Kathmandu University

Department of Geomatics engineering

MINI-PROJECT ON PROCESSING DRONE IMAGE AND DIGITIZING FOR PREPARING TOPOGRAPHICAL MAP

Submitted by:	Submitted to:
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Ge-2021 5th sem	

Date of submission: 6/27/2024

1. Introduction

This project focuses on processing aerial drone data captured using the Pix4D app to generate Digital Terrain Models (DTM), Digital Surface Models (DSM), and orthomosaic maps. The processed data is then imported into ArcMap for digitizing features such as buildings (temporary and permanent) and roads to create a comprehensive topographical map.

2. Objectives

- To acquire and process drone data using Pix4D.
- To generate DTM, DSM, and orthomosaic maps.
- To import the processed data into ArcMap for further analysis and digitization.
- To create a topographical map highlighting key features including buildings and roads.

3. Materials and Methods

3.1 Software and Tools

- **Pix4D**: For processing raw drone imagery to generate DTM, DSM, and orthomosaic.
- **ArcGIS/ArcMap**: For importing processed data, digitizing features, and creating.

3.2 Data Acquisition

- The drone data images were provided by Sujan Sapkota Sir for processing.

3.3 Data Processing in Pix4D

- **Import Images**:
    - Load the captured images into Pix4D Mapper.

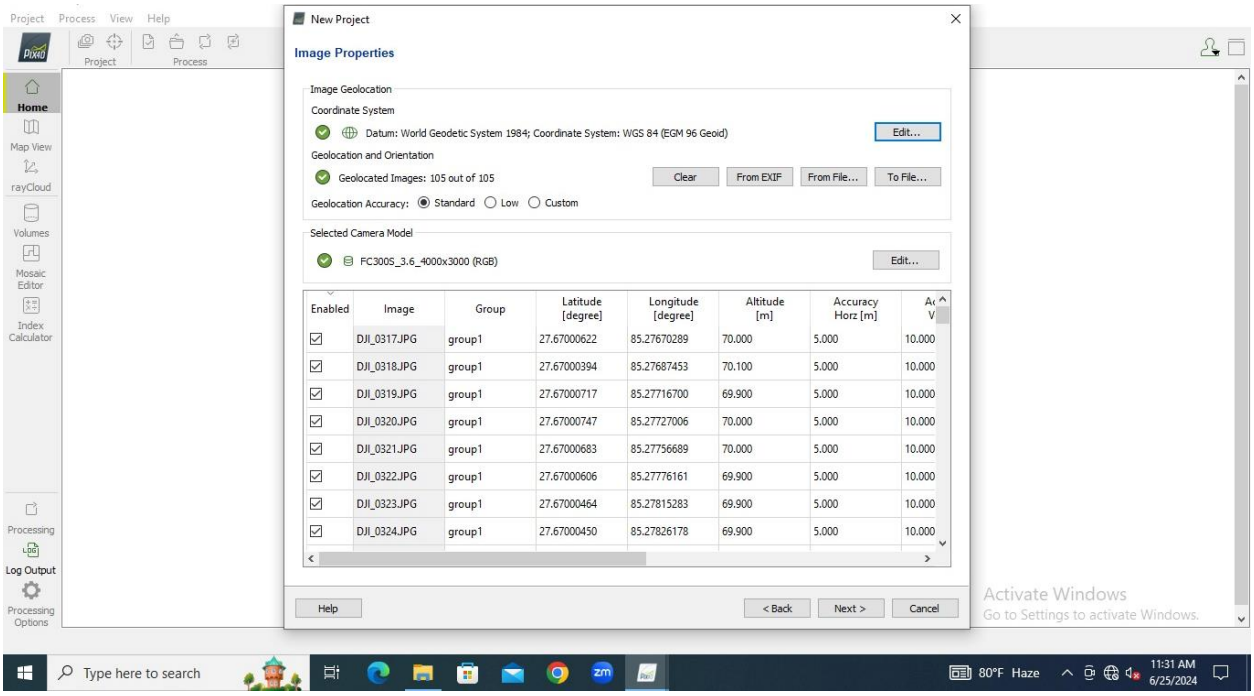
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Image Geolocation
Coordinate System
Datum: World Geodetic System 1984; Coordinate System: WGS 84 (EGM 96 Geoid)
Edit...
Geolocation and Orientation
Geolocated Images: 105 out of 105
Clear
From EXIF
From File...
To File...
Geolocation Accuracy: Standard Low Custom
Selected Camera Model
FC300S_3.6_4000x3000 (RGB)
Edit...
Enabled | Image | Group | Latitude [degree] | Longitude [degree] | Altitude [m] | Accuracy Horz [m]
DJI_0317.JPG | group1 | 27.67000622 | 85.27670289 | 70.000 | 5.000 | 10.000
DJI_0318.JPG | group1 | 27.67000394 | 85.27687453 | 70.100 | 5.000 | 10.000
DJI_0319.JPG | group1 | 27.67000717 | 85.27716700 | 69.900 | 5.000 | 10.000
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DJI_0321.JPG | group1 | 27.67000683 | 85.27756689 | 70.000 | 5.000 | 10.000
DJI_0322.JPG | group1 | 27.67000606 | 85.27776161 | 69.900 | 5.000 | 10.000
DJI_0323.JPG | group1 | 27.67000464 | 85.27815283 | 69.900 | 5.000 | 10.000
DJI_0324.JPG | group1 | 27.67000450 | 85.27826178 | 69.900 | 5.000 | 10.000
Help
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Cancel
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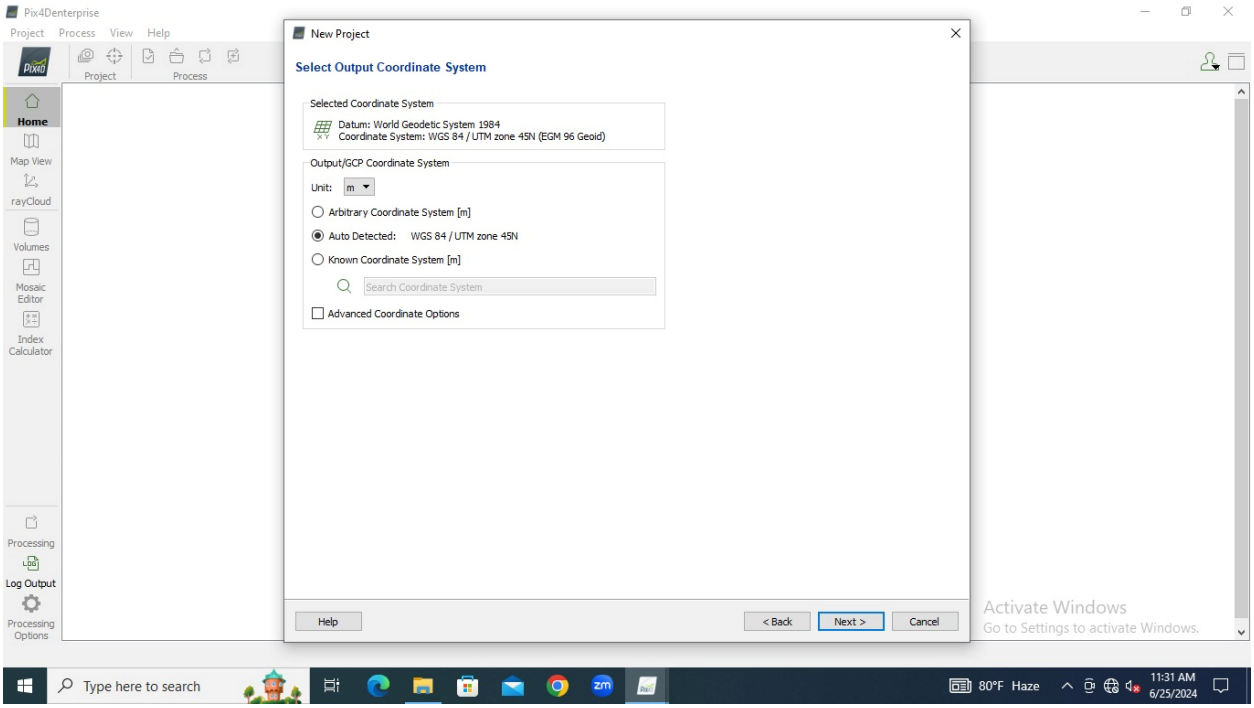
Pix4Denterprise
New Project
Select Output Coordinate System
Selected Coordinate System
Datum: World Geodetic System 1984
Coordinate System: WGS 84 / UTM zone 45N (EGM 96 Geoid)
Output/GCP Coordinate System
Unit: m
Arbitrary Coordinate System [m]
Auto Detected: WGS 84 / UTM zone 45N
Known Coordinate System [m]
Search Coordinate System
Advanced Coordinate Options
Help
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Next >
Cancel
Activate Windows
Go to Settings to activate Windows.
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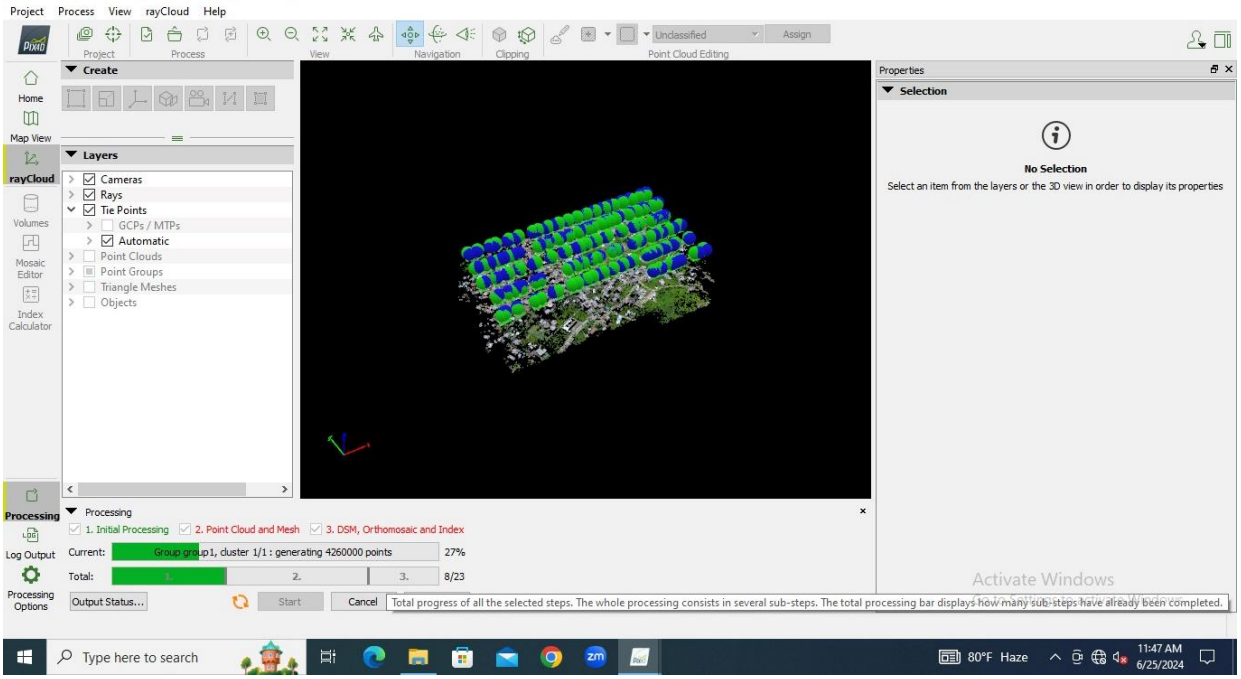
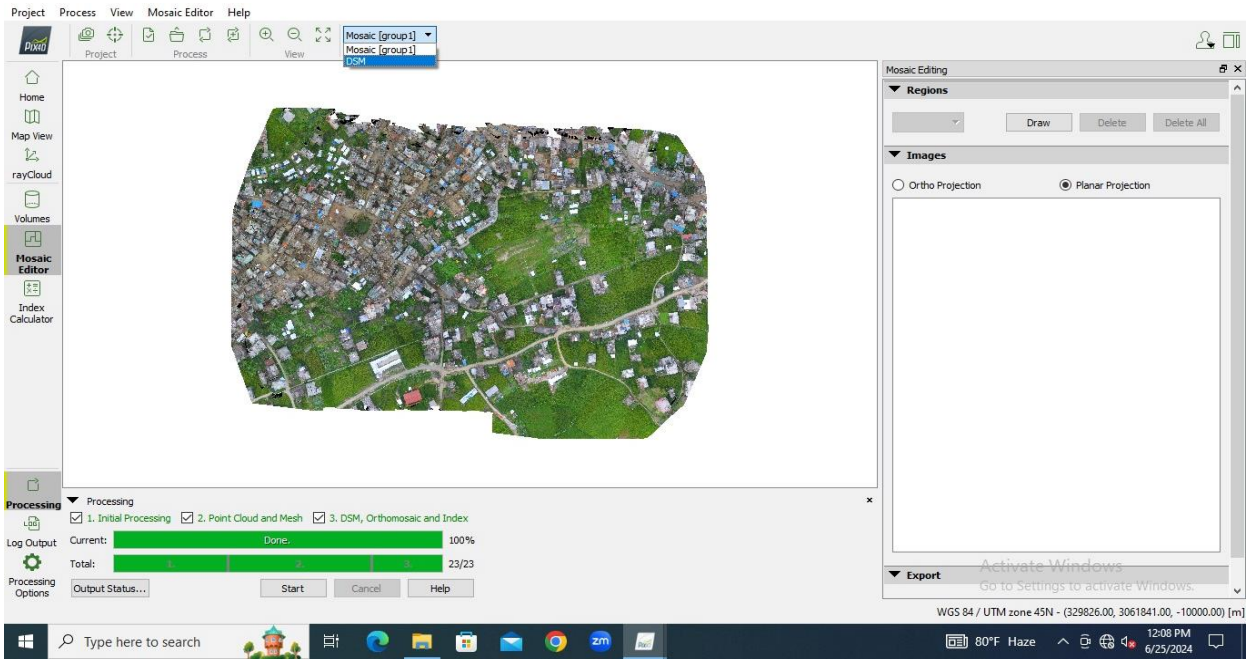
6/25/2024

- **Point Cloud Densification**:
    - Generate a dense point cloud for detailed surface information.



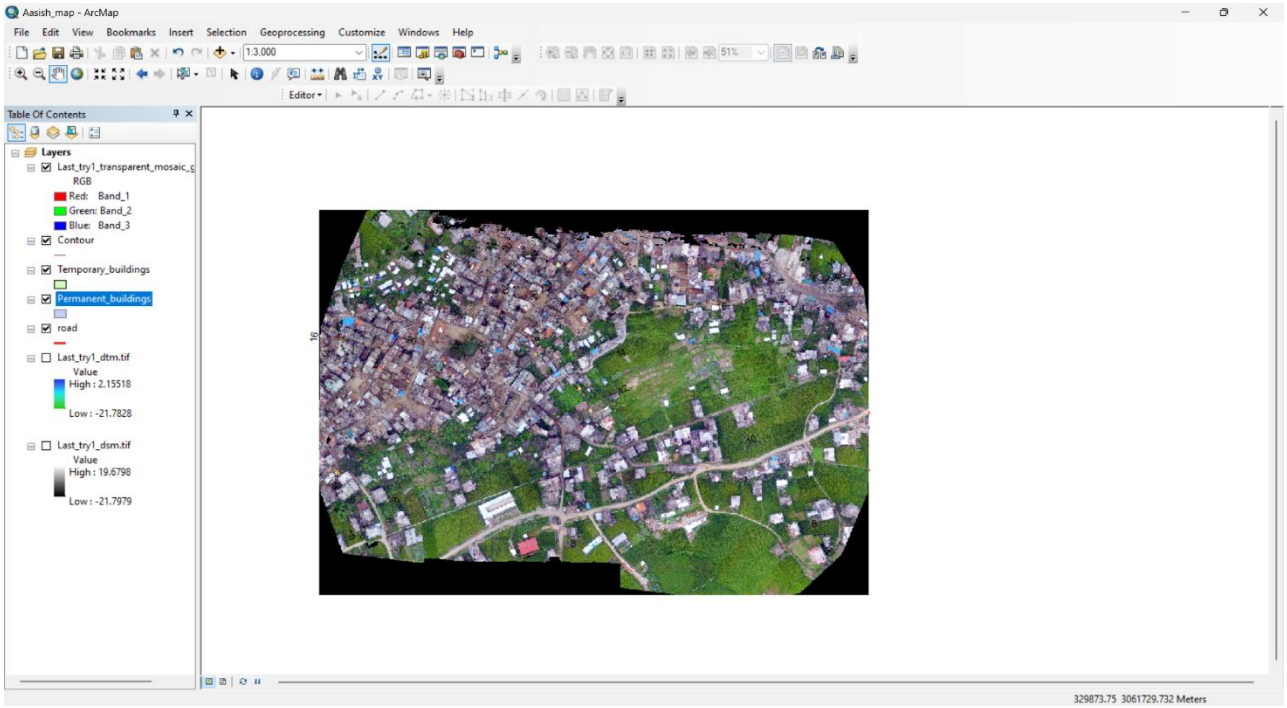
- **Generate DSM and DTM**:
    - DSM: Use the dense point cloud to generate the Digital Surface Model, which includes all surface features.
    - DTM: Filter out non-ground points from the DSM to create the Digital Terrain Model, representing bare ground.
    - **Create Orthomosaic**: Stitch together the images to create a high-resolution, georeferenced orthomosaic map



- Export the generated DSM, DTM, and orthomosaic in formats compatible with ArcGIS (e.g., GeoTIFF).

3.4 Importing Data into ArcMap

1. **Set Up ArcMap Project**:
   - Open ArcMap and create a new project.
   - Define the coordinate system to match the exported data.
2. **Add Raster Data**:
   - Import the DSM, DTM, and orthomosaic into the ArcMap workspace.



3.5 Digitizing Features in ArcMap

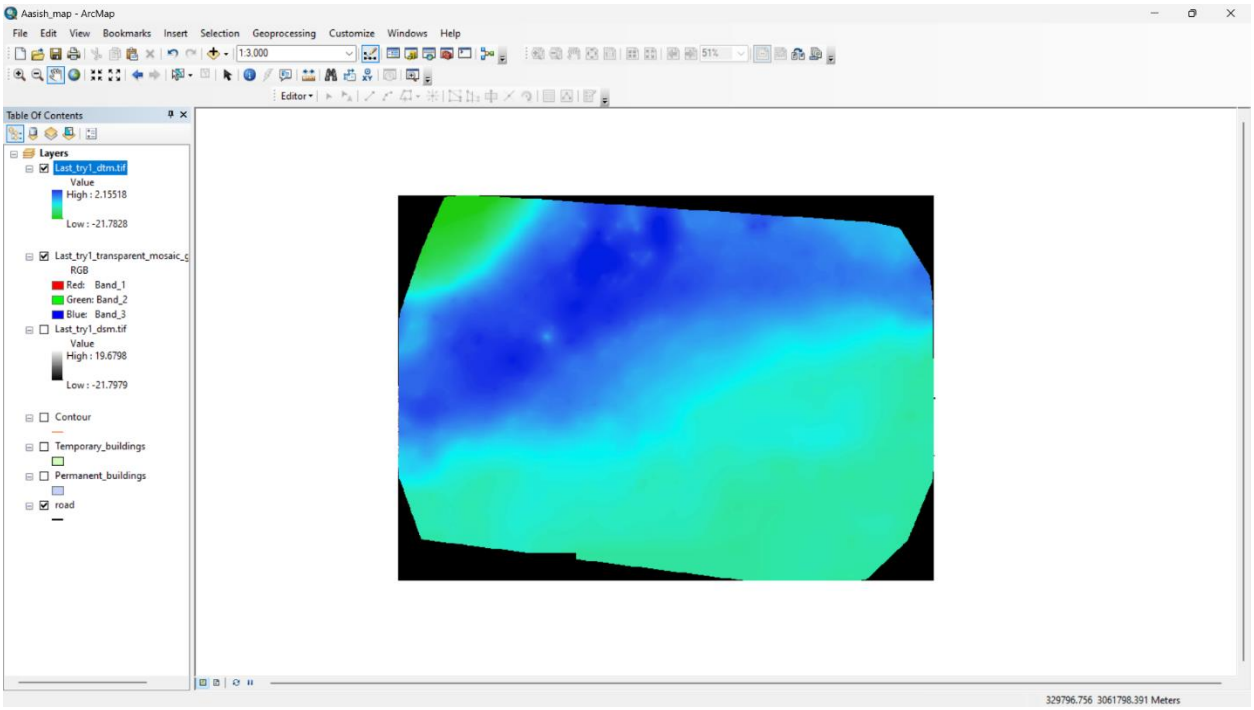
1. **Create Feature Classes**:
   - Set up feature classes for different entities such as buildings, roads, and other landmarks.
2. **Digitize Buildings**:
   - Use the orthomosaic as a reference to manually digitize building footprints.
   - Differentiate between temporary and permanent structures using different layers or attributes.
3. **Digitize Roads**:
   - Trace road networks from the orthomosaic onto a separate feature class.

4. **Attribute Data Entry**:
    - Add relevant attributes to each digitized feature, such as building type or road category.

4. Results

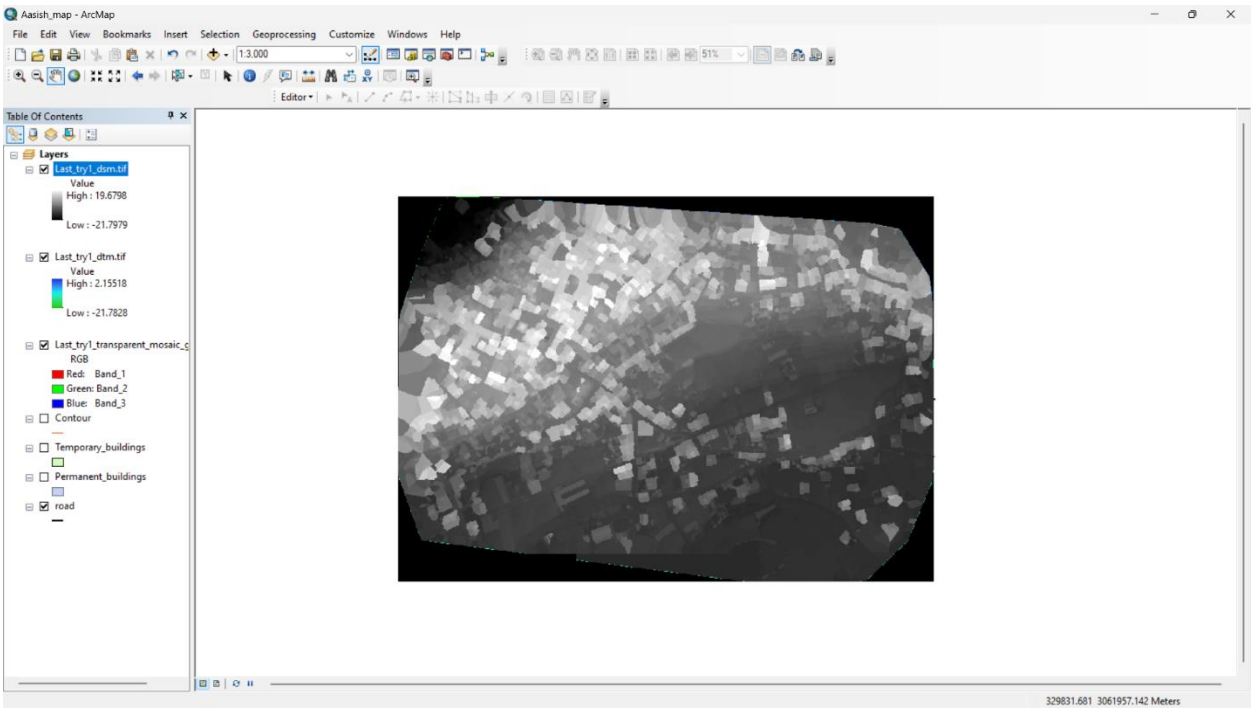
3.1 Digital Terrain Model (DTM)

- **Description**: The DTM represents the bare-earth surface, stripped of vegetation and man-made structures.
- **Output**: A detailed elevation model showcasing the terrain's natural contours.



4.2 Digital Surface Model (DSM)

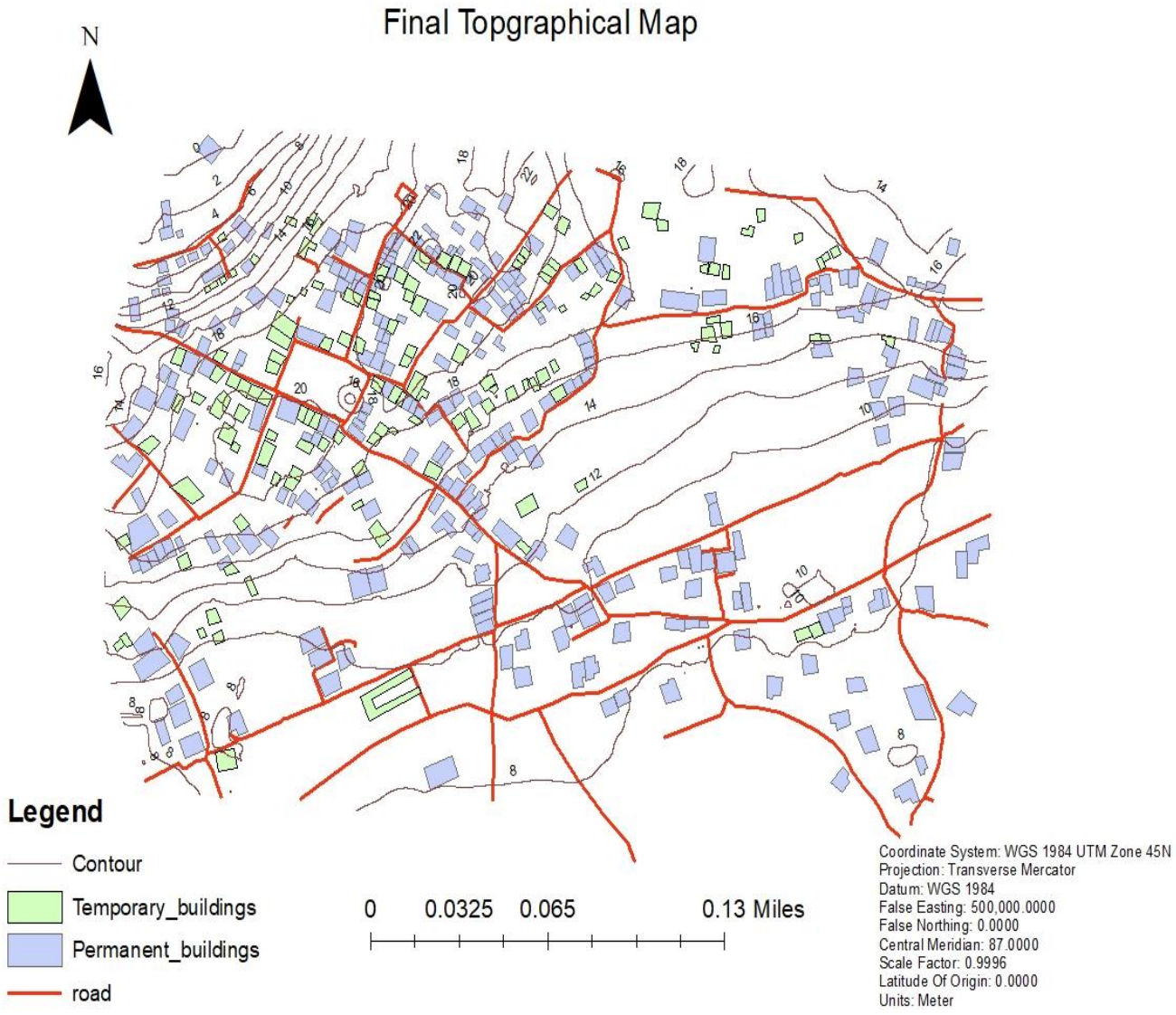
- **Description**: The DSM includes all surface features such as buildings and vegetation.
- **Output**: An elevation model that highlights both the natural terrain and man-made structures.



4.3 Digitized Features

- **Buildings**: Differentiated between temporary and permanent structures.
- **Roads**: Detailed road network traced from the orthomosaic.
- **Other Features**: Additional landmarks and relevant features identified and digitized.

Final Topographical Map



5. Discussion

Applications of the Processed Data

- **Urban Planning**: The topographical map can assist in urban development and infrastructure planning.
- **Environmental Monitoring**: Understanding terrain and surface features helps in monitoring environmental changes.
- **Disaster Management**: The detailed elevation data can aid in disaster preparedness and response planning.

6. Conclusion

This project successfully processed drone data using Pix4D to generate DSM, DTM, and orthomosaic maps. Importing these datasets into ArcMap enabled detailed digitization of buildings and roads, culminating in a comprehensive topographical map. The integration of drone-based data with GIS tools provides powerful capabilities for mapping and analysis in various applications