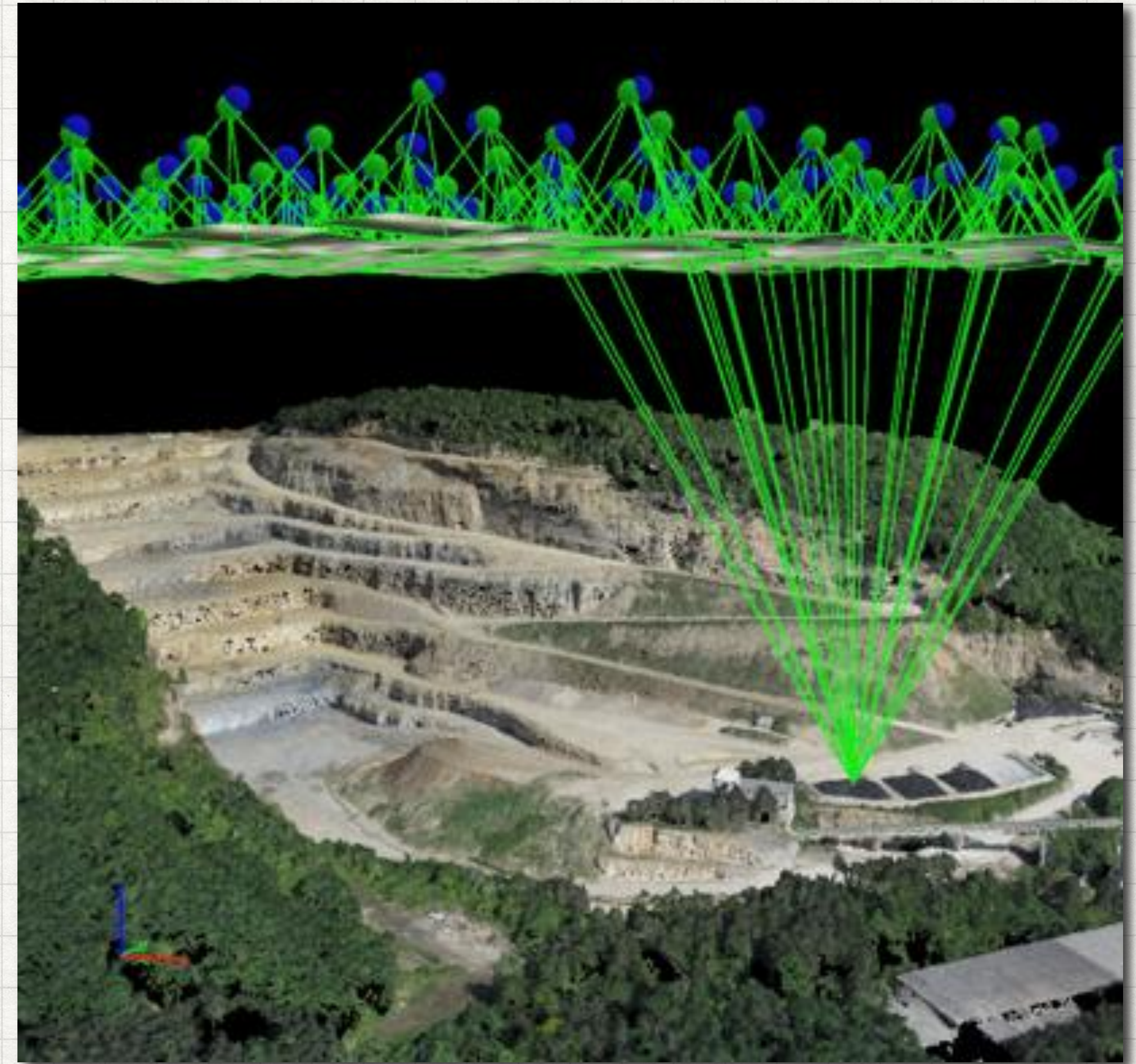
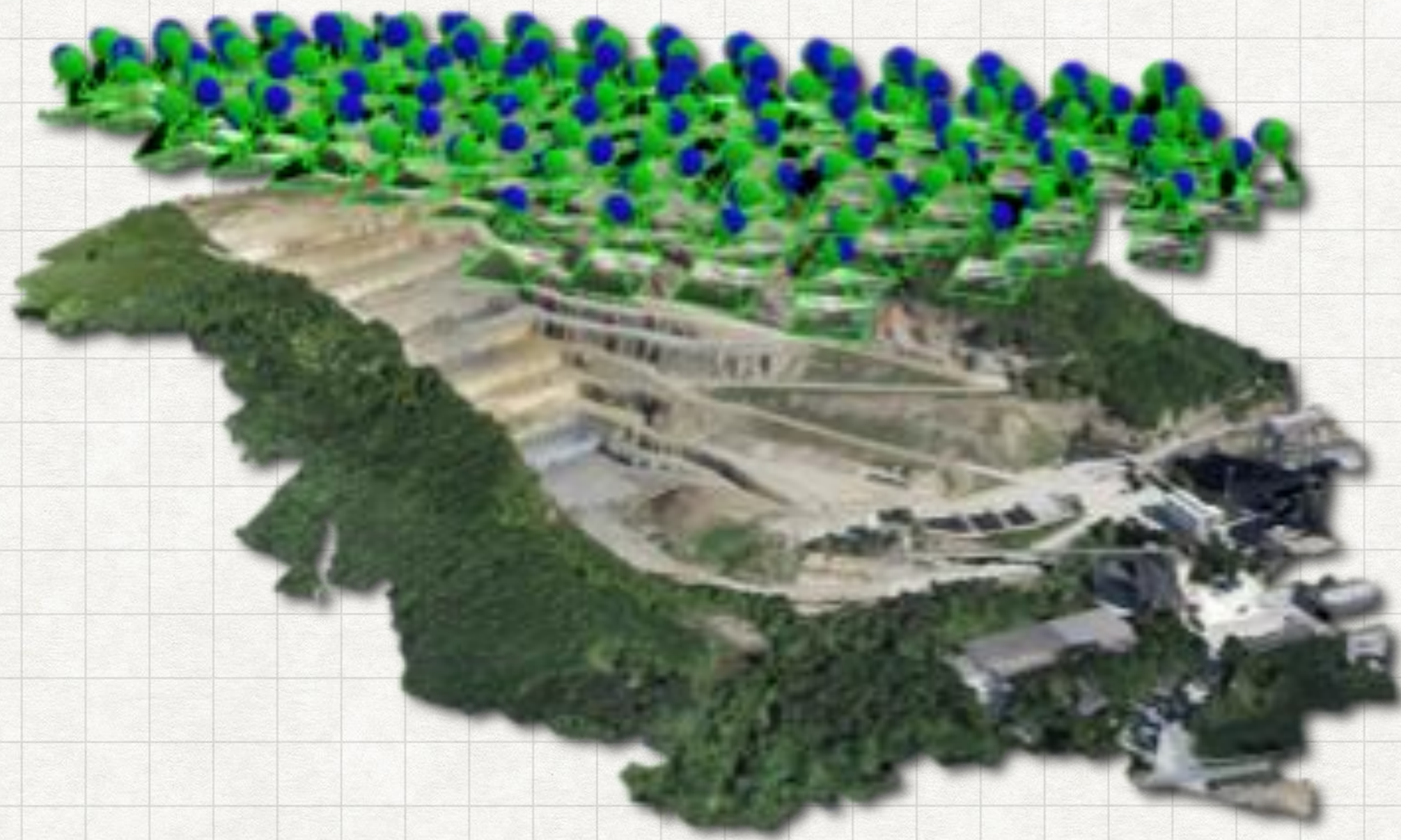


Landing

PPK TECHNOLOGY



3D- POINT CLOUD



STAGE-1
UAV
SURVEY

OCT-NOV
2017

UAV INNOVATION

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STAGE-1
UAV
SURVEY

OCT-NOV
2017

UAV INNOVATION

IMPROVED RESOLUTION



STAGE-1
UAV
SURVEY

OCT-NOV
2017

UAV INNOVATION

SATELLITE



STAGE-1
UAV
SURVEY

OCT-NOV
2017

UAV INNOVATION

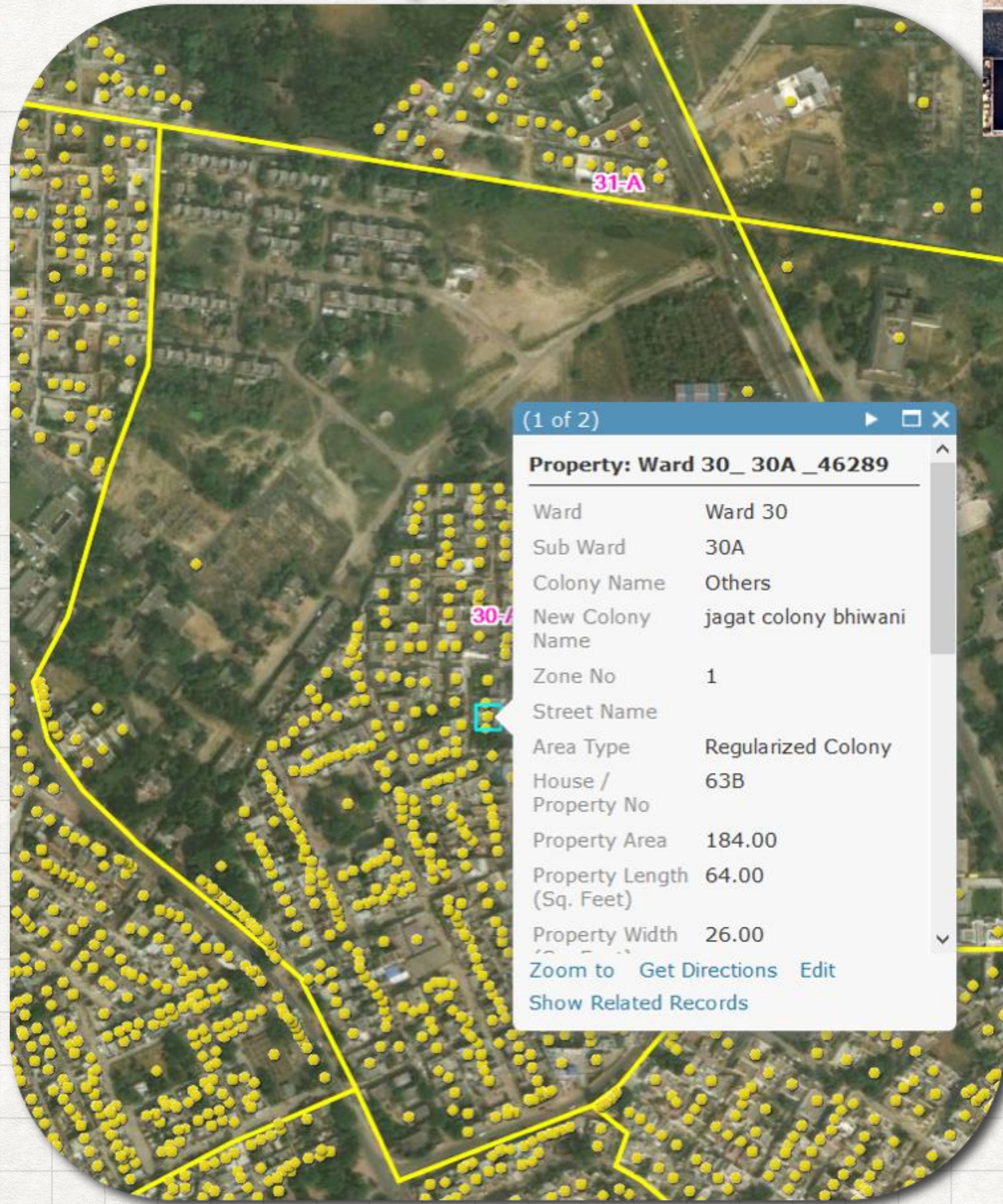
UAV



**STAGE-2
UAV DATA
PROCESS**

DEC
2017

Property Location & its Info



UAV Inset of Property

Geotagged Field Photograph



Ownership details

Ownership Details (1 features, 0 selected)

Ownership Type	Owner Name	Relation Type	Relation Name	Gender	Correspondence Address	Permanent Address
Individual	veena mehta	Wife of	sushil kumar mehta	Female		jagat colony bhiwani h.no 63 B

Floor Details

Floor Details (2 features, 0 selected)

Floor Type	Covered Area Sqfeet	Usage	Property Category	Property Type	Property Subtype	Construction Type
First Floor	600.00	Self occupied	Residential	House	Independent House	RCC/RBC
Ground Floor	1,660.00	Self occupied	Residential	House	Independent House	RCC/RBC

STAGE-3
GEO SPATIAL
DATABSE

JAN
2018

The screenshot displays the ArcGIS Collector application interface. The title bar reads "Collector for ArcGIS" and "Bhiwani_Property_Survey_2018". A "Screen Recorder" watermark is visible in the top right corner. The main view is a satellite map of a densely populated urban area, with a yellow boundary line outlining a specific region. A pink label "288" is visible on the map. On the left side, there is a "Collect new" panel with a search bar and a list of features. The "Property" feature is selected, indicated by a yellow dot and a mouse cursor. At the bottom of the screen, there is a recording control bar showing "Recording..." and a timer at "00:00:00". A small status bar in the bottom right corner shows a location icon and the text "279858.9 ft".

GRIEVANCE REDRESSAL SYSTEM

FEB-JUNE
2018

Grievance reporting - Online

Report Grievance

Search Property

Property ID
 Address
 Mobile No.

Property ID: 260C1126U32680

Zone: 4

Ward No: 30

Owner Name: Not Available!

Gender: Not Available!

Relation: Not Available!

Name: Not Available!

Payable Amount: 2322

Property Details

FLOOR	CATEGORY	STATUS
VP	Vacant Plot	Active

Grievance Registration

Grievance Registration

Have a problem or a request to make, feel free to do so. Our Grievances Redressal team will do all possible efforts to address your request as soon as possible.

All (*) fields are mandatory

Property Tax Correction Form

Document Checklist for Grievance reporting

1. **Rectification of Plot Area**
 - a) Application
 - b) Sale Deed/Conveyance Deed/Allotment letter of HUDA or HSIIDC
 - c) Confirmation from Tehsildar in the case of Laldora
2. **Rectification of Carpet Area**
 - a) Application
 - b) Sale Deed/Conveyance Deed/Allotment letter of HUDA or HSIIDC
 - c) Drawing approved by Competent Authority
3. **Rectification of Category (Building Use)**
 - a) Application
 - b) Occupation Certificate
 - c) Site Inspection Report showing actual use of unit
 - d) Sale Deed/Conveyance Deed/Allotment letter of HUDA or HSIIDC
4. **Rectification of Property Usage from Rent to Self**
 - a) Application
 - b) Income Tax Return
 - c) Site Inspection Report showing actual use of unit
5. **Change of Property Address**
 - a) Application
 - b) Property Ownership Documents
6. **Property Tax Assessment on the basis of Occupation Certificate**
 - a) Application
 - b) Occupation Certificate
7. **Rectification of Category (Building Use from Commercial to IT)**
 - a) Application
 - b) Certification of NASSCOM, GMIT and STPI.
8. **for Generation of New Property ID**
 - a) Application (with details) Building use, Self Occupied or Rented Out.
 - b) Property Ownership Documents with complete details of building/unit.

OTP verification

Verify Mobile Number

Type of Grievances

subject *

- Rectification of Plot Area
- Rectification of Category(Building Use)
- Building usage from Commercial to IT
- Rectification of Carpet Area
- Rectification of Property Usage from Rent to Self
- Exemption of Property Tax for Ex-Servicemen
- Amount transfer from Temp. P.ID to Permanent P.ID
- Conversion of Temporary ID to Permanent ID
- Correction in Name
- Change of Property Address

GRIEVANCE CORRECTION MODULE

FEB-JUNE
2018

Dashboard

Assign Grievance

Pending Grievance

Waiting For Approval

In Objection State

Grievance Report

Reassign

Find Grievance

Add New Sub ID

Correction Module

Delete ID

Users Management

Grievance Assignment

Zone 2

Show 25 entries

Search:

S. NO. ↑	Date Submitted ↕	Grievance No. ↕	Property ID ↕	Owner Name ↕	Subject ↕	Responsible User ↕	Assign ↕
1	2019-01-16	GRI-641	71C499U17	Jai Pal Kataria	1: Rectification of Plot Area 2: Correction in Name 3: Change of Property Address	ZTO	Assign
2	2019-01-16	GRI-639	74C381U163	Sudesh Kumari	1: Rectification of Plot Area 2: Correction in Name	ZTO	Assign
3	2019-01-16	GRI-643	49C13U3	Prem Motors Private Limited	1: Correction in Name	ZTO	Assign
4	2019-01-15	GRI-635	80C164U158	shelly mittal	1: Rectification of Plot Area 2: Rectification of Category(Building Use) 3: Correction in Name	ZTO	Assign
5	2019-01-15	GRI-636	36C1645U136G	PATASO DEVI	1: Correction in Name	ZTO	Assign

Showing 1 to 5 of 5 entries

Previous 1 Next

GRIEVANCE CORRECTION MODULE

FEB-JUNE
2018

- Dashboard
- Assign Grievance
- Pending Grievance
- Waiting For Approval
- In Objection State
- Grievance Report
- Reassign
- Find Grievance
- Add New Sub ID
- Correction Module
- Delete ID
- Users Management

Grievance Report/Status

Zone 2								
Show 25 entries								Search:
S. NO.	Date Submitted	Date Assigned	Grievance No.	Property ID	Name	Subject	Responsible User	Status
1	2018-11-28	2019-01-10	GRI-284	59C919U194	Rajesh	1: Rectification of Plot Area 2: Correction in Name	USER	REJECTED
2	2019-01-07	2019-01-10	GRI-557	42C353U61	Rakesh	1: Rectification of Plot Area	CLERK 6	IN PROGRESS
3	2018-12-18	2019-01-02	GRI-405	74C381U163	NIDHI BANSAL WIFE OF BHARAT BANSAL	1: Rectification of Plot Area 2: Correction in Name	USER	REJECTED
4	2019-01-09	2019-01-16	GRI-587	26C589U302P178	Dale Ram	1: Rectification of Plot Area	TI	OBJECTION
5	2018-11-20	2018-11-30	GRI-228	78C1029U99	Sanjeev Kumar	1: Rectification of Plot Area	USER	REJECTED
6	2018-12-20	2019-01-10	GRI-420	14C1007U544	NEERJA WADHAWAN	1: Rectification of Plot Area 2: Correction in Name	USER	REJECTED
7	2018-12-27	2019-01-12	GRI-476	14C3375U238	Col. J.K.V Singh and Surender Mahindru	1: Correction in Name	OWNER	APPROVED

GRIEVANCE CORRECTION MODULE

FEB-JUNE
2018

- Dashboard
- Assign Grievance
- Pending Grievance
- Waiting For Approval
- In Objection State
- Grievance Report**
- Reassign
- Find Grievance
- Add New Sub ID
- Correction Module
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- Users Management

Grievance Report/Status

Zone 2

Show 25 entries

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GRIEVANCE CORRECTION MODULE

FEB-JUNE
2018

- Dashboard
- Assign Grievance
- Pending Grievance
- Waiting For Approval
- In Objection State
- Grievance Report
- Reassign
- Find Grievance**
- Add New Sub ID
- Correction Module
- Delete ID
- Users Management

Enter Grievance Number/Property ID/Mobile No/Responsible User

Show 10 entries

Search:

S. No. ^	Date Submit ↕	Gri No ↕	Property Id ↕	Owner Name ↕	Mobile No ↕	Locality ↕	Subject ↕	Responsible User ↕	Status ↕
1	2018-11-28	GRI-284	59C919U194	Rajesh	9899541099	Rajeev Nagar	1: Rectification of Plot Area 2: Correction in Name	USER	REJECTED
2	2018-11-28	GRI-285	59C919U194	Rajesh	9899541099	Rajeev Nagar	1: Rectification of Plot Area 2: Correction in Name	CLERK 6	OBJECTION

Showing 1 to 2 of 2 entries

Previous 1 Next

GRIEVANCE CORRECTION MODULE

FEB-JUNE
2018

- Dashboard
- Assign Grievance
- Pending Grievance
- Waiting For Approval
- In Objection State
- Grievance Report
- Reassign
- Find Grievance
- Add New Sub ID
- Correction Module
- Delete ID
- Users Management

Correction Form

1. Ownership Related

Owner Name	Rajesh
Gender	M
Relation Type	null
Relation Name	null
Mobile Number	null
Email Id	null

Last Updated on : N/A

2. Building Details

GF x Delete Floor

Floor Type	GF	Property Category	Residential
Property Type	House	Property Sub Type	Independent House
Property Uses Type	R	Applicable Rate Factor	4
Property Tax	1400	Fire Tax	0
Floor wise Covered/Carpet Area(Sq. Ft.)	975	Total Plot Area(Sq.Yds.)	350
Total Annual Property Tax	1400	Under Construction	N

Last Updated on : N/A

3. Arrear Details

Property Tax	28317
Fire Tax	0
Interest on arrear upto 31-03-2017	28623
Interest on arrear 18% on (2017-18)	5097
Total Arrear	62037
Current Property Tax	1400
Current Fire Tax	0
Total	1400
Bill Amount	63437
Rebate Amount	0
1% Rebate	0
Current Year Total Collection	0
Payable Amount	63437
Exemption Amount	0
Exemption Remarks	null
Special Rebate Amount	33720
Payable amount till 30-06-2018	29717

Remarks : N/A

Kindly attach final approved document before updating data.

Choose file No file chosen

Last Updated on : N/A

Update Data

FEB-JUNE
2018

- Dashboard
- Assign Grievance
- Pending Grievance
- Waiting For Approval
- In Objection State
- Grievance Report
- Reassign
- Find Grievance
- Add New Sub ID
- Correction Module
- Delete ID**
- Users Management

Advance Correction Module

Delete My Property

Enter Property ID

Note : You can set
In case of delay in updated data reflection and in abnormal behaviour press reset button.
Once a property is deleted, it's status can not be reverted back !

Ownership Related

Unique Property Id : 59C919U194

Owner Name : Rajesh

Gender : M

Relation Type : null

Relation Name : null

Mobile Number : null

Email Id : null

Is Editable

Kindly attach final approved document before deleting property data.

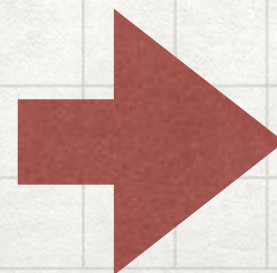
No file chosen

Last Updated on : N/A

STAGE-5
DEPLOYMENT OF
CITIZEN SERVICES

JULY
2018


PROPERTY TAX BILL



iPad 9:41 AM

नगर परिषद - भिवानी (2018-19)
Municipal Council Bhiwani (2018-19)
Property Tax Bill

Property ID	Zone	Ward	Sub Ward	Owner/Occupier Name	Property Address	Locality
63311	1	22	22A	Dushyant	null null New Aadars Nagar Bhiwani	New Aadars Nagar Bhiwani


Total Plot Area(Sq.Yds.)	Property Category	Property Type	Property Sub Type	Floor	Floor wise Covered/Carpet Area(Sq. Ft.)	Self Occupied/Rented	Rate for calculation of Property Tax(Rs.)	Annual Property Tax	Annual Fire Tax	Total Annual Property Tax
72.5	Residential	House	Independent House	Ground Floor	648	Self occupied	N/A	36	0	36
72.5	Residential	House	Independent House	Second Floor	648	Self occupied	N/A	18	0	18
72.5	Commercial	Commercial	Commercial	Second Floor	0	Self occupied	N/A			0
72.5	Residential	House	Independent House	First Floor	648	Self occupied	N/A	22	0	22
Total					1944			76	0	76

Note : Payments for amounts more than Rs. 5,000/- are accepted by MCB only through an A/c payee demand draft in favour of Commissioner, Municipal Council of Bhiwani, Station Rd, Krishna Colony, Bhiwani, Haryana, 127021. No DD will be accepted until the "Mobile/Phone No./Email" and "Property Id" is mentioned on the back side of the DD. **No cheque will be accepted for any amount.**

कृपया बिल की एक प्रति अपने पास सुरक्षित रखें।
Please keep safe a copy of this bill for your record.

किसी भी प्रकार की विसंगति/आपत्ति की अवस्था में बिल को ठीक करने के लिए सम्बन्धित दस्तावेज सहित आनलाईन आवेदन कर सकते हैं।
In case of any deviation in data, apply online for correction of property tax bill.

सम्पत्तिकर की आनलाईन अदायगी के लिए नगर निगम की वेबसाइट पर मौजूद दिशानिर्देशों का अनुसरण करें।
To pay the property tax online follow the instructions given on MCB website.

सम्पत्तिकर रिकॉर्ड को अपडेट करने के लिए कृपया अपना "मोबाइल/फोन नं./ईमेल/आधार नं." की सूचना नगर निगम की वेबसाइट पर उपलब्ध कराएं।
Please provide your "Mobile/Phone No./Email/Aadhar No." on MCB website to update the same in property tax record.

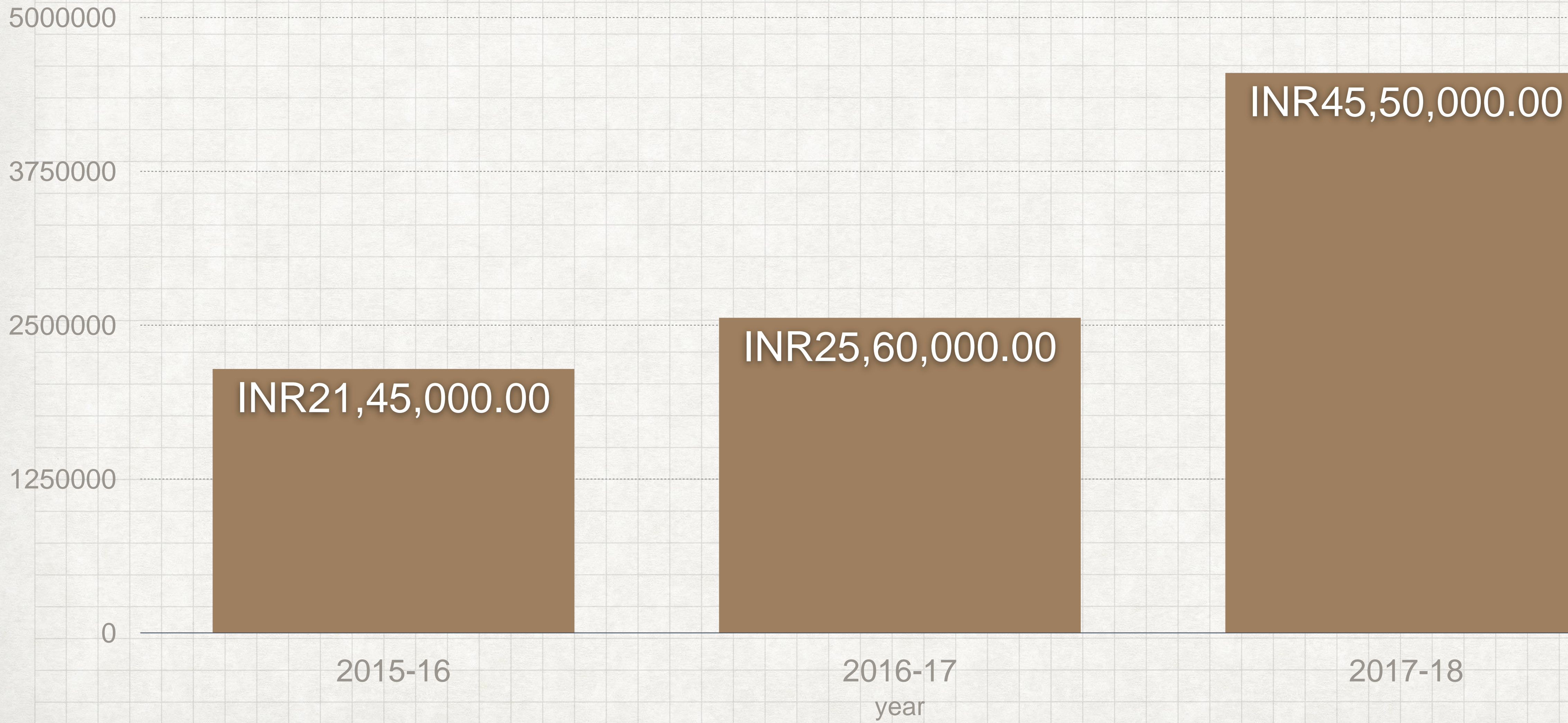
Secretary -
Municipal Council, Bhiwani.

Name of the Owner/Occupier	Mobile No	Email ID	Aadhar No.

WARD NO 05 YEAR WISE ASSESSMENT

Year	Total Properties	Demand (Rs)	Recovery (Rs)	Non recovered (Rs)
2015-16	1150	2145000	440000	1705000
2016-17	1630	2560000	896000	1664000
2017-18	2721	4550000	1820000	2730000

impact on Year wise assessment ■ Ward 05



CITIZEN CENTRIC DEVELOPMENT

- The service delivery channel for the user is a single window web enabled solution for assessing the tax, payment of tax and grievance redressal also.
- The complete system is paperless and the user can view their property details, register any changes in their data through online portal and even can view the progress of their file online.
- The system is 24 x 7 working the user can access the same anytime.
- The complete solution is online acting as a single window solution for assessing the tax, payment of tax and grievance redressal also so the user need not go to any place and get all the facilities on his/her mobile phone.

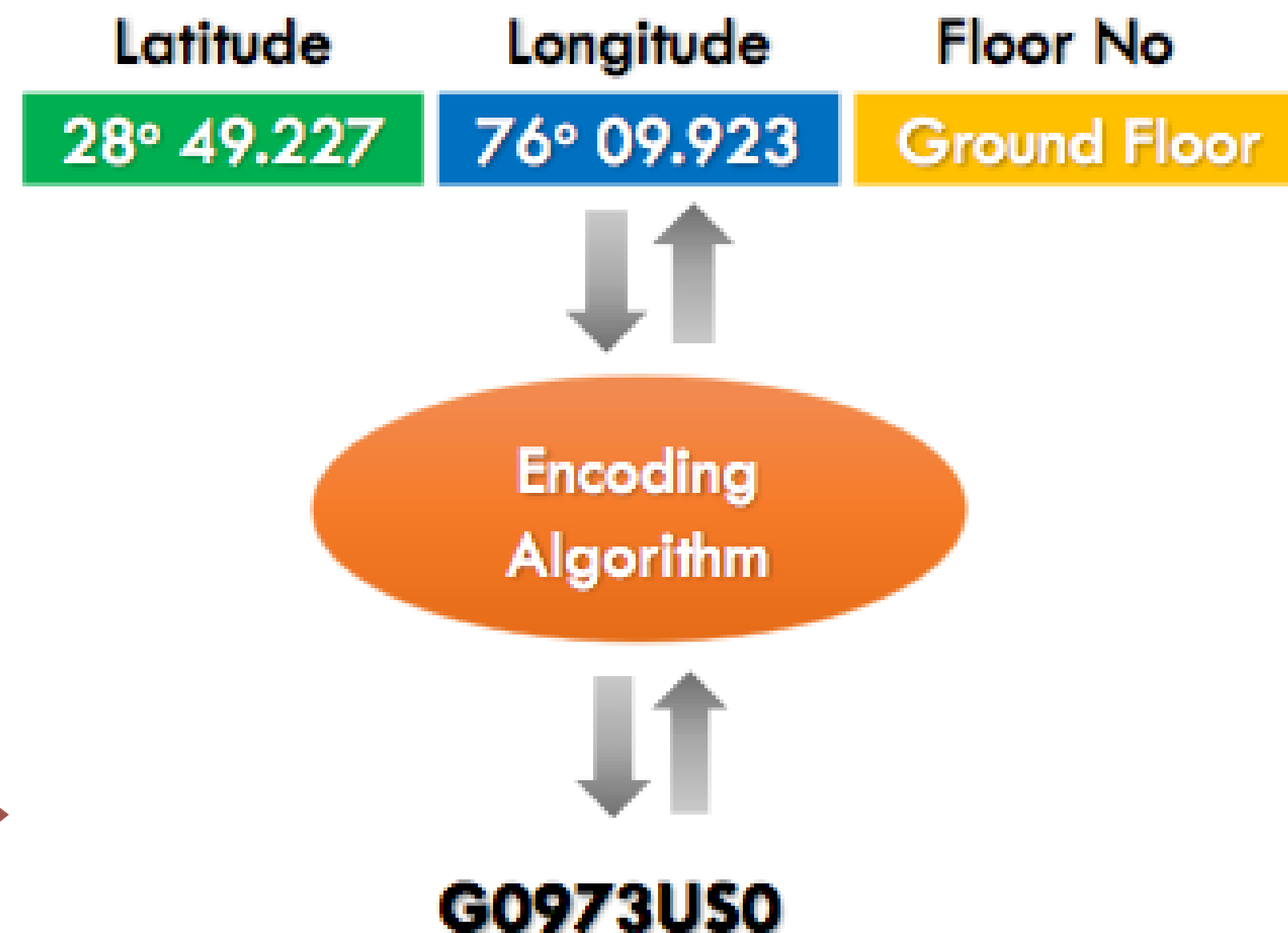
CITIZEN CENTRIC DEVELOPMENT

- 'The solution is completely online and driven by a single window for assessing the tax. Data validation, generation of demand notices and grievance redressal is through online portal.
- 'The entire system is paperless and the user can view their property details, register any changes in their data through online portal. He can even view the progress of their grievance redressal file online along with the officer's details who is handling the file at that moment.

OVERVIEW OF ADDRESSING ALGORITHM

EIGHT DIGIT UNIQUE ID

- Shortest Property ID (8 Digit)
- 3-Dimensional
- Unique ID can be generated for every 2 meter land
- It can also be used as Postal address
- Property ID is generated using Location Information through the encoding process of Algorithm using numbers and letters



Locating on Map

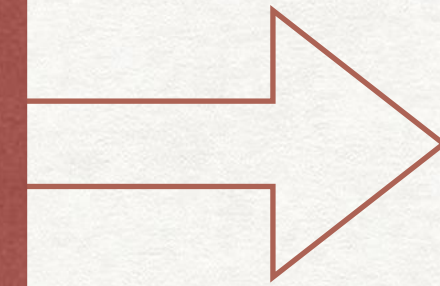
The screenshot shows a web interface with two main sections: **Enter Location Coordinates** and **Show Property Over Map**.

Enter Location Coordinates: This section contains three input fields: **Enter Latitude** (with dropdowns for 28, 48, and 227), **Enter Longitude** (with dropdowns for 76, 9, and 25), and **Floor** (with a dropdown for Ground Floor). A **Generate New Property Id** button is located below these fields.

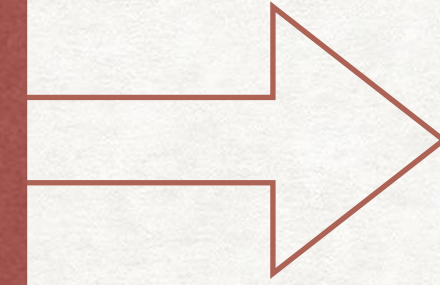
Show Property Over Map: This section displays the generated property ID **G0973US0** in red. It also includes a **Show Property** button and a map showing the location. The map displays the coordinates **Latitude : 28°48.227'** and **Longitude : 76°9.25'** in red, along with the floor **Floor : Ground Floor** in red. A red pin is placed on the map at the corresponding location. A blue location marker for **Sanskrit Sadan** is also visible on the map.



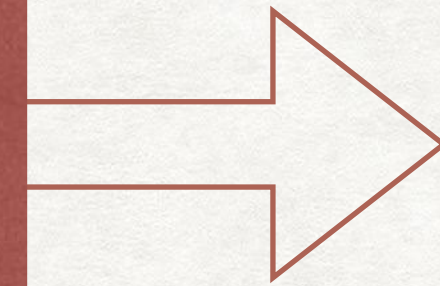
RESEARCHING
TO DEVELOP
TRANSPARENT,
ACCOUNTABLE,
CITIZEN
CENTRIC,
GEO-ICT
ENABLED
URBAN
GOVERNANCE
DIGITAL
PLATFORM



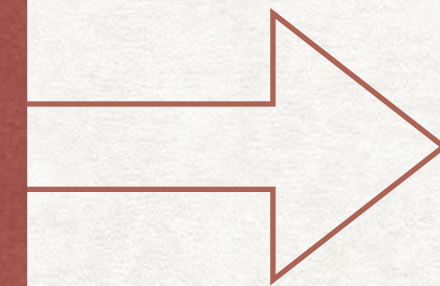
PROPERTY TAX MANAGEMENT



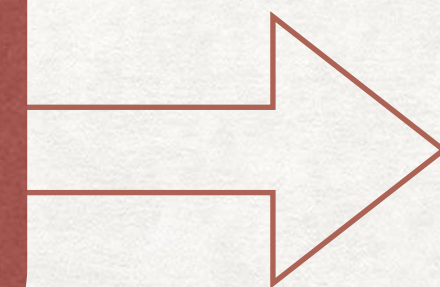
DISEASE CONTROL & HEALTH



DISASTER MANAGEMENT



REVENUE RECORDS



MONITORING MINING

APPLICATIONS

LAND INFORMATION MANAGEMENT



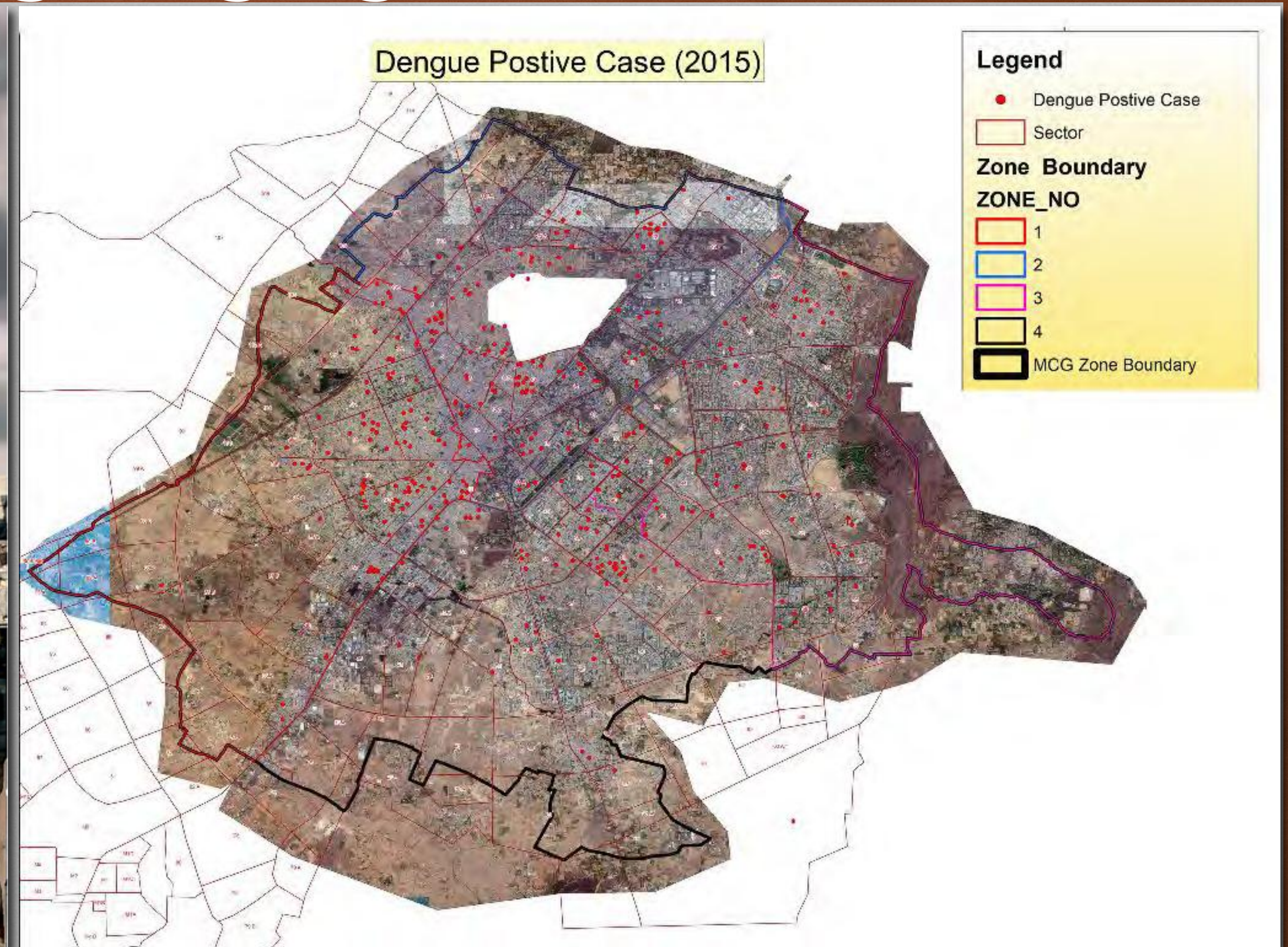
**High- Resolution
Satellite Image
50cm**



**Project UDAAN
5cm Resolution**



APPLICATIONS MITIGATION OF VECTOR BORNE DISEASES

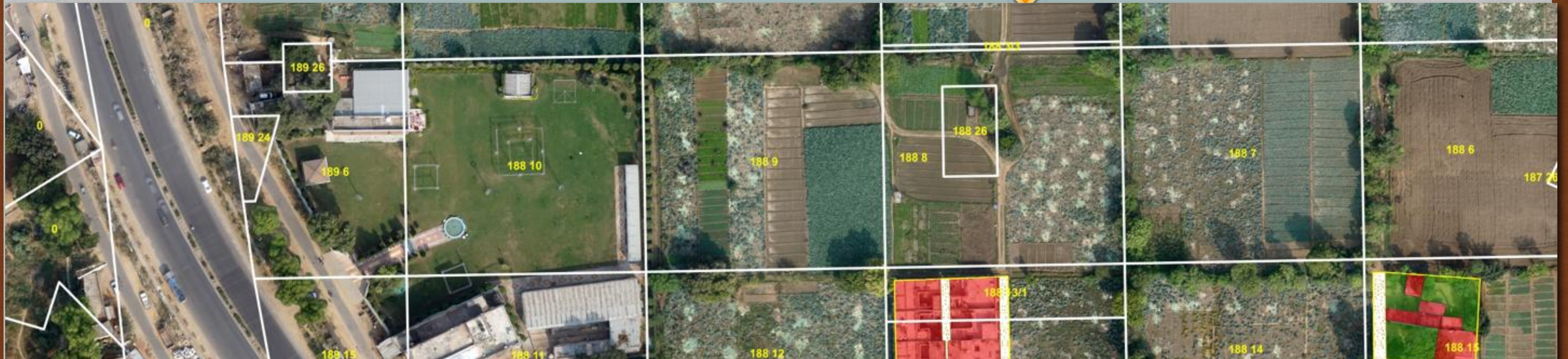
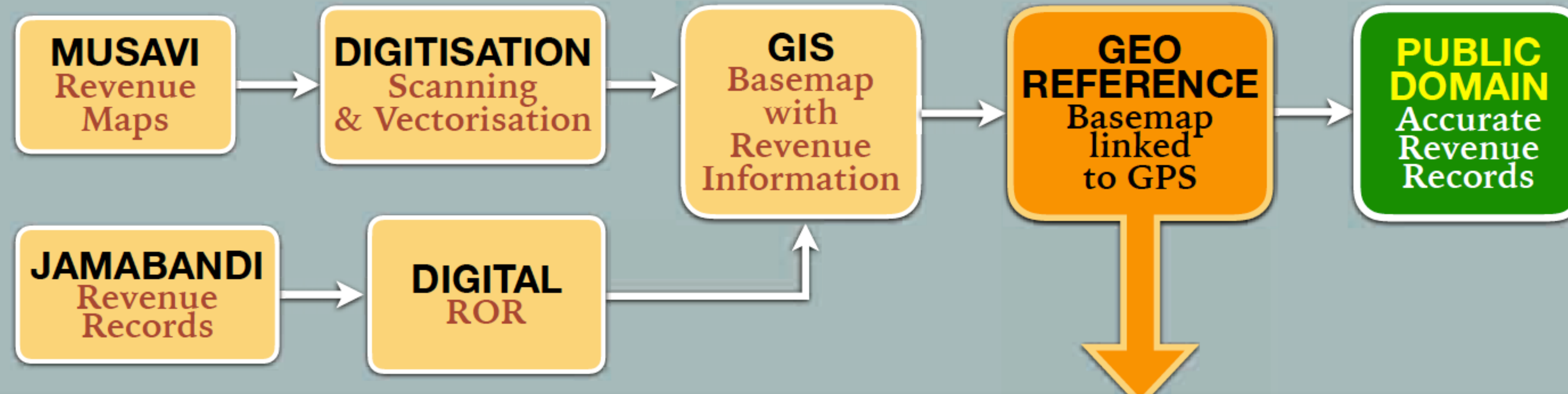


COMPARISON WITH SATELLITE DATA



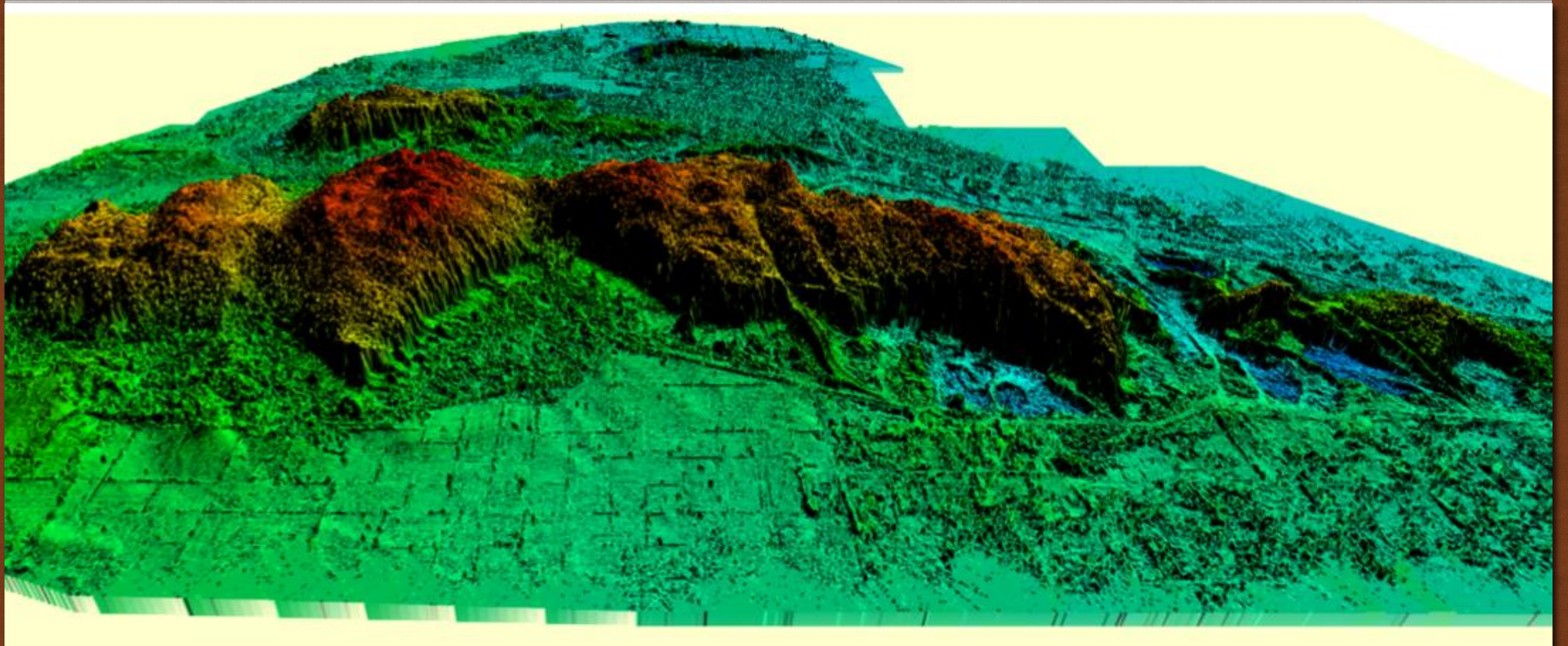
50 cm resolution Satellite vs 5cm UAV data

APPLICATIONS LAND RECORDS



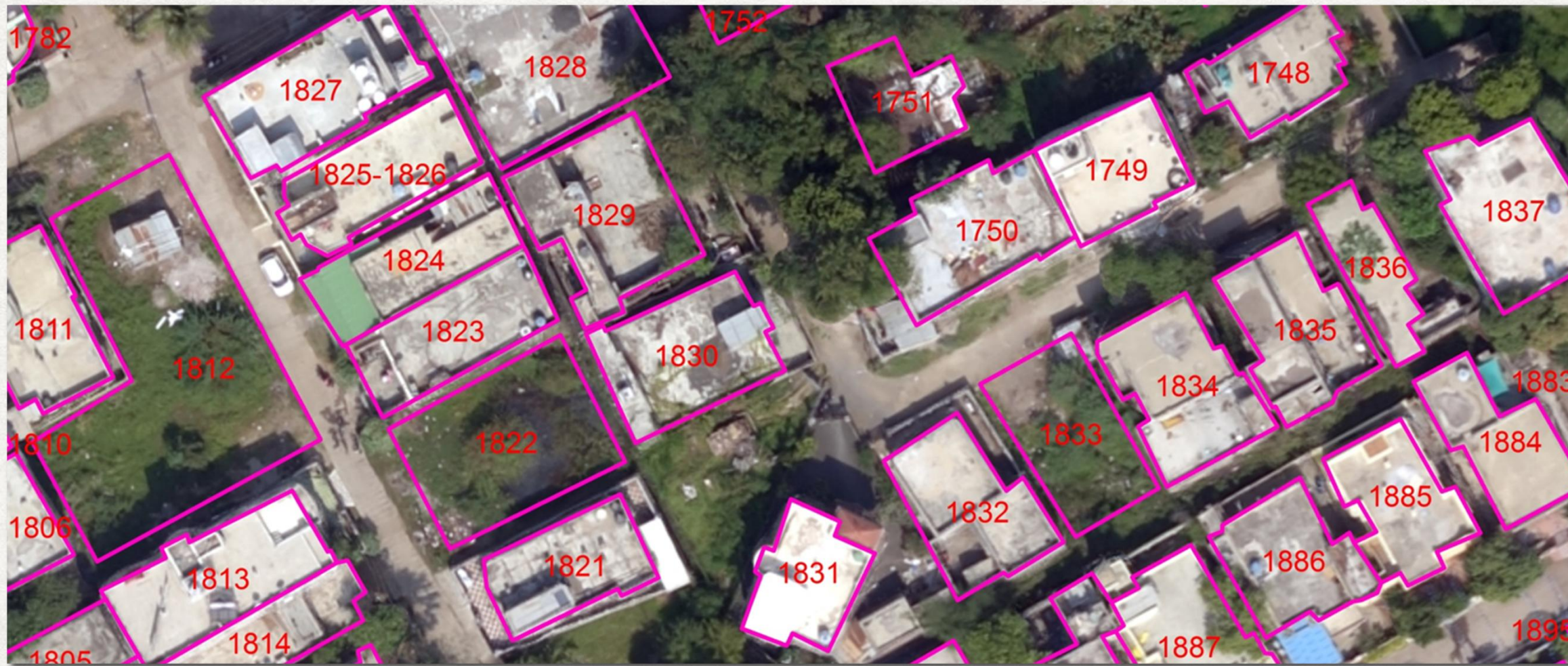
APPLICATIONS

VOLUMETRIC ANALYSIS



Legacy Data Validation

- Disputes Resolved: 758
- Property Tax Base Increased from 32,875 to 60,786



MC
Bhiwani

Difference between
Past Demand and
Current Demand
Increased by
198%

THANK YOU