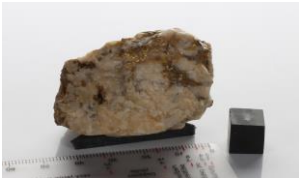**You are a geologist working for a mining company. During a trip to an island, you collected samples of these rocks, which you have identified as being metal ores:**

Gold-ore (native gold)	Copper-ore	Tellurium-ore (calaverite)

Excited by this find, you carry out lab work on other rocks that you collected during the trip. As part of this lab work, you measure the gold, copper and tellurium concentrations, and identified 3 potential mineral deposits where these concentrations were especially high.

The map below shows these 3 potential mines that the company is interested in buying. Different mines have different characteristics based on how they form and natural processes which cause variation. Based on the information on the different sites, along with extra useful pieces of information below, it is your job to decide:

- **Which metal you want to mine? Which deposit you should mine?**

There are multiple ways you could decide this:

- **Which will you make the most money from? Which is the most important metal to mine? Which is the most ethical to mine?**
  TIP: There is no right or wrong answer! This practical is designed to show you that even in science there is not always a 'correct' answer – instead you need to justify your decision and use evidence to back yourself up!
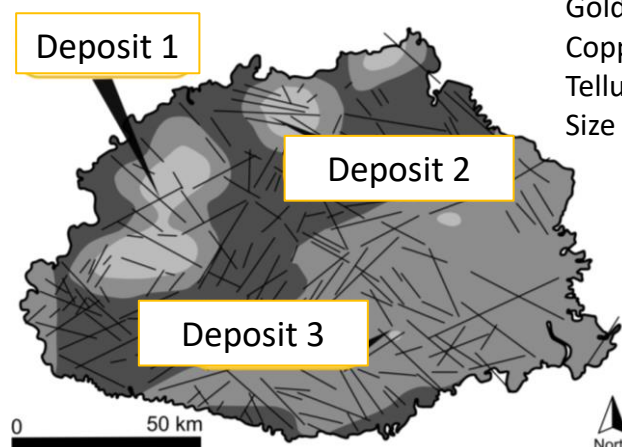
Information about the island:

Deposit 2
Gold concentration: 1.9 g/t
Copper concentration: 560 g/t
Tellurium concentration: 2.1 g/t
Size of deposit: 52200000 t

Deposit 1
Gold concentration: 2.2 g/t
Copper concentration: 600 g/t
Tellurium concentration: 3.0 g/t
Size of deposit: 42000000 t

Deposit 3
Gold concentration: 0.05 g/t
Copper concentration: 3,700 g/t
Tellurium concentration: 0.06 g/t
Size of deposit: 1,790,000,000 t

Information about the metals:

Gold, average price: 60 $/g

- ➤ Precious metal, used as currency / bullion for hundreds of years and new uses in medical technology
- ➤ Gold mining often has high reward (money) but is also high risk. Occasionally the price crashes, making gold mines essentially worthless and putting many people out of work
- ➤ It is often not environmentally friendly, as mining methods often release toxic metals into the environment.
- ➤ New technologies allow mining to be more responsible, but they are often more expensive, so profits decrease.

Copper, average price: 0.005 $/g

- ➤ Important metal, used in vast quantities in electronics, buildings and new technologies
- ➤ Copper mining has to be large scale to make money as the metal itself is cheap – lots of it has to be sold to make a profit.
- ➤ Big mines often mean big impacts (more noise, dust and vibrations) and are also more likely to be big eyesores.
- ➤ Despite the large size of copper mines, the methods are more environmentally friendly.
- ➤ Copper's use in new 'green' technology somewhat offsets this, although it is more likely to end up in a mobile phone!

Tellurium, average price: 0.1 $/g

- ➤ Semi-metal, one of the rarest elements in Earth's crust, used in solar panels
- ➤ Often not mined directly, but collected as a by-product
- ➤ As the demand for tellurium increases as we produce more electricity via renewables, direct mining will be required to ensure supply – this will likely make it more valuable
- ➤ Whilst other renewable energy methods exist, solar panels are often cheaper, more efficient and more accessible

Work flow:

1. Calculate the value of (a) gold, (b) copper and (c) tellurium at Deposit 1
2. Calculate the value of (a) gold, (b) copper and (c) tellurium at Deposit 2
3. Calculate the value of (a) gold, (b) copper and (c) tellurium at Deposit 3

*Use the equation: **Concentration (g/t) * size of deposit (t) * price ($/g) = value ($)***

4. Rank these in order of value
5. List the pros and cons of mining (a) gold, (b) copper, and (c) tellurium

This can include information which has been provided and you have calculated, including the price, likely profit, the uses of the metal

6. Based on the work you have done, decide which metal you would like to mine at which location, and give 3 reasons why.

Whilst it in important to the company board that they make money, you might want to choose your deposit based on what metal you would mine. It is increasingly important that a company can show it is 'ethical'