Name: ________________________ **Date: ___________**

Lab Per #: _________

Lab # _____ – Topographic Maps – Creating a 3-D Map from a 2-D Picture

Introduction: Topographic maps enable geologists, builders, engineers, and hikers to "see" the shape of a particular landscape in 3 dimensions - think of it as the length, width and height of a location. The beauty of a topo map is that all of this information and more (street names, landmarks, highways, political boundaries, etc.) fits onto a flat piece of paper that can be folded up and tucked away. It takes a great deal of practice before one can easily read and interpret the information on a topo map. Perhaps the most difficult part is envisioning the various changes in elevations and features- steep slopes, hills, valleys, and plateaus.

Purpose: This activity is designed to help you translate topographic maps from a flat representation to a 3-D model – in other words, to help you to "see" the 2-D map in 3 dimensions.

Procedure:
A. Each lab table is responsible for "constructing" a 3-D model of one of the given topo maps. Put a check in the box next to your map:

__ Mt. St. Helens "Before" **__ Mt. St. Helens "After"** **__ Depression Map** **__ Stream Map** **__ Hill Map**

B. Each group is responsible for tracing 1 contour per piece of glass from your given map. Make certain that all lines of the same elevation are traced. The best way to do this is to line up the corners of your glass plates with the right angle brackets provided on the map. Next, trace your chosen line with a wet erase marker, being careful to LABEL your glass in the lower left corner with that contour line's elevation (see Figure 1).

C. Once your group completes each contour for your map, stack the contour plates on top of one another in order (lowest on the bottom, highest on top) onto the second map at your lab table to show the 3-D model right on top of the 2-D map. Make sure that your contours align properly. See Figure 1.

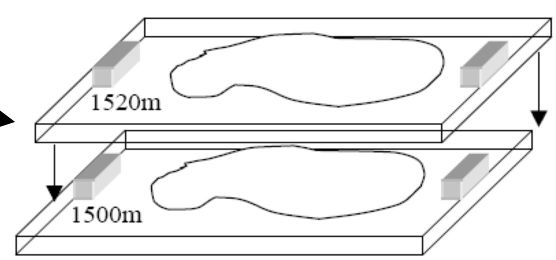

Figure 1: Glass contour plates are set directly on top of one another with the spacers between them.

D. When your group has finished, display your model in the middle of your lab table. The groups will rotate through the maps – having 4 minutes at each map to answer the questions in each section. Ex. Map 1 group will go to map 2, 2 to 3, 3 to 4, 4 to 5 and 5 to

1. The group that constructs Mt. St Helen's "After" will have to wait to answer question # 2f until after they rotate through the Mt. St. Helen's "Before" map.

Interpretation & Analysis:

In this section, you will be asked to consider a series of questions about each model. Move from model to model until you have completed your interpretation of each. Be sure answer the conclusion questions at the end.

NOTE: Models are best observed by looking from directly above!!

1. Mt. St. Helens "Before"- This volcano, located latitude 46.20 N, longitude 122.18 W, is a stratovolcano (steep-sided with alternating layers of "flow out" and "blow out"). Located in the Cascade Range of Washington State, Mt. St. Helens is the fifth highest peak in Washington.

a. What is the total change in elevation on this map (highest contour – lowest contour)? ___________________

b. Using the scale provided, calculate the total distance across the base of the volcano (from one side all the way to the other – East to West) : ___________________

c. Note the highest contour on this map: _________________________

Optional brain stretcher: Sketch a profile (side) view of this volcano and label the lowest and highest altitudes on your sketch.

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2. Mt. St. Helens "After" - At 8:32 a.m. PDT on May 18, 1980, a magnitude 5.1 earthquake 1 mile below Mt. St. Helens triggered a massive volcanic eruption that blew 3.7 BILLION cubic yards of material into the air and over the land. An eruptive plume of material reached 80,000 feet into the sky in less than 15 minutes. When it was over, the summit of the volcano was significantly lower. The topography of Mt. St. Helens was permanently changed.

a. What is the total change in elevation on this map? _______________________

Work space:

b. What is the highest contour now? _________________

c. How many meters of the mountain did the eruption blow off? _________________
Work space

d. On which side (compass dir.) of the mountain did the eruption occur? _______________

e. How do you know? ____

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f. Note what time the eruption took place, using your knowledge of time zones and longitude, what time was it in NY when the eruption occurred? ___________________

g. Describe in detail how the appearance of the volcano has changed since the 1980 eruption.

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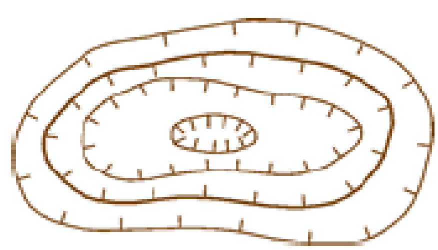
Optional brain stretcher: At home, use the Internet to research the eruption. Specifically, how were nearby cities affected? And, how did the eruption affect the weather of the US that year?

3. Depression Map - Hachure marks on closed contours indicate areas of lower elevation, known as depressions (see example below). There is no surface drainage out of depressions.

a. What are the highest and lowest elevations on this map?

High = _____________ Low = _________________



Hachure marks indicating a depression

b. Why are there two 650 lines drawn on this model? ______________________________

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c. Why are there two 670 lines drawn on this model? What is happening to the elevation of the land in between the two lines?

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4. Stream Map - Streams are often prominent features on topographic maps. Streams flow in one direction - downhill! As a result, contour lines can help us to determine the direction of stream flow.

a. Assuming North is toward the "top" of the model, in which compass direction is this stream flowing?

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b. Describe the appearance of the contour lines as they cross the stream.

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c. Relative to the flow of the stream, in what direction are the contours "pointing" as they cross the stream?

____

Is this uphill or downhill? ____________________

d. In general, contour lines always make a _______ shape when crossing streams, with the point of the _______ pointing ______________ (upstream or downstream).

5. Hill Map - Hills are frequently the most prominent and easiest to identify features on topographic maps.

a. What is the difference in elevation between the highest and lowest contours?

____

Work space:

b. Describe the change in elevation in words and how hard you would be exercising if you were to hike from the bottom right corner of the map to the top left corner of the map.

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____

c. On which side of the hill (compass dir.) is the steepest part of this model?

____

d. What does the actual “steepness” depend on? In other words what 2 measurements are compared when determining steepness?

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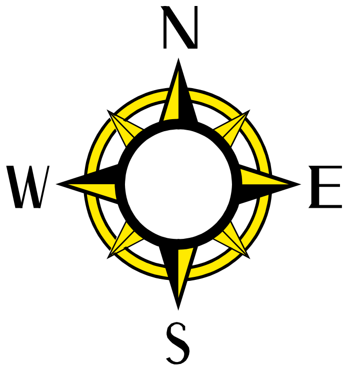
OPTIONAL BRAIN STRETCHER…. Assuming a scale of 1cm=1km, determine the gradient from the highest point on model 5 (Hill) to the southwest corner of the map (assume an elevation of 1150 at that point). **Describe whether this is actually a steep hill or not. *Justify your answer.*** *(A copy of this map is attached if you’d like to work on this brain stretcher at home….)* ***Be sure to show your work by writing the gradient formula, plugging in the data and showing the units!!!!!!***

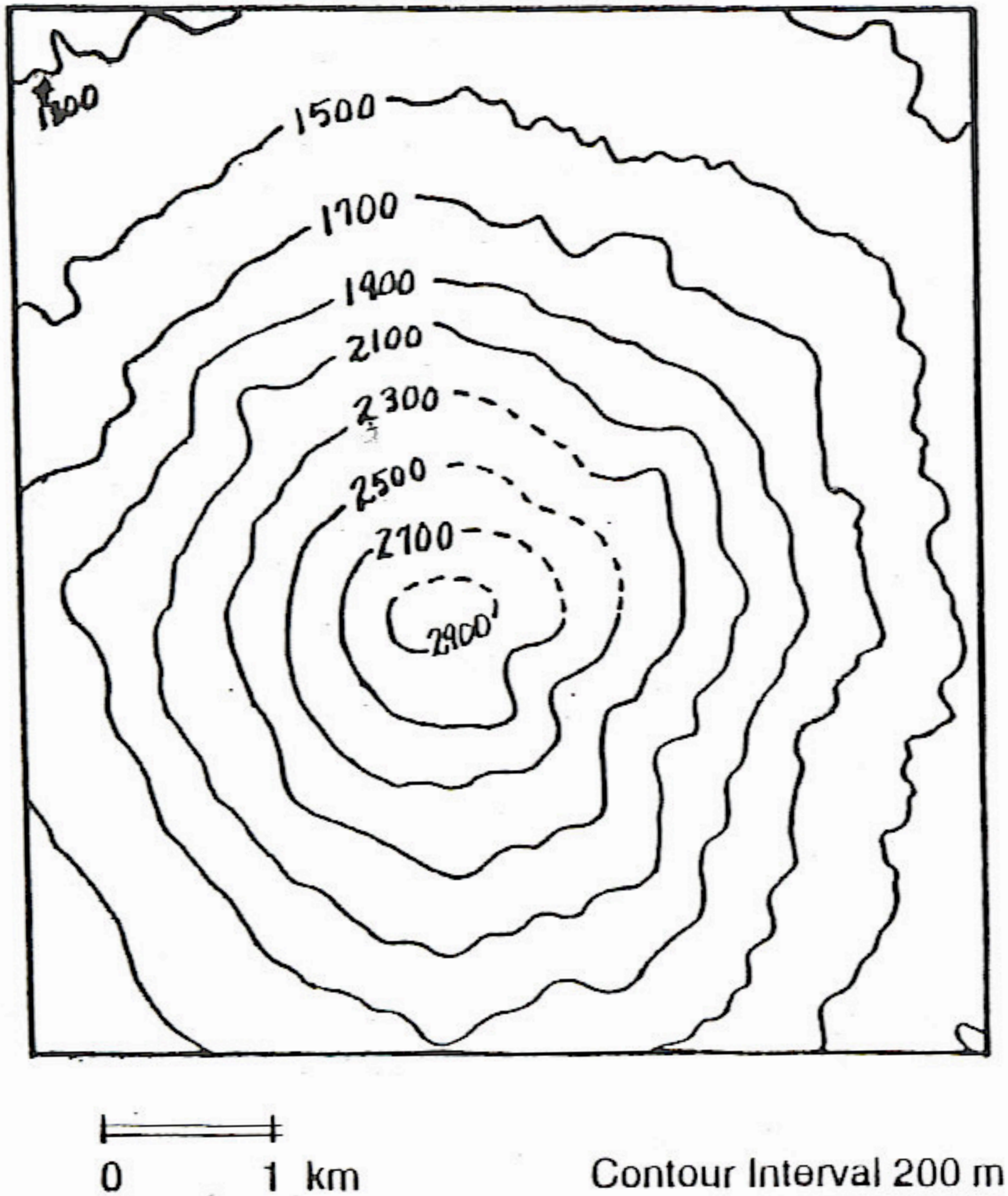
Analysis Questions:

1. Summarize 3 “rules” or characteristics of contour lines that you have learned from this activity:

2. Using the attached map of Mt. St. Helen’s “before”, determine the gradient of the volcano from the Southwest base to the peak of the volcano. ***Be sure to show your work by writing the gradient formula, plugging in the data and showing the units!!!!!!***

Map #1 - Topography of Mt. St. Helen's Volcano BEFORE May 18, 1980 eruption





Map #5 – Hill Map