TOPOGRAPHIC AND CADASTRAL MAPPING OF UNDERGROUND WASTE COLLECTION PLATFORM SITES IN THE CITY OF ALBA IULIA

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ABSTRACT: *Protecting the environment has become a priority for mankind in terms of ensuring a clean future, capable of sustaining the lives of future generations. Whether we speak about car pollution, deforestation or even selective waste collection, all of these have one common objective, namely to improve our ecosystem. The question is how topographic and cadastral mapping can assist in this global issue. One of the problems that topography can easily address would be selecting the appropriate location for placing urban underground waste collection platforms, in our case in the city of Alba Iulia.*

Keywords*: collection system; cadastral mapping; underground platforms; sensor;*

Introduction

The selective waste collection system used in the city of Alba Iulia to date has involved the following resources:

- 1,100 L Eurocontainers for the collection of cardboard and paper, plastic, and glass placed in different collection areas in the city;
- 120 L and 240 L Eurobins placed in the residential areas of Home Owners' Associations in the city;
- transportation of waste through average capacity refuse trucks.

The aim of this project is to place underground platforms for the selective collection of urban waste. Thus, urban waste will be collected in 1.1m3 containers, housed in underground platforms, with the separation of waste into fractions (wet fraction, paper, plastic, metals and glass). The collection points will be provided with electronic-digital access systems, software-based input metering, remote monitoring and green energy supply for the operation of this system[1].

The current surface waste collection system totals over 600 containers in the area of home owners' associations alone, in residential areas. The underground ecological isles will be positioned as close as possible to the old waste collection sites, their use being standardized both for the waste collecting company, which will empty them though a hydraulic system, but also for the direct beneficiaries[2].

These underground selective waste collection bins will be installed in stages, as follows:

- The surveyors take measurements of the areas of interest where the platforms will be installed. A 2m-deep pit is to be dug. Then the area will be cemented before placing the four 1,100 L selective waste collection containers;
- A waterproof reinforced precast concrete vault with a lifting metal casing operated through a hydraulic system is to be installed. In addition, a sensor will be attached to each of the 4 containers, which will notify the waste collecting company when the bins are 75% full;
- The platform is lifted through an adaptation performed on the collection truck by connecting it through a pressure hose. This system will include safety mechanisms to prevent accidents during waste collection. While the metal casing

is lifted, it will self-block, thus providing extra safety for the operators.

- Moreover, the top bins are also self-blocking. An inside sensor detects when the containers are full and blocks the top lids. Thus, the containers can be emptied on time and will no longer be loaded at maximum capacity, therefore allowing the hydraulic system to operate easily with no pressure on the hydraulic system or on the waste collection company. A hygienic and clean aspect of the surrounding area will be maintained. In addition, the top bins are made of stainless steel, which extends their lifetime[3] (Fig. 1).

After the receiver and the station were connected via Bluetooth, a file was created where the collected points were stored. By press of a button on the receiver's keyboard, the field point coordinates were automatically collected (Fig. 4. 5).

At the end of the cadastral mapping operation for the future urban waste platform sites, the field book was downloaded through an USB cable, connected to the receiver and also to the computer. Once downloaded in a .txt format, the field book was copied and inserted into an Excel file in order to make some changes concerning the points' coordinates (point after the decimals) (Fig. 6, 7, 8, 9).

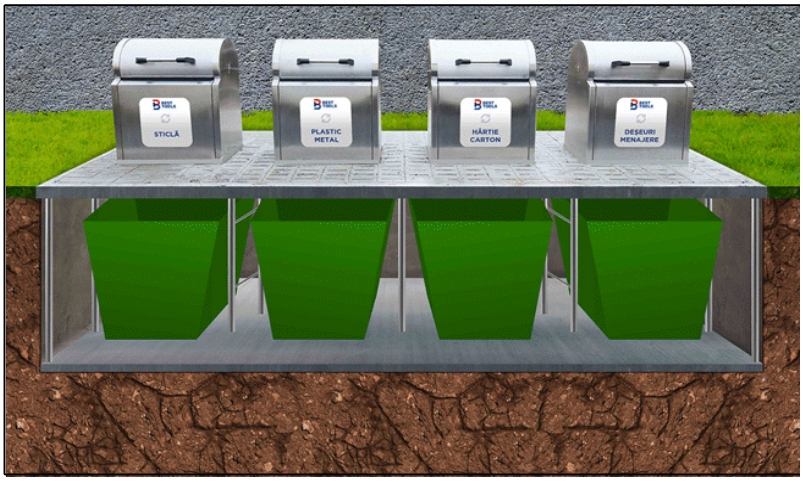

Fig.1. An underground waste collection platform[4]

Carrying out field measurements

The Stonex S9 III Plus GNNS was used for mapping.

Our paper presents one of these works, namely the one carried out in Emil Racoviţă Street in Alba Iulia (Fig. 2).

Field measurements with the GPS device were recorded through the receiver. Firstly, the receiver was connected to the GPS station in order to record, save and download the measuring operations, which then allowed for the data to be processed[6] (Fig. 3).

Thus, after changes were made in Excel, the coordinates were then input in AutoCad with the help of the TopoLT app (Fig. 10).

Setting up the property layout plan

The property layout plan, with indication of borders to adjoining properties, was carried out with the help of apps in AutoCad. The lines or polylines were connected using the OSNAP function (Fig. 11).

Also, the TopoGraph app was used for the analytical calculus of the site areas.

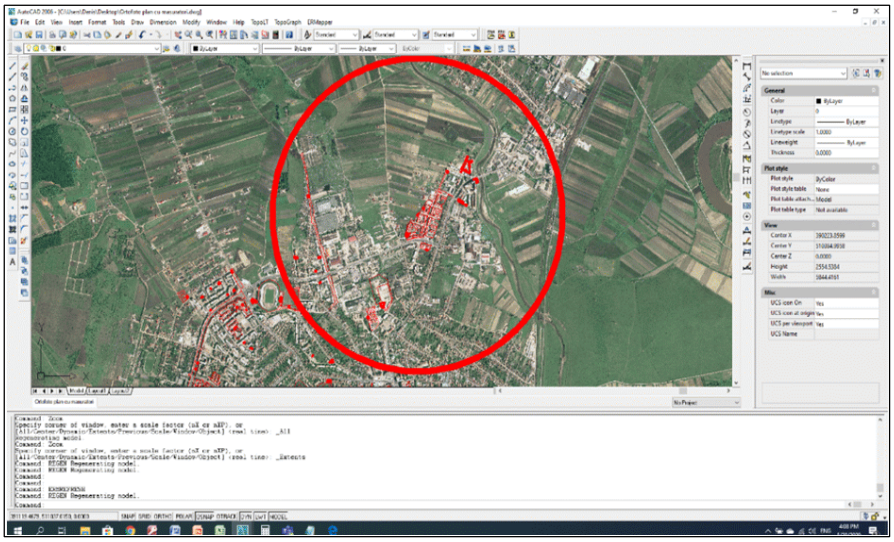

Fig. 2. Mapping carried out in Emil Racoviţă Street, city of Alba Iulia[5]

Fig. 3. Connecting the receiver to the GPS station[7]

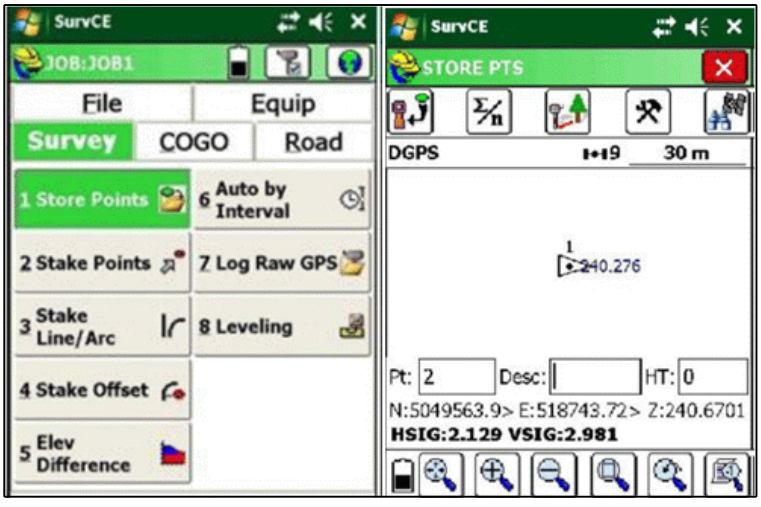

Figure 4. Collection of field points through the GPS system[8]

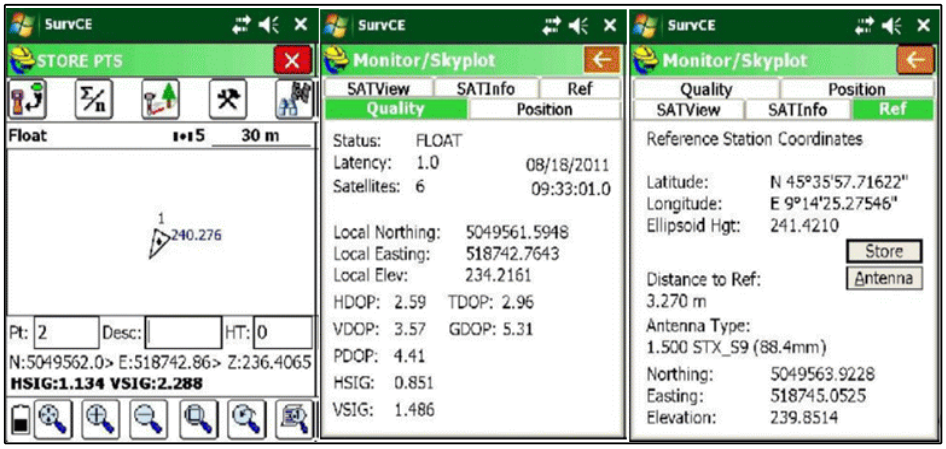

Fig. 5. Information stored by the receiver about the collected points[9]

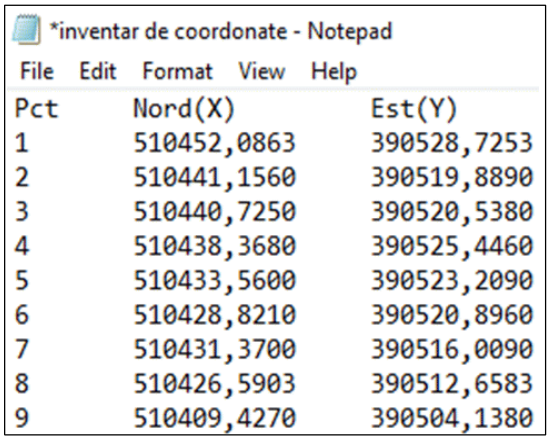

Fig. 6. The field book in a .txt format[10]

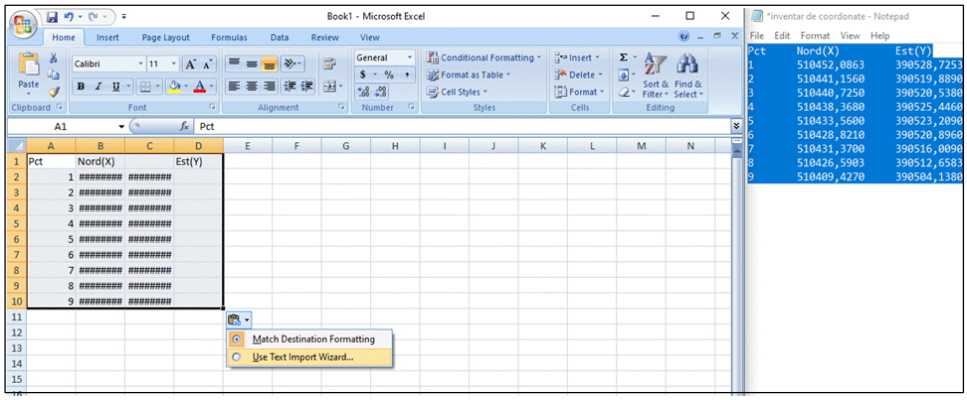

Fig. 7. Changes using Excel[11]

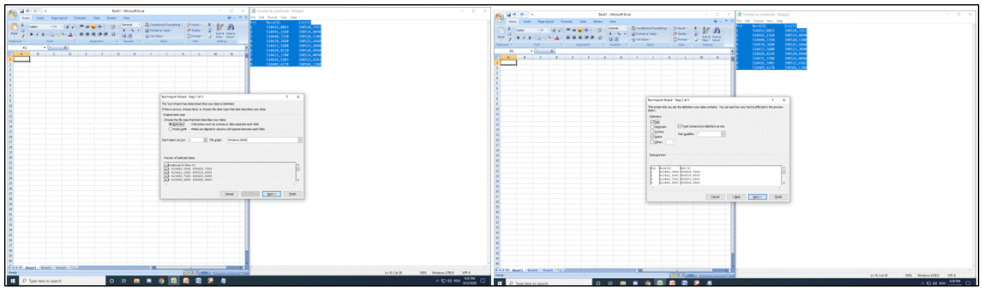

Fig. 8. Changes using Excel[12]

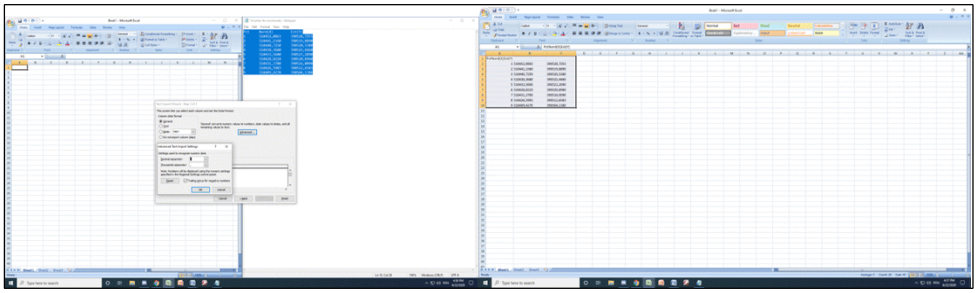

Fig. 9 Final result after changes[13]

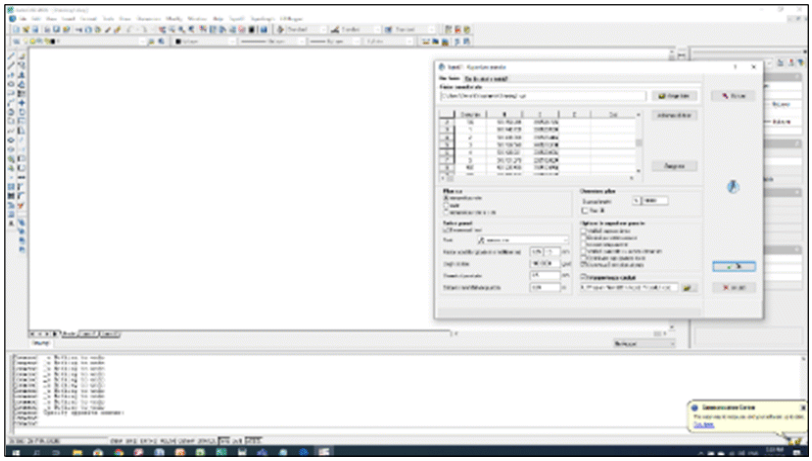

Fig. 10. Inserting coordinates from the field book[14]

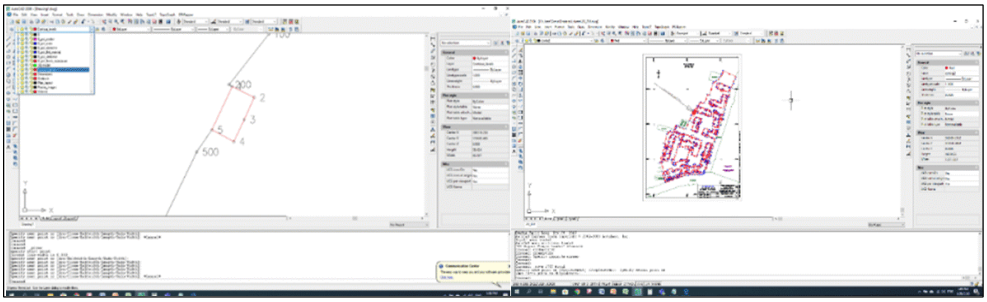

Figure 11. Property layout plan[15]

Conclusions

Our research results and outputs, together with the underground waste collection project initiated in Romania, will certainly contribute to improved human health and to greener cities by a quick and easy selective collection, now modernized with the help of underground platforms for selective waste collection. In addition, the Stonex S9 III Plus GNNS has helped to speed up the measurements as well as to accurately map the future platform sites.

Notes:

1. http://reciclare.declic.ro/
2. http://romaniansmartcity.ro/wp-content/uploads/2017/04/Prezentare-Eurith.pdf
3. https://economisestepentrutine.ro/colectare a-selectiva-a-deseurilor-impact-asupra-med iului/
4. Printscreen - Dinu Denis Vasile – Bachelor's Degree Thesis - Măsurători topo-cadastrale efectuate în vederea amplasării platformelor subterane pentru colectarea selectivă a deşeurilor urbane în municipiul Alba Iulia, Universitatea '1 Decembrie 1918' din Alba Iulia, 2020;
5. Printscreen - Dinu Denis Vasile – Bachelor's Degree Thesis - Măsurători topo-cadastrale efectuate în vederea amplasării platformelor subterane pentru colectarea selectivă a deşeurilor urbane în municipiul Alba Iulia, Universitatea '1 Decembrie 1918' din Alba Iulia, 2020;
6. http://survey-solutions.ro/manual/Tutorial %20Stonex%20SurvCe%20conectare%20 NTRIP%20S7_S8_S9III.pdf;
7. http://survey-solutions.ro/manual/Tutorial %20Stonex%20SurvCe%20conectare%20 NTRIP%20S7_S8_S9III.pdf
8. http://survey-solutions.ro/manual/Tutorial %20Stonex%20SurvCe%20conectare%20 NTRIP%20S7_S8_S9III.pdf
9. http://survey-solutions.ro/manual/Tutorial %20Stonex%20SurvCe%20conectare%20 NTRIP%20S7_S8_S9III.pdf
10. Printscreen - Dinu Denis Vasile – Bachelor's Degree Thesis - Măsurători topo-cadastrale efectuate în vederea amplasării platformelor subterane pentru colectarea selectivă a deşeurilor urbane în municipiul Alba Iulia, Universitatea '1 Decembrie 1918' din Alba Iulia, 2020;
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13. Printscreen - Dinu Denis Vasile - Bachelor's Degree Thesis - Măsurători topo-cadastrale efectuate în vederea amplasării platformelor subterane pentru colectarea selectivă a deşeurilor urbane în municipiul Alba Iulia, Universitatea '1 Decembrie 1918' din Alba Iulia, 2020;
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15. Printscreen - Dinu Denis Vasile - Bachelor's Degree Thesis - Măsurători topo-cadastrale efectuate în vederea amplasării platformelor subterane pentru colectarea selectivă a deşeurilor urbane în municipiul Alba Iulia, Universitatea '1 Decembrie 1918' din Alba Iulia, 2020;

References:

1. http://reciclare.declic.ro/
2. http://romaniansmartcity.ro/wp-content/uploads/2017/04/Prezentare-Euriteh.pdf
3. https://economisestepentrutine.ro/colectarea-selectiva-a-deseurilor-impact-asupra-mediului/
4. http://survey-solutions.ro/manual/Tutorial%20Stonex%20SurvCe%20conectare%20NTRIP%20S7_S8_S9III.pdf
5. Vasile, D. D., (2020), *Măsurători topo-cadastrale efectuate în vederea amplasării platformelor subterane pentru colectarea selectivă a deşeurilor urbane în municipiul Alba Iulia*, Bachelor's Degree Thesis, Universitatea ,1 Decembrie 1918' din Alba Iulia, scientific coordonator: Assoc.prof. Eng.D. Magdolna Eva Koncsag.