Thermography

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Introduction

- What is Thermography?

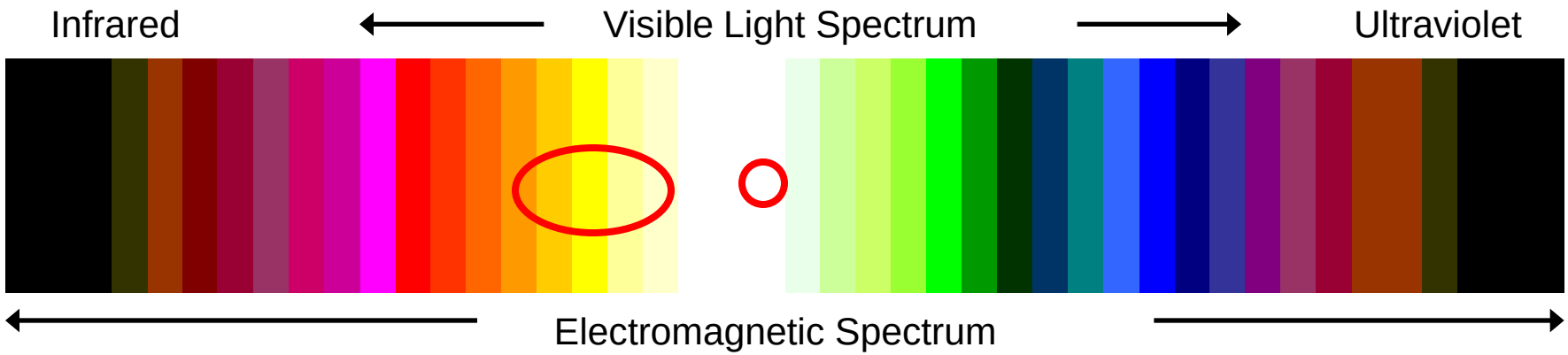
- “The detection by an instrument to measure invisible infrared energy being emitted from an object.“

Inorganic Thermal Regulation

- Absorbed temperature in an inorganic or inanimate object is a consequence of thermal energy that is continually being introduced into an object, such as sun light.
- Metals, rocks, or sand etc. do not produce their own heat.
- Heat produced from a source outside of the object and the object retains the heat which then dissipates and is lost to the environment.
- The relative uniformity of retained heat in inorganic/inanimate objects is a direct correlation to particular events, such as touching, moving or exposing it to a heat source (sun light).

Visible Wavelength Detection

The human eye can only see a narrow range of wavelengths in the electromagnetic spectrum.



Infrared (**IR**) radiation is electromagnetic radiation with wavelength longer than that of visible light (400–700 nm),

Visible Wavelength Detection (cont.)

- Wavelengths range in length from 0.4 to 0.7 microns, a micron is one millionth of a meter.
- Most of what the eye sees is reflections from objects that high energy from the sun or an incandescent light bulb is striking.
- If the temperature of an object gets hot enough (977 Degrees Fahrenheit) the energy from that object will radiate energy in the visible spectrum and we will see it.

- This is when we see an object like the burner on an electric stove "*glowing* " red. In fact any time an object will emit or reflect energy in the same frequency of our eyes we will see it. Mostly, however we see reflections!

Measuring Thermal Energy

- ***How does a thermal imager "SEE" Heat?***

- All objects, cold or hot, radiate heat in the form of infrared energy.

- As an object increases in temperature, it radiates more energy and the wavelength gets shorter.

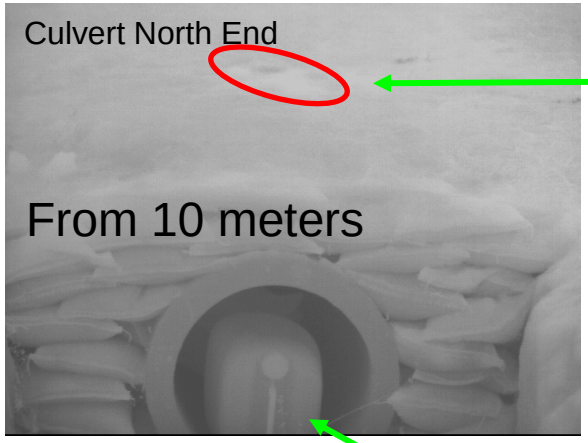
- Infrared radiation, visible light and ultraviolet light are all forms of energy in the electromagnetic spectrum. The only difference is their wavelength or frequency.

- Thermal imaging displays the amount of infrared energy emitted, transmitted, and reflected by an object.

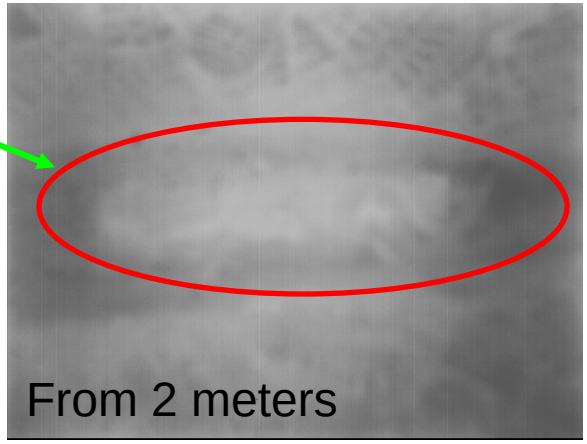
Thermal Image Interpretation

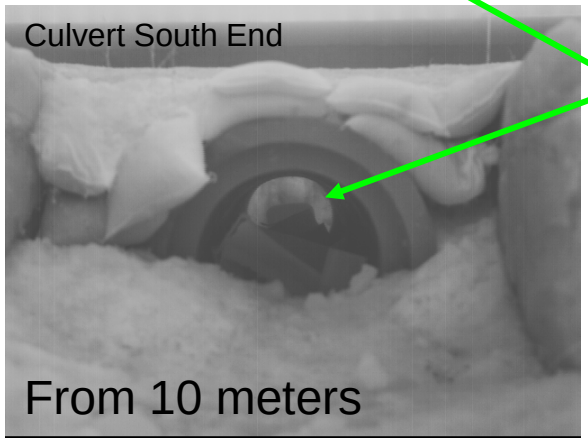
IED Signature Detection – Example 1

1. **AREA:** Linear Culvert 3’ deep, 25 m long. Hard packed dirt.
   TIME/ATMOSPHERICS: 1100, 90 degrees, 29.86inHg
   IED: HME jug in culvert mouth unburied
   INITIATOR: Pressure plate, buried 2 inches



Pressure Plate

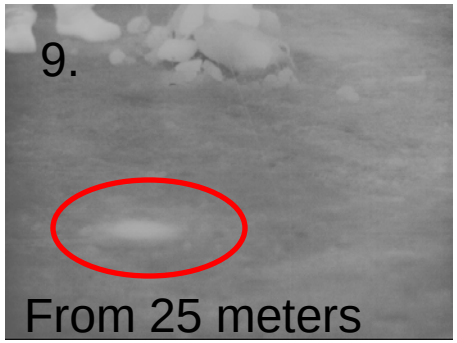


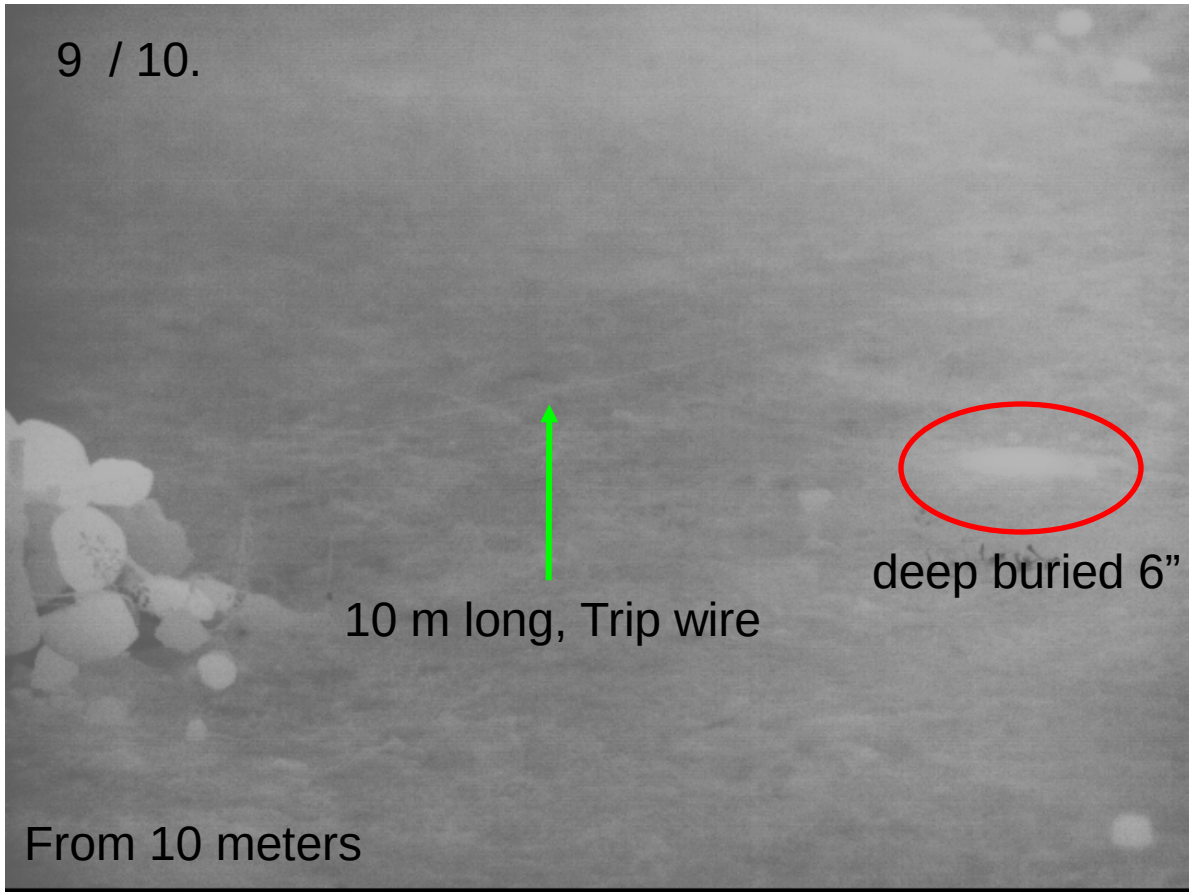


HME

IED Signature Detection – Example 2

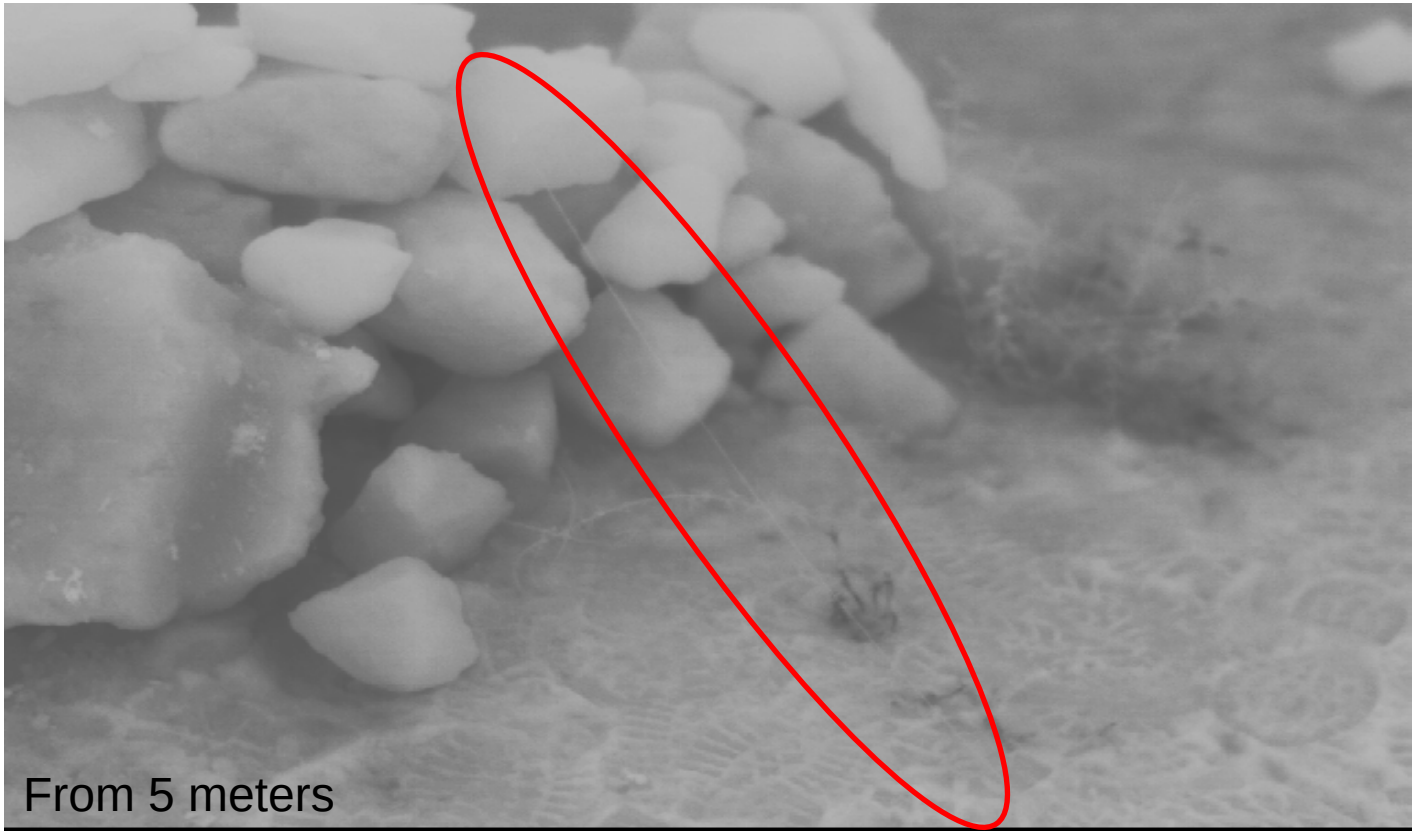
AREA: Hard packed dirt road.
TIME/ATMOSPHERICS: 1230, 92 degrees, 29.86inHg
IED: TC-6 antitank mine, deep buried 6”
INITIATOR: Pressure release, Initial (9.)
Trip wire (white cloth/cotton) string, secondary (10.)





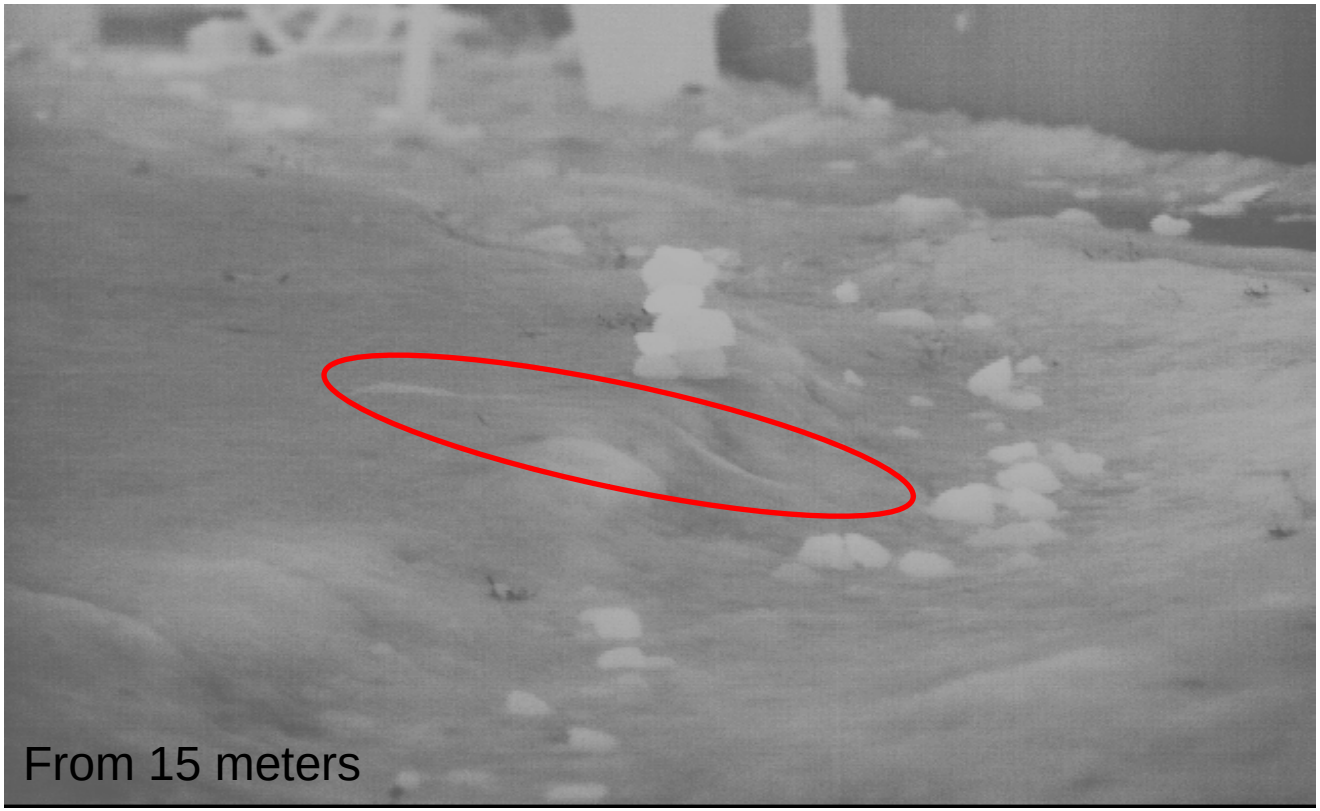
IED Signature Detection – Example 3

AREA: Hard packed dirt, small rise / hill
TIME/ATMOSPHERICS: 1200, 92 degrees, 29.86inHg
IED: 3, 107mm rockets, surface laid
INITIATOR: Pressure trip wire (black cloth/cotton) string connected to clothespin

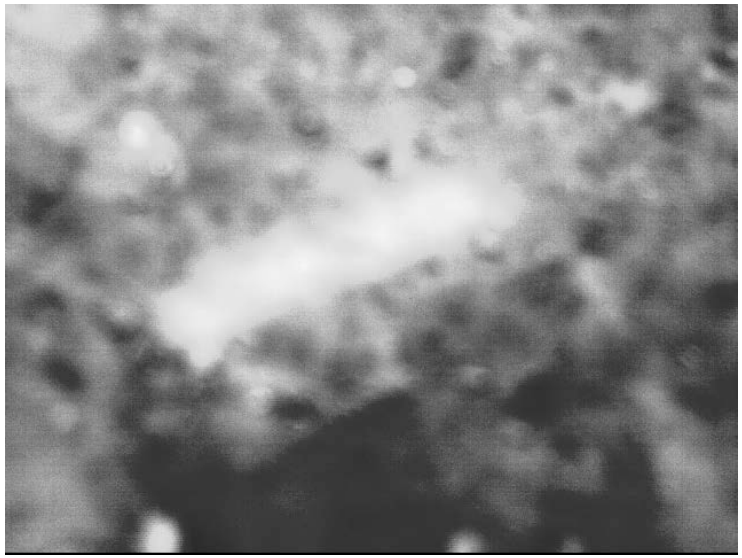


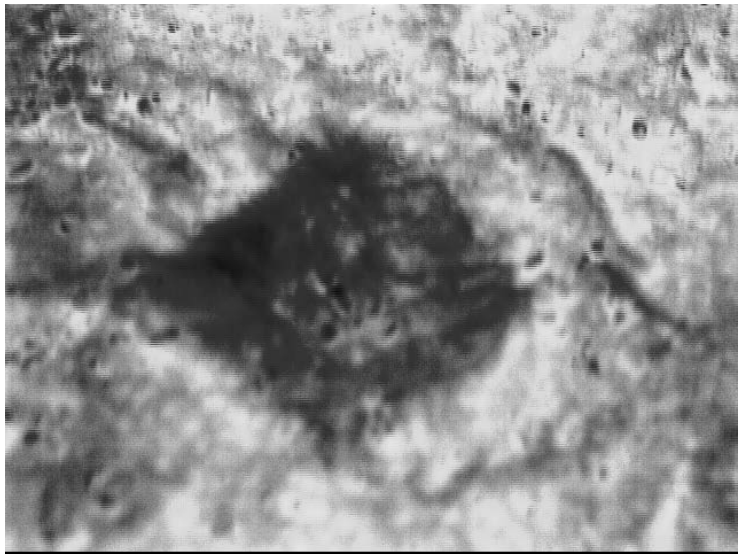
IED Signature Detection – Example 4

AREA: Hard packed dirt road with shallow ditch to the right side of the road.
TIME/ATMOSPHERICS: 1127, 92 degrees, 29.86inHg
IED: none / hoax
INITIATOR: Pressure trigger / metallic in rubber hose wrapped in canvas sheath buried 4”.



IED Find – Afghanistan 2011





Inert IED Emplacement – August 2012

Main Charge

Pressure Plate

Inert IED – August 2012 (Cont'd)

Pressure plate 52 hours after emplacement – photographed 2 hours after sundown.

Gathering Information from Thermal Pictures

Which vehicle has moved recently?

What is the tank's water level?

Where is the tower guard?

Where has digging occurred?

Equipment Repairs

- **IF ANY ITEM IN YOUR KIT BECOMES INOPERABLE, PLEASE CONTACT THE FOLLOWING BY E-MAIL OR PHONE:**

- ***SSC Pacific C4I Help Desk - 24/7/365***
  ssc_pac_c4isrhd@navy.mil
  (619/DSN) 524-3888

- **IF ANY ITEM IN YOUR KIT BREAKS OR BECOMES DAMAGED (FOR ANY REASON), CONTACT THE ABOVE WEB ADDRESS TO CONFIRM SHIPPING INSTRUCTIONS. PLEASE BOX BROKEN OR DAMAGED GEAR AND SHIP TO:**

- ***N69255 Receiving Officer***
  Attn: Ron Brown Tel:(619) 524-3882
  SPAWAR Systems Center Pacific (41420)
  4297 Pacific Highway, Building 7
  San Diego, CA. 92110

- **ONCE CONFIRMATION OF SHIPPING OF DAMAGED EQUIPMENT TAKES PLACES, REPLACEMENT GEAR WILL BE SENT TO YOU. ENSURE YOU PUT YOUR UNIT'S RUC OR DODAAC NUMBERS AND UNIT'S ADDRESS AND A POINT OF CONTACT WITH EMAIL AND PHONE NUMBER.**


QUESTIONS?