

## OJT Training Module Cover Sheet

**Title: 823 Understand the factors influencing GPR subsurface detection.**

**Type:**      Skill      Knowledge

**Performance Objective:** Trainee will be able to:

- Calculate reflection coefficient and discuss its application in soil investigations.
- Calculate resolution and wavelength utilizing the associated equations.
- Illustrate scattering losses and the relationship to frequency.
- Determine site and soil conditions suited to GPR investigations.

**Target Proficiency:**

- Awareness    Understanding    Perform w/ Supervision  
 Apply Independently    Proficiency, can teach others

**Trainer Preparation:**

- Trainer should be familiar with the assigned reading/review material in the lesson plan that follows.
- If possible, have several radar records and the associated soil descriptions on hand for interpretation.
- Have calculator available.

**Special Requirements:**

Initiate an external learning request with a SF-182 in Aglearn for this activity. Instructions and a template are located on the training webpages for OJT modules.

**Prerequisite Modules:**

- 802 Understanding GPR and how GPR works.
- 803 Determining depth of exploration and dielectric permittivity for GPR.
- 804 Determining depth and dielectric permittivity.

**Notes:**

None

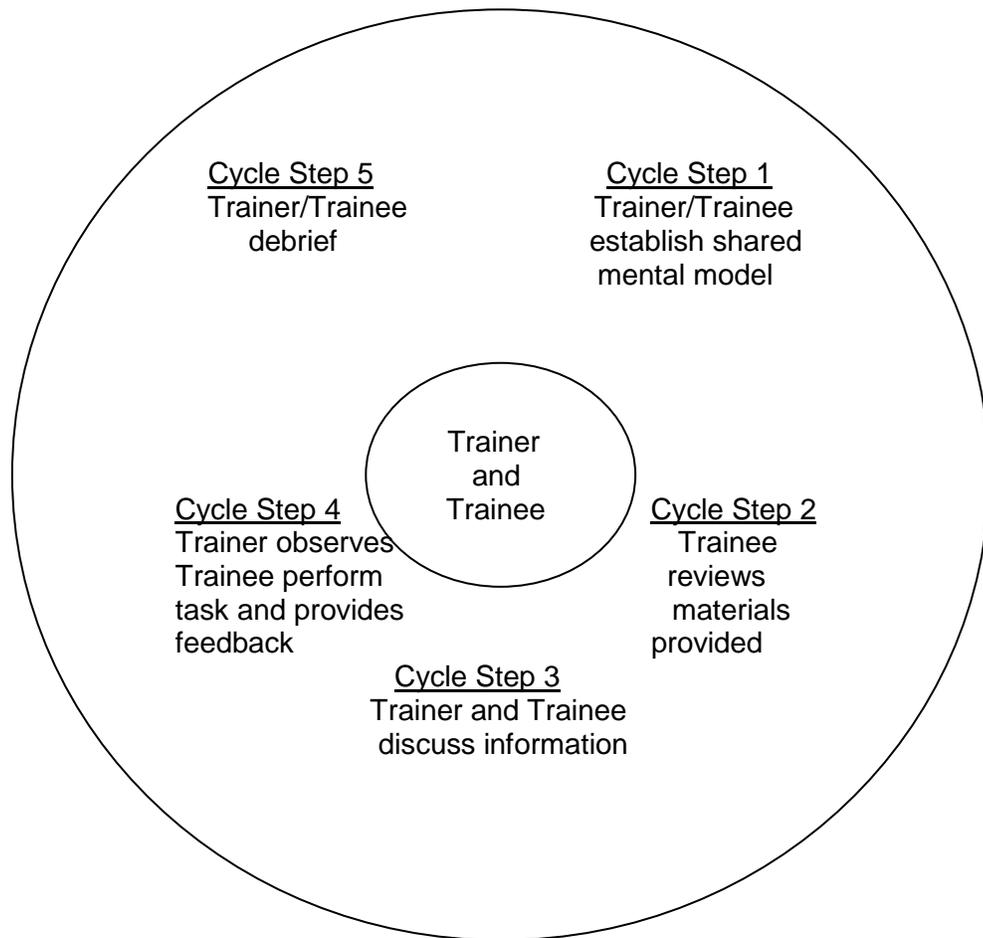
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# The Five-Step OJT Cycle for Declarative Training (Knowledge)



## OJT Module Lesson

Title: <b>823 Understand the factors influencing GPR subsurface detection.</b>	
WHAT	WHY, WHEN, WHERE, HOW, SAFETY, QUALITY
Cycle step 1	<p>Trainee should have read these sections attached to this module:</p> <ul style="list-style-type: none"> <li>• <b>Factors influencing the detection of subsurface features with GPR.pdf</b></li> <li>• <b>Ground-Penetrating Radar Soil Suitability Maps.pdf</b></li> </ul>
Cycle step 2	Trainer and trainee do the following:
1. Reflection coefficient	<ul style="list-style-type: none"> <li>• Note the combination of soil properties that create good reflectors for GPR.</li> <li>• Review the equation for the reflection coefficient.</li> <li>• Discuss the effect of propagation velocity on the signatures displayed on the radar record. Relate this to soil conditions in your survey area.</li> <li>• Discuss <math>E_r</math> dependency on moisture content. Relate this to soil conditions in your survey area.</li> </ul>
2. Resolution	Discuss what influences resolution, how to calculate resolution, and how to calculate wavelength.
3. Scattering losses	Discuss the difference between scattering losses and electrical losses. Discuss the effects of scattering losses on attenuation.
4. Site and soil suitability	<p>Access the national and state <a href="#">Ground-Penetrating Radar Soil Suitability Maps</a> on the soils.usda.gov web pages. Open and review the national map and one or more state maps related to your soil survey office.</p> <p>Discuss site and soil properties suited to GPR investigations, both in general and specifically for your soil survey area.</p>
Cycle steps 3 and 4	Have the trainee describe and utilize the equations, site conditions, and soil properties detailed above as appropriate in your survey area.
Cycle step 5	Answer any questions. Repeat any steps as necessary.

## OJT Module Lesson Measurement of Learning

Title: **823 Understand the factors influencing GPR subsurface detection.**

WHAT	WHY, WHEN, WHERE, HOW, SAFETY, QUALITY
Trainee's learning is measured.	Have the trainee complete the attached quiz to reinforce the concepts in this module.
Develop skill in identifying factors related to detecting subsurface features using GPR by routinely assigning this activity during project activities.	During project activities, assign this task to the trainee. Sign off on performance when target proficiency is achieved.

### **SF-182**

Trainee and/or supervisor access Aglearn to verify completion of the module via its SF-182.

## Quiz

1. According to equation [3], which interface will produce the greatest reflection coefficient?
  - A) Dry sandy materials ( $E_r$  4) over dry silty materials ( $E_r$  5).
  - B) Dry sandy materials ( $E_r$  4) over dry clayey materials ( $E_r$  7).
  - C) Dry sandy materials ( $E_r$  4) over wet sandy materials ( $E_r$  35).
  - D) Wet clayey materials ( $E_r$  35) over wet limestone ( $E_r$  12).
  
2. According to equation [3], which of the following interfaces should produce a reflected wave with reverse polarity:
  - A) Dry sandy materials ( $E_r$  4) over dry silty materials ( $E_r$  5).
  - B) Dry sandy materials ( $E_r$  4) over dry clayey materials ( $E_r$  7).
  - C) Dry sandy materials ( $E_r$  4) over wet sandy materials ( $E_r$  35).
  - D) Wet clayey materials ( $E_r$  35) over wet limestone ( $E_r$  12).
  
3. True or False? Radar energy is radiated from an antenna into the ground as a highly focused, narrow beam.
  
4. True or False? Horizontal resolution will decrease with increasing depth of exploration.
  
5. You are profiling a soil with a 400-MHz antenna. The estimated velocity of propagation through this soil material is 0.1300 m/ns. What is the theoretical wavelength of the propagated energy?
  - A) 325 m
  - B) 32.5 m
  - C) 32.5 cm
  - D) 32.5 mm