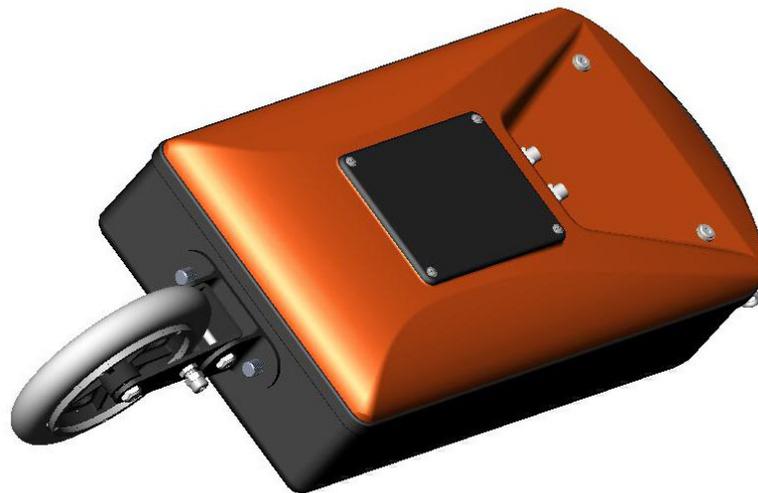


Methodological guidelines for the use of ground penetrating radars



© Transient Technologies 2004...2015

Transient Technologies LLC

office 604, 13, Maryny Raskovoi str., Kyiv, Ukraine

Tel.: +380 44 2408594

E-mail: info@viy.ua

VIY® – registered trade mark owned by Transient Technologies LLC

Figures and illustrations in this Metodica are provided for reference only and may differ from actual product appearance.

Product design and specification may be changed without notice.

Contents

Option 1. Express Search 4
 GPR and Cart-36 Trolley.....4
 GPR & VO-20 Measuring Wheel 7
Option 2. Difficult Conditions Search..... 8
 GPR & Cart-36 Trolley 8
 GPR & VO-20 Measuring Wheel 8
Option 3. Universal Search..... 9

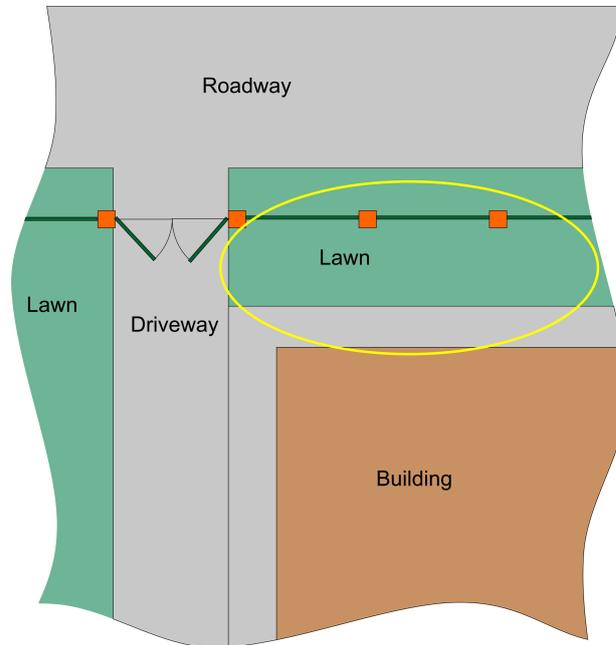
Option 1. Express Search

These guidelines are advisory in nature. Technique of GPRs application is constantly developing and changing. Each company which uses GPR has its own methods of appliance. This is due to the range of tasks, personnel qualification and availability of optional equipment.

There are several ways to use GPR.

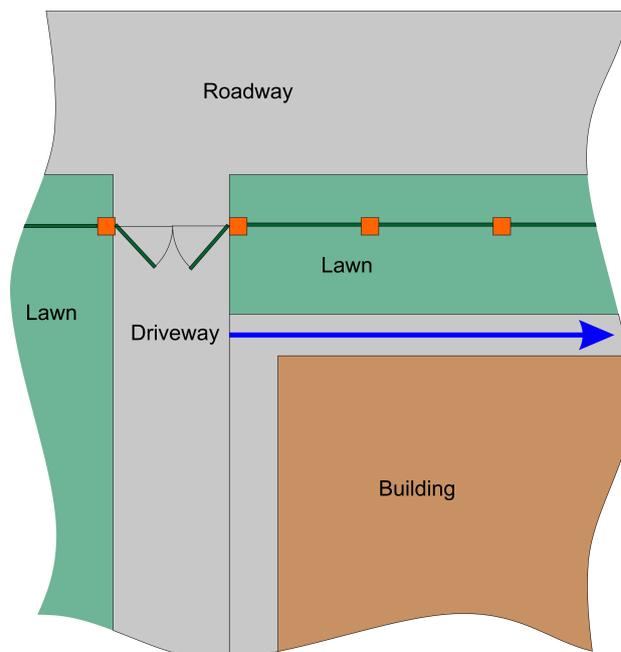
Option 1. Express Search

Most frequently this method is used to specify the location of underground utilities. That is when you need to clarify the location and the depth of the underground communication.



An example of such a problem: the detection of the gas pipe under the road, laid from main pipeline to the building. Metal pipe with a diameter of about 2 inches allegedly passes through the territory indicated by the yellow line.

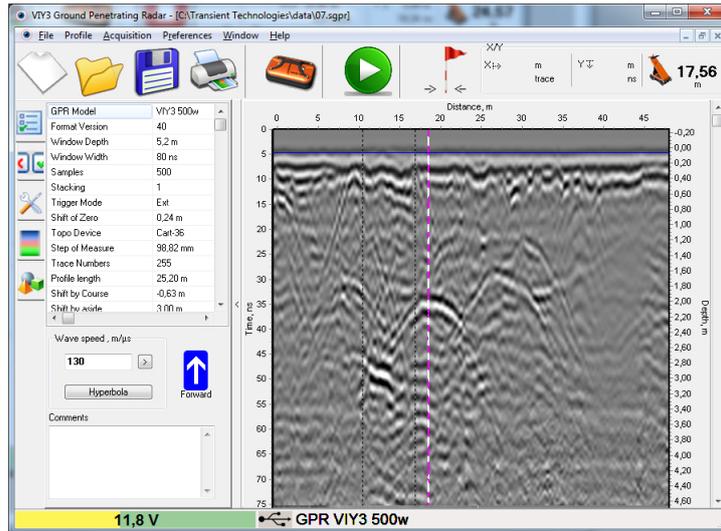
To localize the pipe position, perform GPR profile along the path indicated by the blue line.



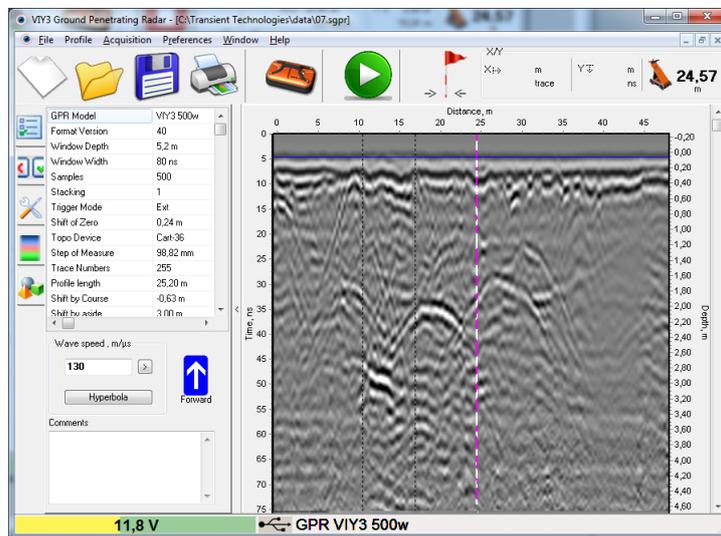
GPR and Cart-36 Trolley

Place the Cart-36 trolley with antenna at the starting point. Create a new profile, start probing and move the trolley along the intended path. Stop the probing. The GPR profile is processed automatically. Locate the profile element in the form of an arc.

By moving the trolley align the cursor (vertical marker) to the apex of the arc.



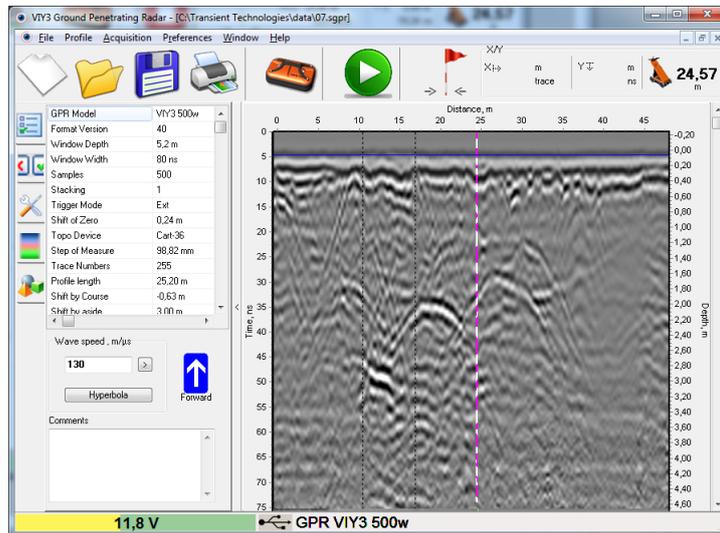
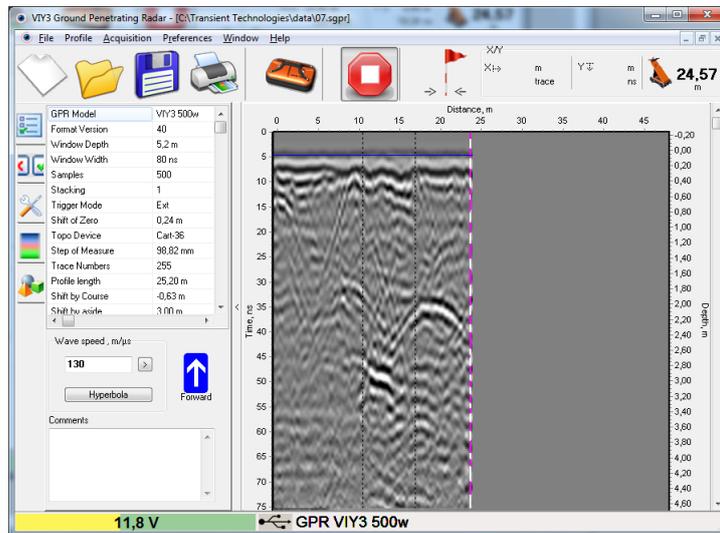
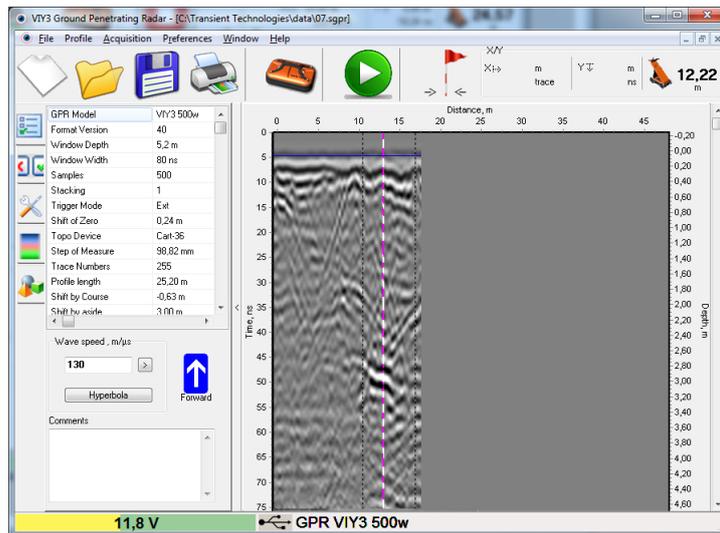
The centre of the antenna will be on the top of the underground object.



If the profile is presented only part of the arc without its vertices, the probing should continue. To do this, move the trolley in a way that the cursor remains inside the profile, switch on the probing and move the trolley the way you need it, forward or backward. The profile increases in a particular direction. After the probing has stopped, new part of the profile will also be processed.

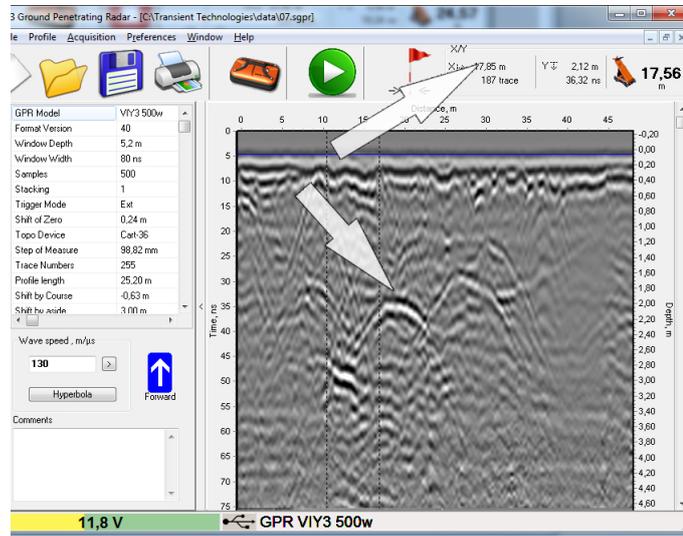
Then move the trolley to make sure that the profile cursor matches the apex of the arc. The centre of the antenna matches the object location.

Option 1. Express Search



GPR & VO-20 Measuring Wheel

VO-20 measuring wheel does not provide information about movement direction of the antenna. In addition, using the transport belt can not move the antenna in the reverse direction. Therefore, to locate the underground object, you will need a measuring tape. Set up the antenna to the start position, marking it on the ground. Create a new profile, start probing and move the trolley along the intended path. Stop the probing. The GPR profile is processed automatically. Locate the profile element in the form of an arc. On the upper scale of the profile or using the mouse cursor measure the distance to the top of the arc.



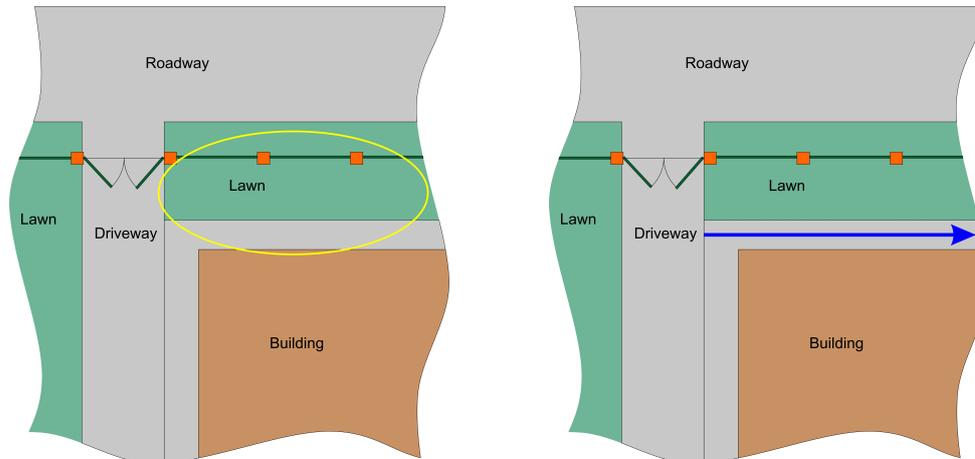
Use the measuring tape mark this distance on the ground. The object is localized.

Option 2. Difficult Conditions Search

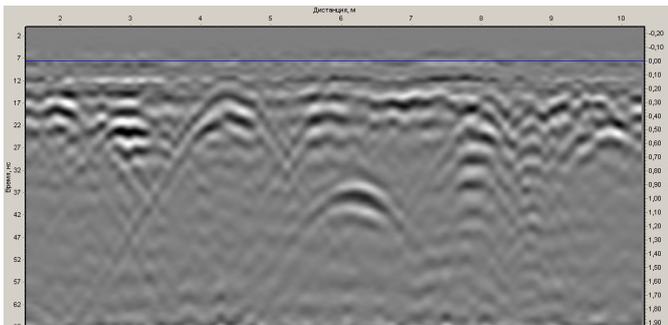
Option 2. Difficult Conditions Search

Most cases underground environment characterized by a large numbers of reflections from objects of various nature in different depths. Consider the same case: need to locate a gas pipe adjacent to the building.

On the GPR profile found not one arc, but several.



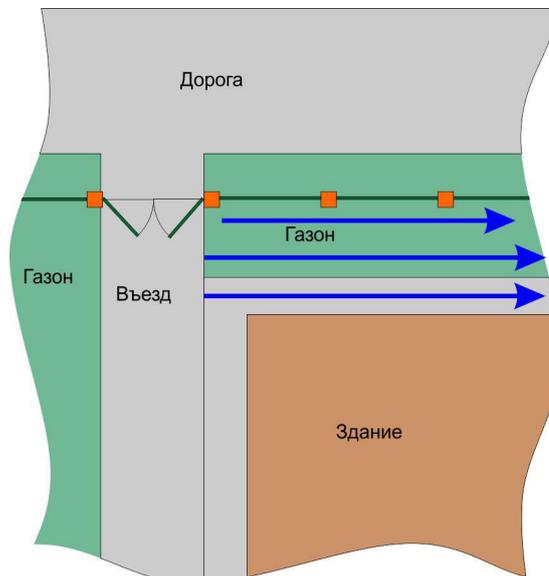
In this case you must perform several parallel profiles.



GPR & Cart-36 Trolley

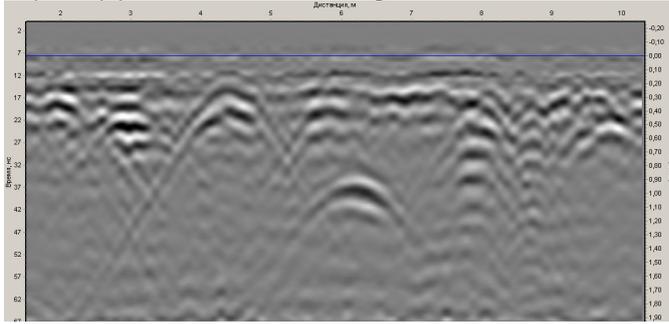
Using Cart-36 trolley allows without additional devices to make marks of located objects right on the ground. Perform the first GPR profile, stop the probing. By moving the trolley align the cursor to the top of all the arcs detected on the profile. Mark these objects on the ground. Shift 0, 5-1 meter aside from the first profile and perform the second profile. Mark on the ground the detected objects. As far as the terrain allows perform several parallel profiles. The required pipe will be visible on the ground with several marks which are located on the same line.

GPR & VO-20 Measuring Wheel

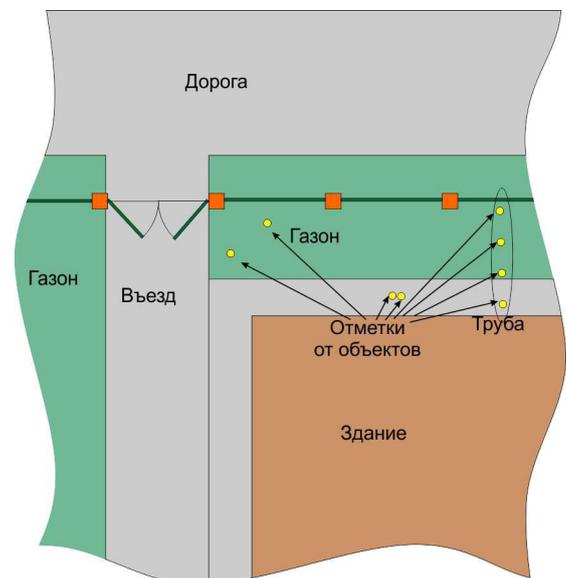
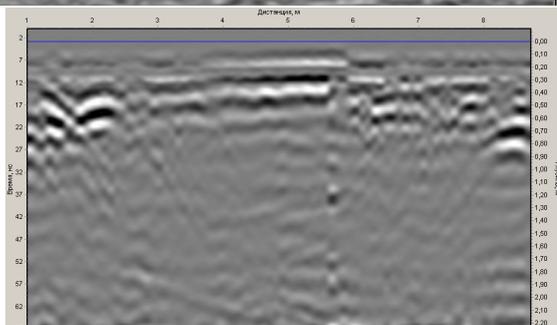
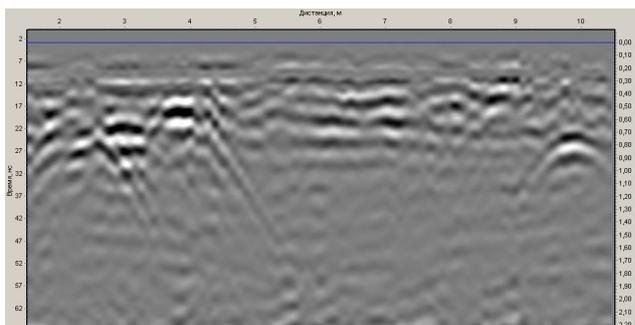
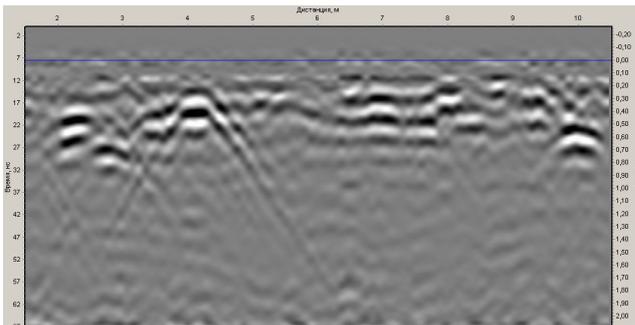
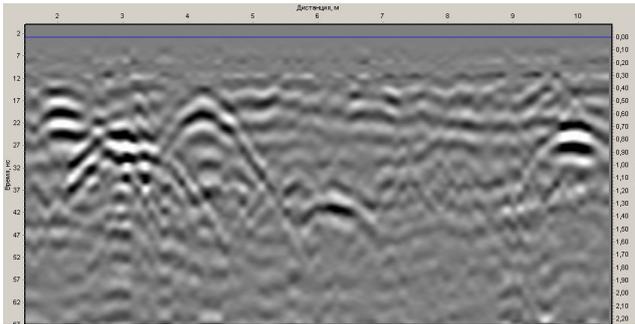


Option 3. Universal Search

When using a measuring wheel you will need a measuring tape to mark the detected objects on the ground. Mark the beginning of each new profile on the terrain. Using the measuring tape mark detected objects on the ground. The required pipe will be visible on the ground with several marks which are located on the same line.

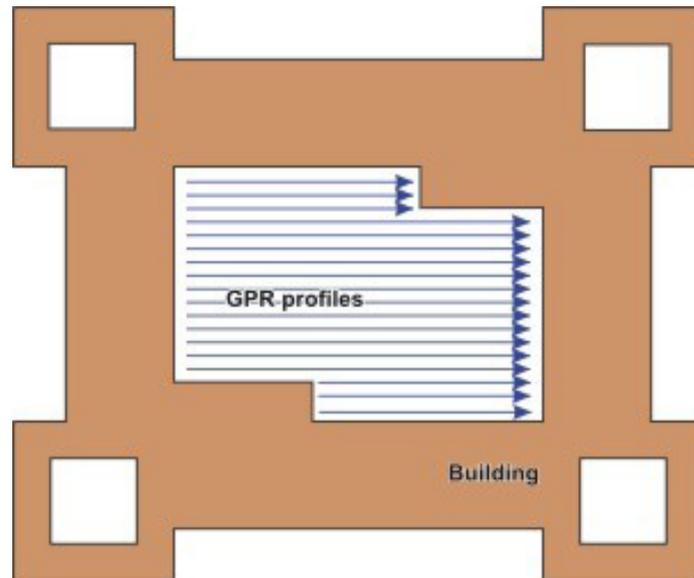


Option 3. Universal Search



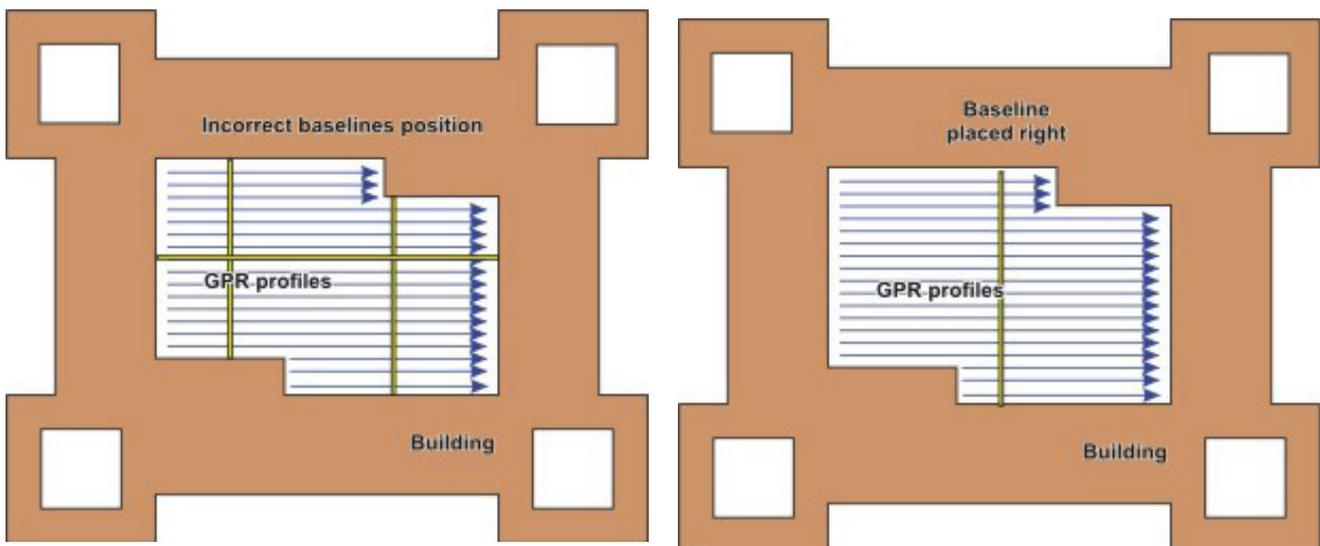
Option 3. Universal Search

This method is used to show in the investigated territory all detected objects. For example, before historical area reconstruction it is necessary to study it on the presence of underground facilities that may have historical significance. In this case, before starting to work, one must have topographical plan of investigated territory. It is desirable that in the plan were given known underground facilities: pipelines, communications, collectors etc. On the area of interest is necessary to perform grid of profiles.



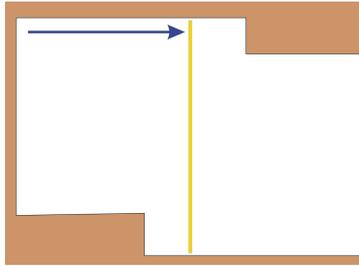
In this case Planner program included in the VIY3 software package should be used to organize the probing process.

Place the measuring tape on the test area so that all future GPR profiles were crossing it. The measuring tape will be the base line for further measurements. Location of the measuring tape in the form of yellow line is shown below.



Connect the antenna to laptop. Run Planner program. Create a new project, specify the length of the base line equal to the length of your measuring tape. Click Create Profile button in the Planner program. The Synchro3 program will start and new profile will be created. Perform required settings and start GPR sounding.

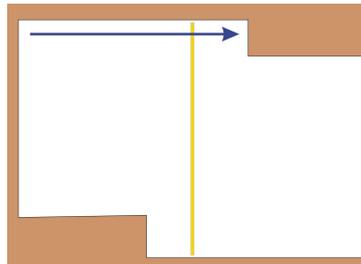
- ✓ Set Direction option for the first profile as FORWARD.



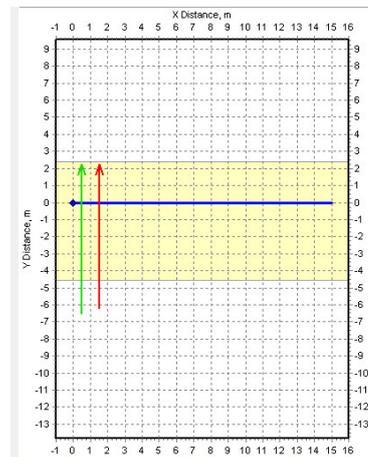
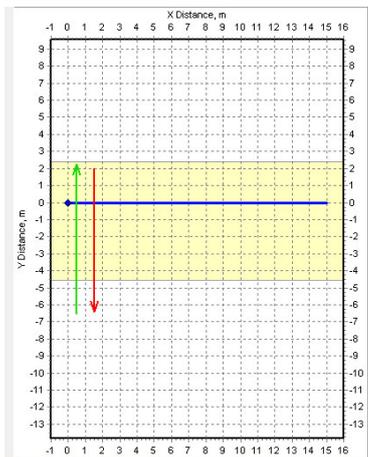
At the time when the center of the antenna cross measuring tape, click Insert button on the keyboard. Dialogue box for the profile bindings will appears in the Synchro3 program:

| | | | | | |
|-----------------------------------|--------------|--------------------------------------|--|------------|---------------------------------|
| | By course, m | <input type="text" value="-3,5235"/> | | Azimuth, ° | <input type="text" value="0"/> |
| | Aside, m | <input type="text" value="3"/> | | Angle, ° | <input type="text" value="90"/> |
| | By height, m | <input type="text" value="0"/> | | | |
| <input type="button" value="OK"/> | | | | | |

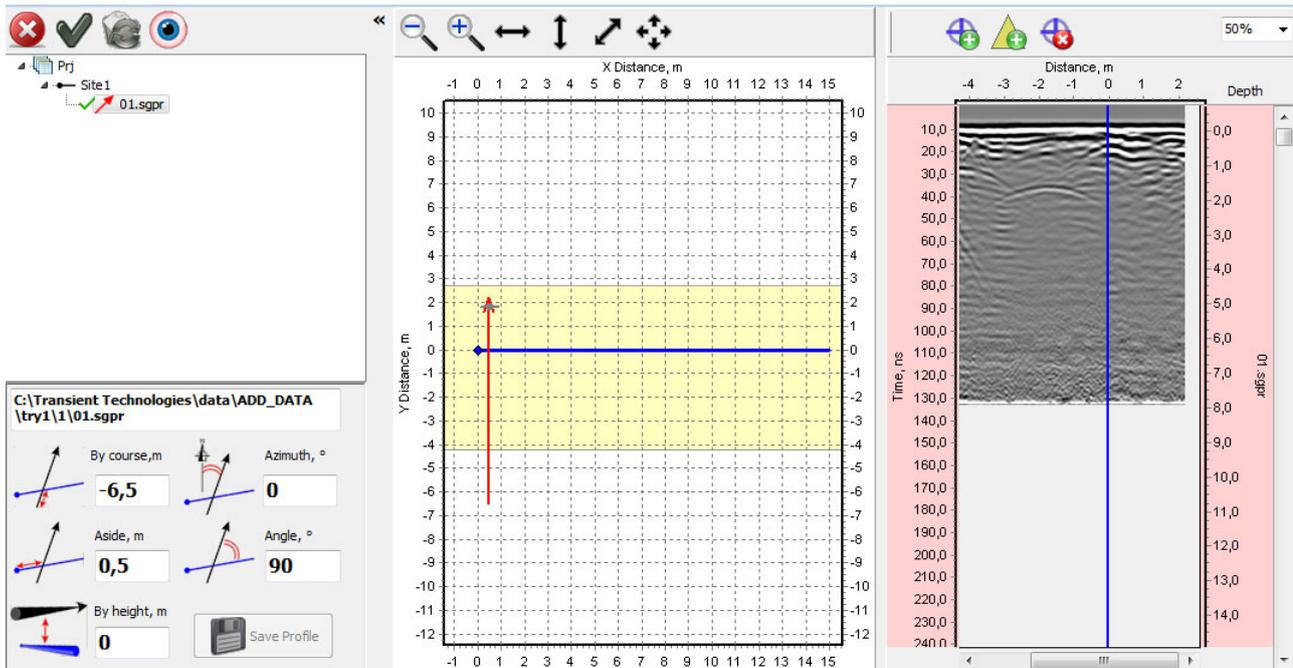
Distance traveled by the antenna will be indicated in "By course, m". Type distance value on the measuring tape in the point of intersection in the "Aside, m" box. The angle of the profile and base line intersection is 90° by default. Click OK and continue the antenna movement.



After completing the process of sounding, save the profile by giving the name of the file. In this case Planner window will appear and just obtained profile will add to the project.



Option 3. Universal Search

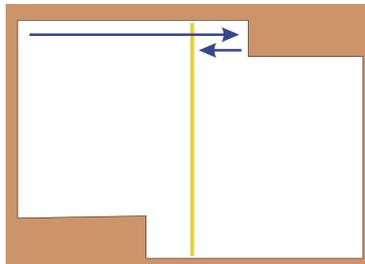


If you are using VO-20 measuring wheel. Step aside from the previous profile at a predetermined distance and turn around with antenna in the opposite direction.

If you are using Cart-36. Step aside from the previous profile at a predetermined distance, turn around or move reverse.

- ✓ The distance that you step aside from the previous profile, determined by the level of detailing of the GPR investigation. The general rule is - the step between profiles should be twice less the size of underground object.

Click Create Profile button in the Planner program. The Synchro3 program will start and new profile will be created. Complete required settings. Change the Direction option from FORWARD to BACKWARD if you turn around antenna with measuring wheel or Cart-36 trolley. Leave the Direction option as FORWARD if you move the trolley reverse. Start the sounding.

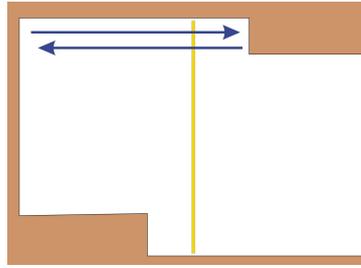


At the time when the center of the antenna cross measuring tape, click Insert button on the keyboard. Dialog box for the profile bindings will appear in the Synchro3 program:

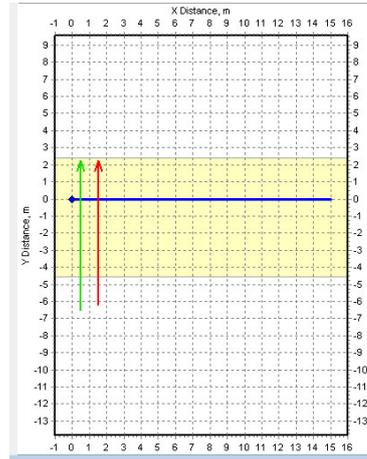
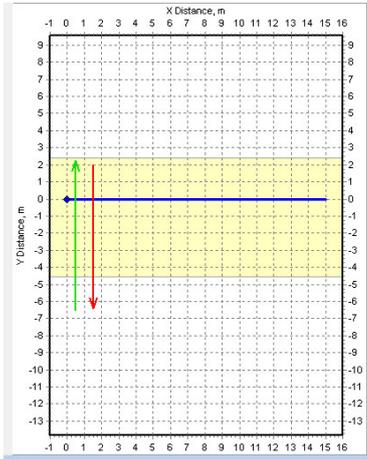
The dialog box contains the following settings: 'По курсу, м' (By course, m) set to 3,8984; 'Азимут, °' (Azimuth, °) set to 0; 'В сторону, м' (Aside, m) set to 0; 'Угол, °' (Angle, °) set to 90; and 'По высоте, м' (By height, m) set to 0. An 'OK' button is at the bottom.

Distance traveled by the antenna will be indicated in "By course, m". Type distance value on the measuring tape in the point of intersection in the "Aside, m" box. The angle of the profile and base line intersection is 90° by default. Click OK and continue the antenna movement.

Option 3. Universal Search



After the profile completing name and save the file. In this case Planner window will appear and just obtained profile will add to the project.

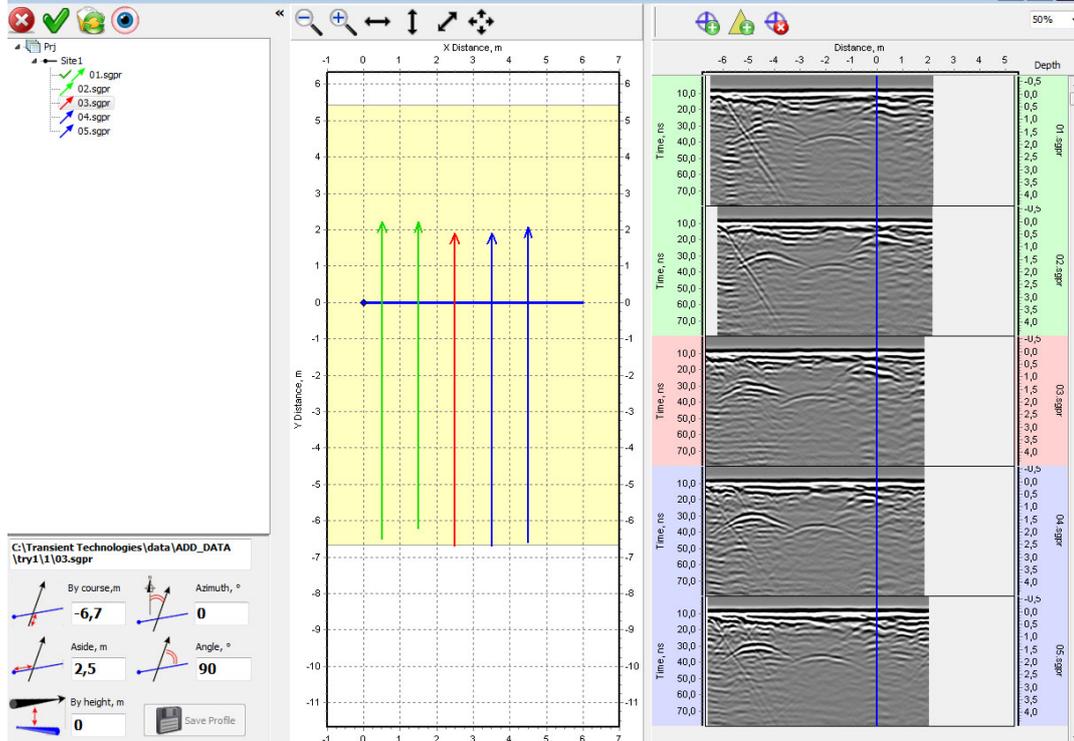


Direction option is BACKWARD

Direction option is FORWARD (Cart-36 was moving backwards)

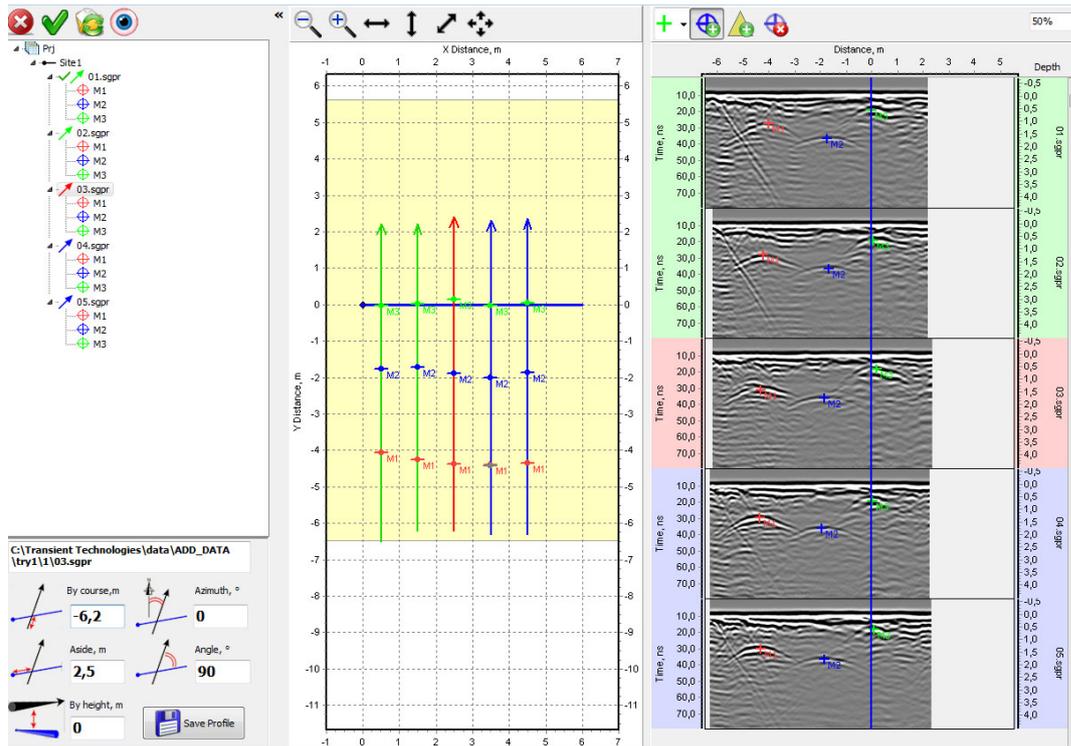
Repeat the addition of GPR profiles as necessary. At the same time follow the correct indication of the Direction option.

The result is the set of profiles and your project in the Planner program will look like.

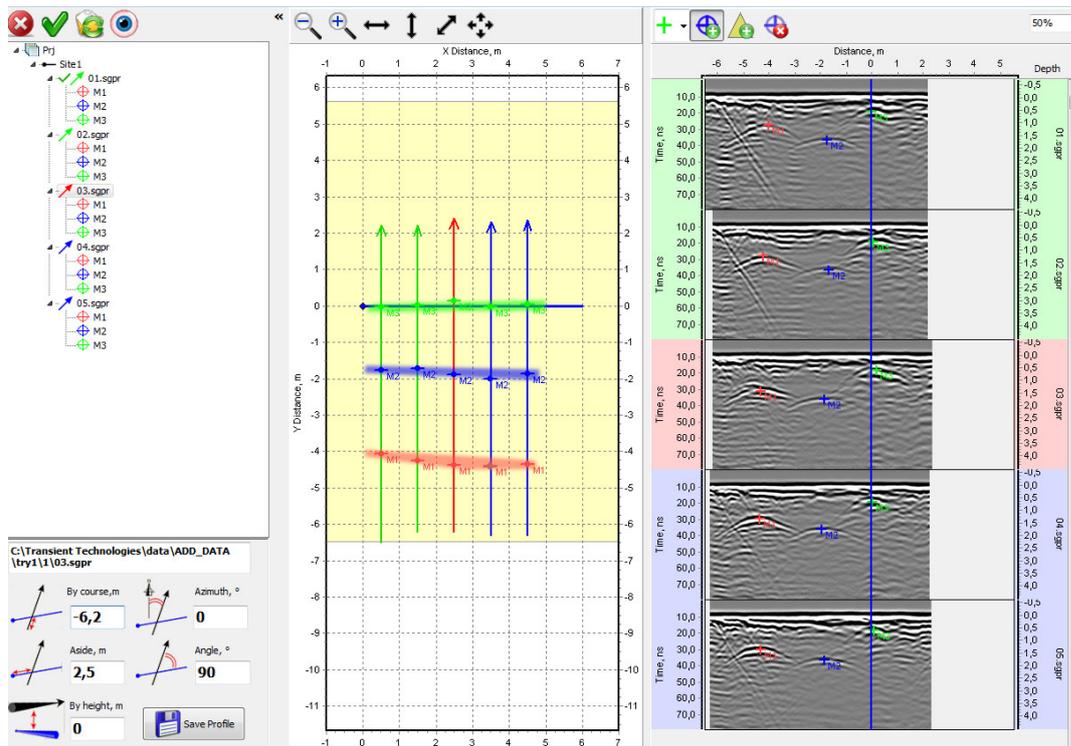


Option 3. Universal Search

Now the detected objects can be marked in the GPR profiles. The markers will also appear on the plan.



In this example, three underground utilities succeeded to detect and locate:



If necessary, you can export the data from Planner program to DXF format for use by AutoCad program.

