Manual for QGIS Plugin

BoundaryDelineation

May 2017

Sophie Crommelinck

s.crommelinck@utwente.nl

Summary

This manual explains the use of the QGIS Plugin BoundaryDelineation. Most of the steps are explained in the graphical user interface of the Plugin. This manual can serve as an extended explanation of the installation and use of Plugin. The Plugin was designed to support the semi-automatic delineation of visible cadastral boundaries from UAV data. The Plugin is experimental. For visualization and digitization purposes, an orthoimage captured with an unmanned aerial vehicle (UAV) is required. Further, a vectorized output of gPb contour detection and SLIC superpixels are required. The plugin combines the two vectorized datasets to network and nodes aiming to support the digitalization of visible cadastral boundaries from UAV data. The Plugin's code is available here. A video showing the Plugin's use can be found here.

This research is part of its4land, a European Commission Horizon 2020 project that aims to deliver an innovative suite of land tenure recording tools. These tools are intended to respond to sub Saharan Africa's immense challenge to rapidly and cost-effectively map millions of unrecognized or unrecorded land rights, in order to register them in formal land administration systems. An overview of the project was presented at the World Bank Conference on Land and Poverty.

The work package (WP 5 – Automate It) that this Plugin is developed for is part of its4land. It aims to exploit the use of high-resolution UAV imagery combined with an image interpretation workflow that automatically extracts relevant land tenure features from UAV data. These can be physical objects such as hedges, fences, stone walls, tree lines, roads, walkways or waterways that often demarcate cadastral boundaries. Such an approach cannot deliver complete matching – as some tenure boundaries are only social and not visible to sensors – however, even 50% matching would radically alter tenure mapping workflow costs and times. The scientific progress of finding optimal methods and combining them in a workflow is ongoing. A review on related issues and case studies, such as the combination of cadastral mapping and remote sensing as well as image-based feature extraction methods can be found here. The initial workflow step – gPb contour detection – is explained and evaluated here. The second workflow step – SLIC superpixels – is submitted, but not yet published.
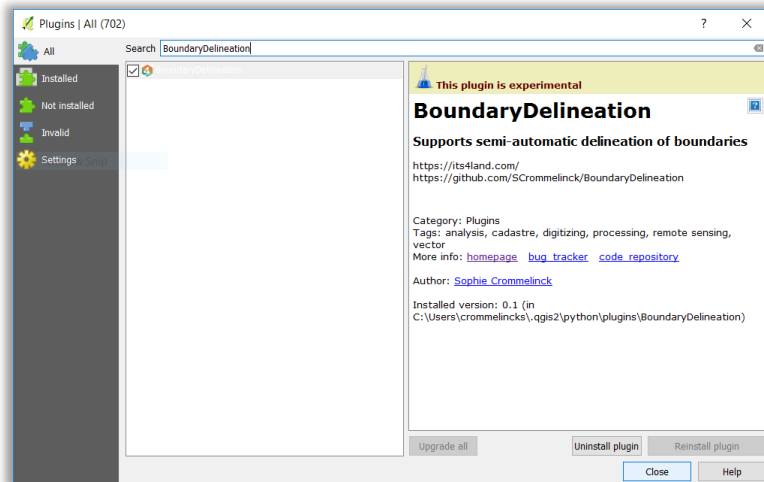
BoundaryDelineation Manual

1. Install the Plugin

- Open QGIS
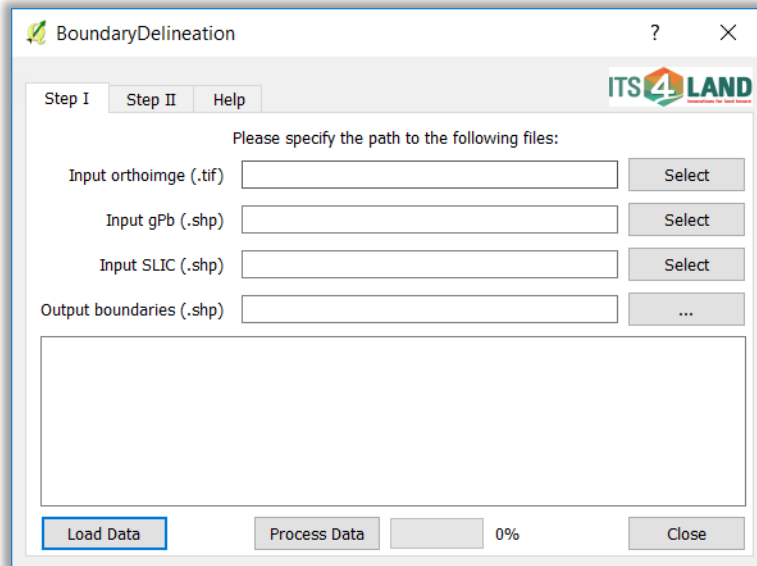- Click **Plugins > Manage and Install Plugins...**
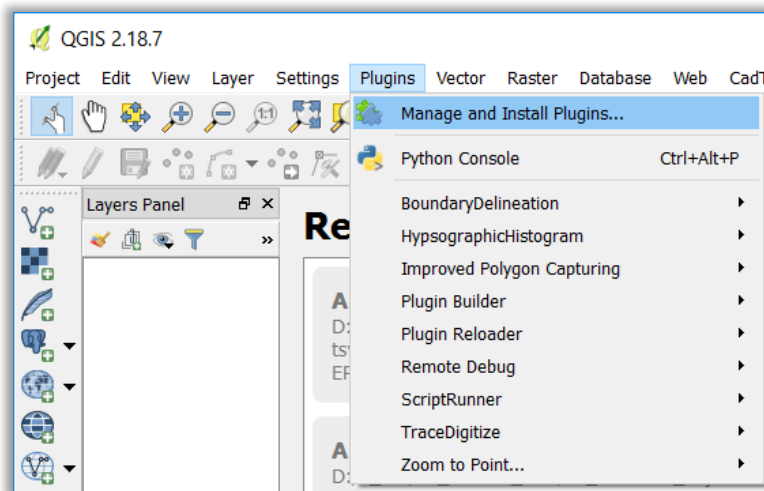
- Search for BoundaryDelineation Plugin
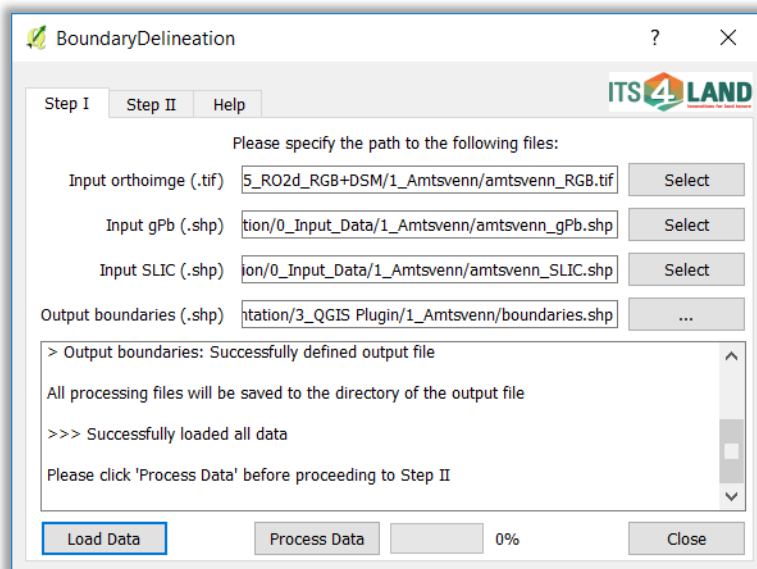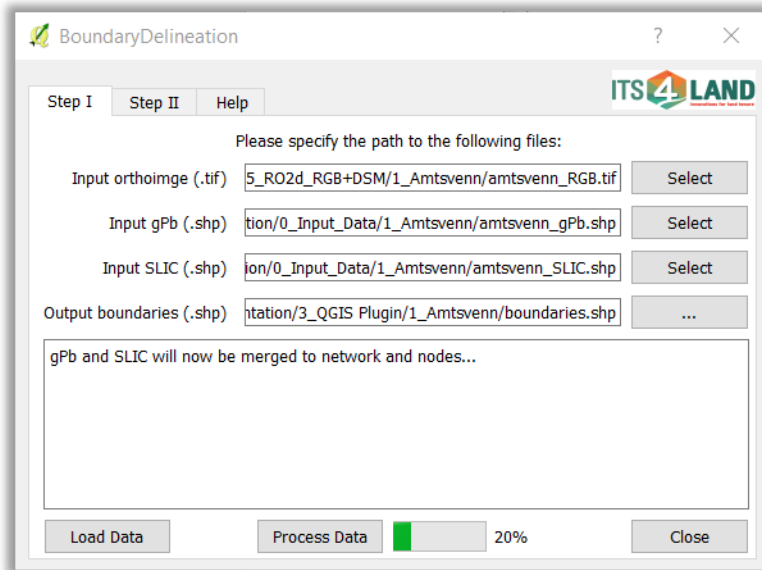- Click **Install plugin**

2. Run the Plugin

2.1. Step I

- Open the Plugin
  - o Click on the BoundaryDelineation Plugin icon in the QGIS toolbar

- Specify the path to the files
- Click **Load Data**
  - o Do not rename loaded layers in QGIS while using the plugin
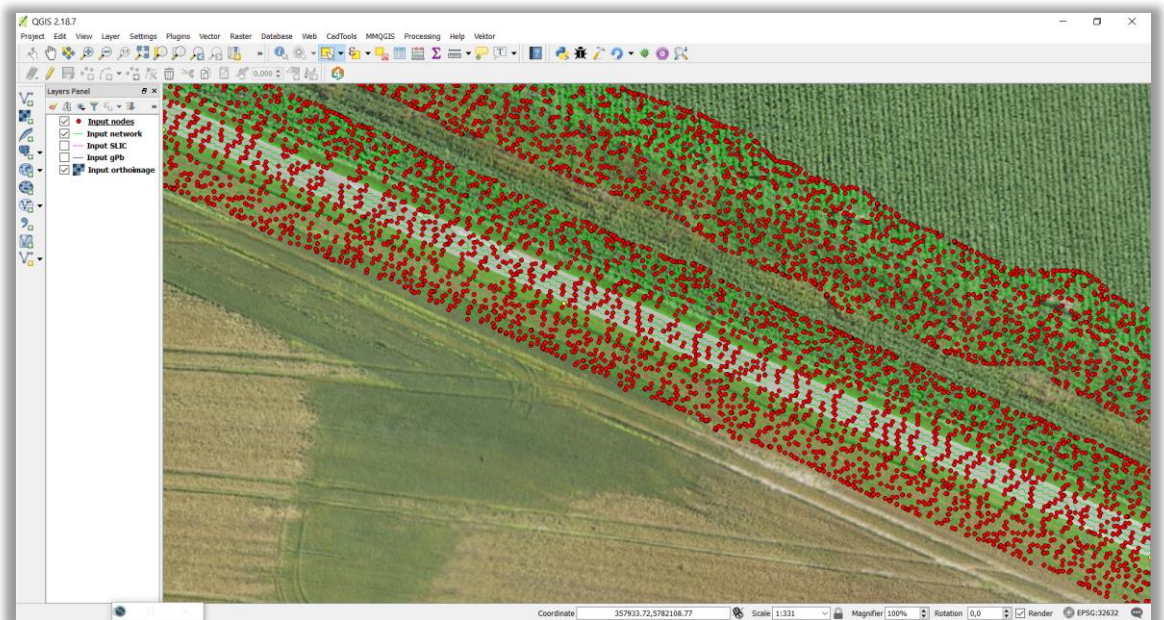
- Click **Process Data**
  - This step can take several minutes depending on the size of the input files
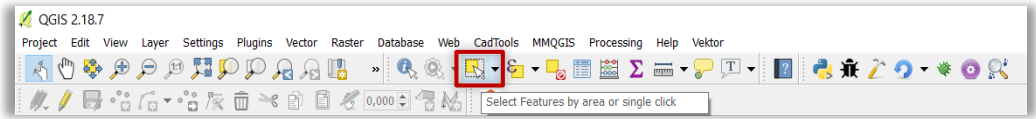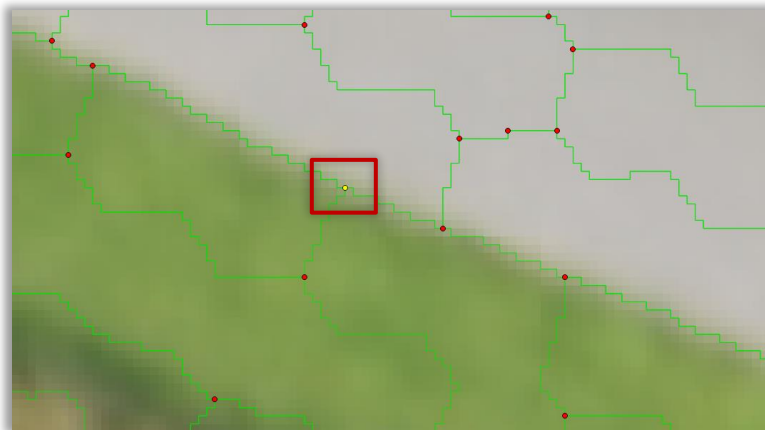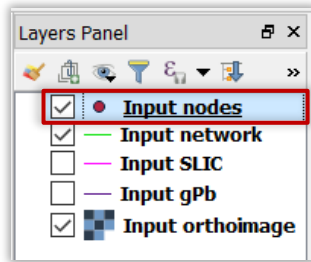

2.2. Step II

- Click on **Step II**
- Zoom to an area, where a land parcel boundary is visible and overlaid by the *input network* and *input nodes* layer
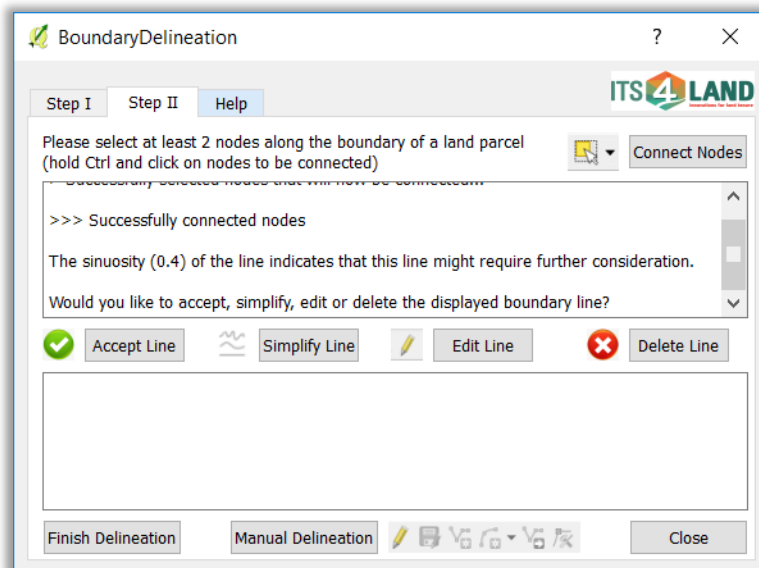
- Select two or more nodes along the land parcel boundary
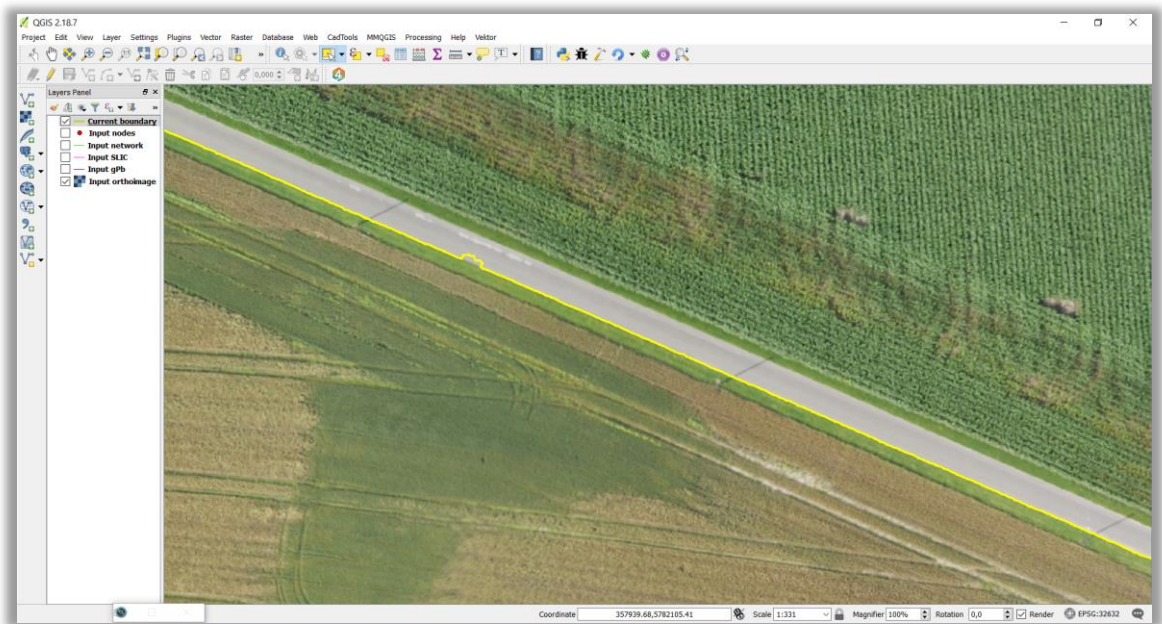 - Hold *Ctrl* and click on the nodes to be connected

  - *Input nodes* should be selected as active layer in the *Layer Panel*
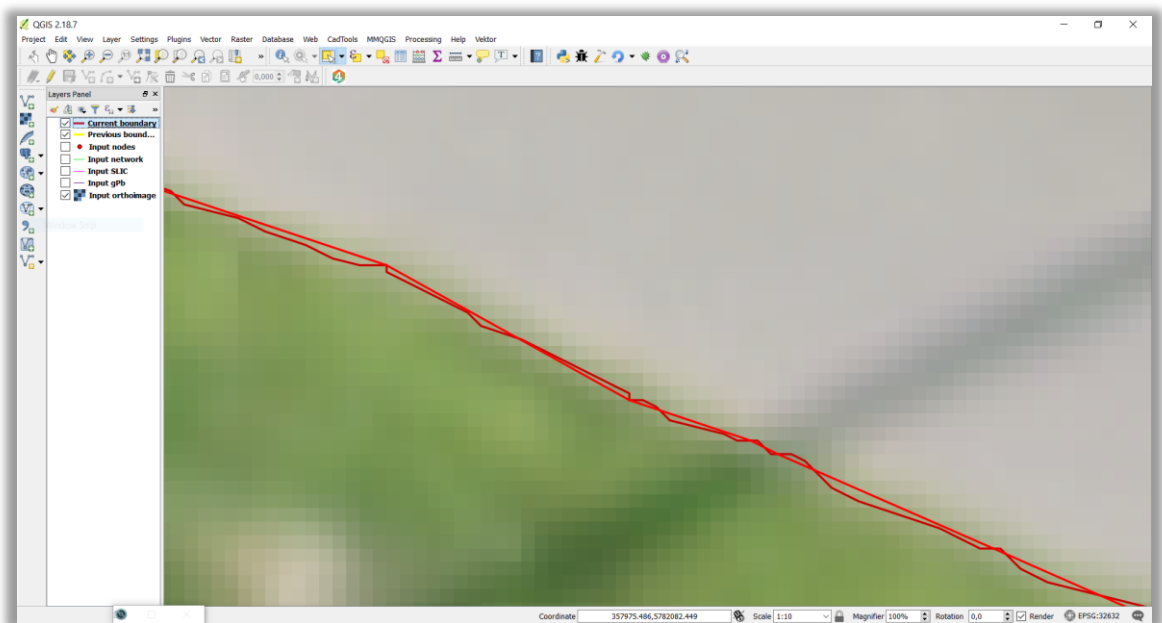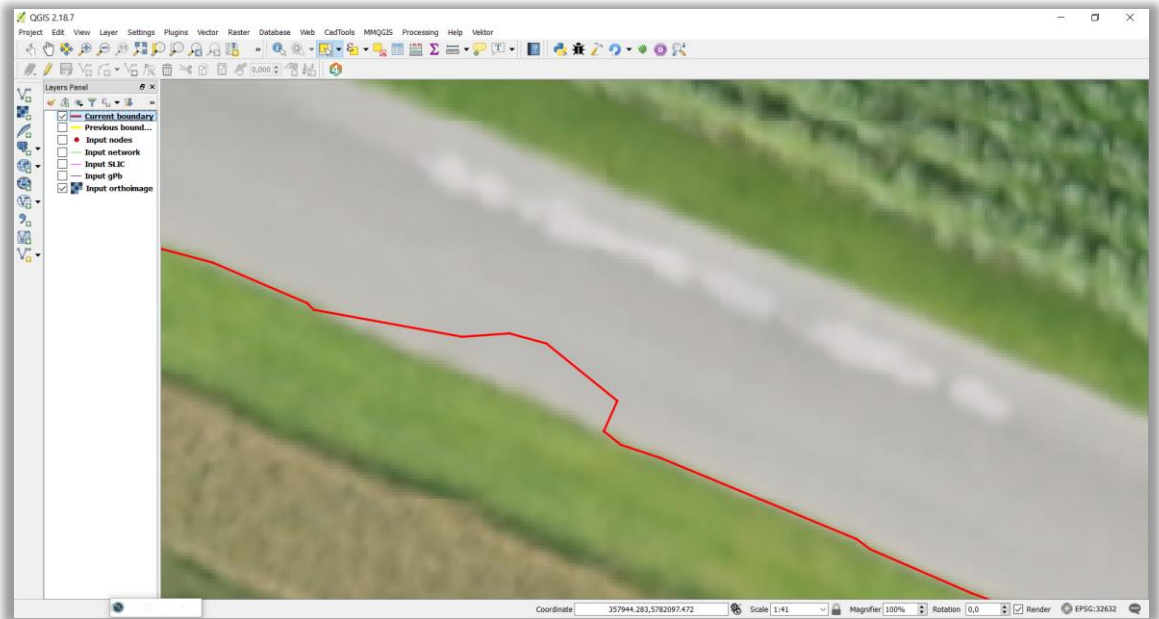

- Click on **Connect Nodes**

- Decide to accept, simplify, edit or delete the displayed boundary line
  - Although the displayed line is already smoothed, it is mostly advisable to simplify the line again
- Click on **Simplify Line**
  - This step can be repeated multiple times until the line cannot be further simplified

- Zoom to incorrectly delineated parts

- Click on **Edit Line**
- Use the QGIS Digitizing Toolbar to manually add/move/delete segments or nodes of the line
  - See the QGIS manual on digitizing (in the help tab) for further explanation
  - In this example, it would be advisable to click on Node Tool, delete all wrong nodes by pressing Delete and snapping the ends of the remaining correct nodes to each other
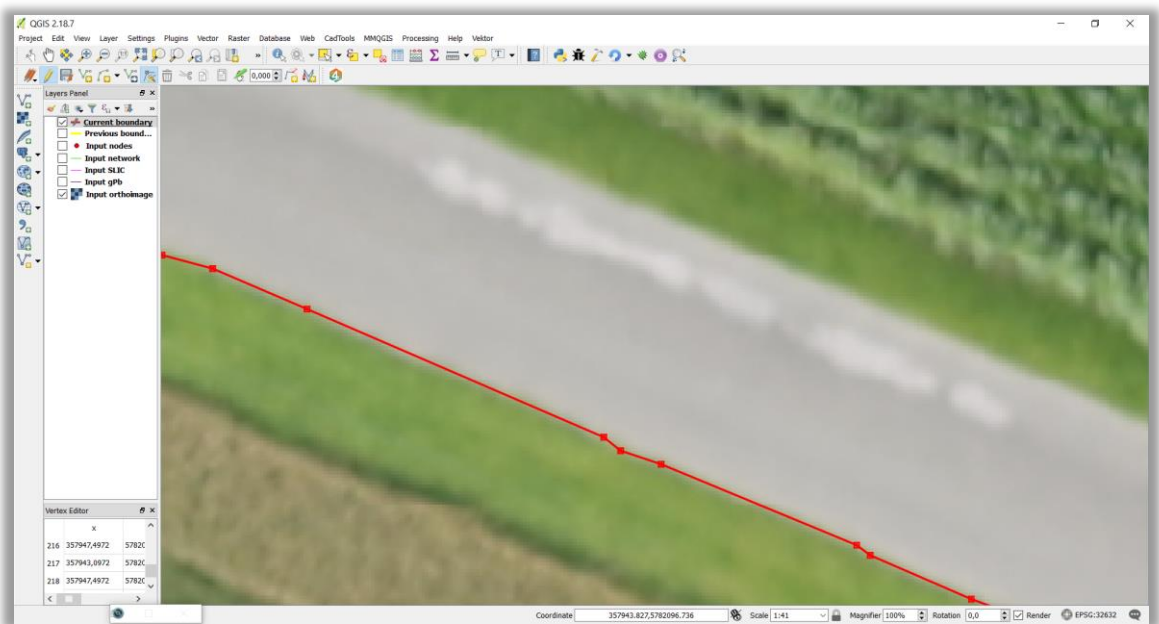
- Click on **Accept Line**
- Restart at the beginning of Step II

- Click on **Finish Delineation**, once no more boundaries can be digitized with the help of *input network* and *input nodes* layer
- Click on **Manal Delineation** to add further boundaries in areas where gPb and SLIC did not detect visible boundaries (e.g., socially perceived boundaries)
  - See the QGIS manual on digitizing (in the help tab) for further explanation

2.3. Help

- The help tab provides links to:
  - [its4land website](#)
  - [QGIS manual on digitizing](#)

3. Notes

3.1. Acknowledgements

3.2. References

- Crommelinck, S., Bennett, R., Gerke, M., Nex, F., Yang, M., Vosselman, G., 2016. Review of automatic feature extraction from high-resolution optical sensor data for UAV-based cadastral mapping. *Remote Sensing*, 8(8), pp. 1-28.

- Crommelinck, S., Bennett, R., Gerke, M., Yang, M., Vosselman, G., 2017. Contour detection for UAV-based cadastral mapping. *Remote Sensing*, 9(2), pp. 171.

- Rohan Bennett, M.G., Joep Crompvoets, Serene Ho, Angela Schwering, Malumbo Chipofya, Carl Schultz, Tarek Zein, Mireille Biraro, Berhanu Alemie, Robert Wayumba, Kaspar Kundert, Sophie Crommelinck, Claudia Stöcker Building Third Generation Land Tools: Its4land, Smart Sketchmaps, UAVs, Automatic Feature Extraction, and the GeoCloud. In: *Annual World Bank Conference on Land and Poverty (Responsible Land Governance: Towards and Evidence Based Approach)*, Washington D.C. (US).