ROYAL CANADIAN ARMY CADETS

MASTER CADET

INSTRUCTIONAL GUIDE

EO C522.01 – ANALYZE MAP TOPOGRAPHY

Total Time: 90 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the completion of this self study package are listed in the lesson specification located in A-CR-CCP-705/PG-001, *Master Cadet Qualification Standard and Plan*, Chapter 4. Specific uses for said resources are identified throughout the self study package within the section for which they are required.

Self study packages are intended to be completed by the cadet independently. More information about self study packages can be found in the foreword and preface.

Review the lesson content and become familiar with the material prior to facilitating this lesson.

Photocopy the self study package located at Attachment A for the cadet.

Photocopy the relief map templates located at Attachment B for the cadet (it is recommended that the templates be printed in colour). The relief map templates may be printed on full page self-adhesive labels.

Photocopy the answer key at Attachment C but **do not** provide it to the cadet.

PRE-LESSON ASSIGNMENT

Nil.

APPROACH

A self study was chosen for this lesson as it allows the cadet to analyze map topography at their own learning pace. This encourages the cadet to become more self-reliant and independent by focusing on their own learning instead of learning directed by the instructor.

INTRODUCTION

REVIEW

Nil.

OBJECTIVES

By the end of this lesson the cadet shall have analyzed map topography.

IMPORTANCE

It is important for cadets to analyze map topography as it aids them in understanding how the shape of the land can affect moving over terrain.

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SELF STUDY PACKAGE INSTRUCTIONS

OBJECTIVES

The objective of this self study package is to have the cadet analyze map topography.

RESOURCES

- Self study package,
- Pen / pencil,
- Relief map templates located at Attachment B,
- Eight foam sheets (soft, flexible, craft-type foam 8.5 X 11 inches, approximately 2 mm thick),
- Glue stick, and
- Scissors.

ACTIVITY LAYOUT

Provide the cadet with a classroom or training area suitable to complete the self study package.

ACTIVITY INSTRUCTIONS

1. Provide the cadet with a copy of the self study package located at Attachment A, a pen / pencil, and the resources to create the relief map.

2. Allow the cadet 90 minutes to complete the self study package.

3. Provide assistance as required to the cadet.

4. Collect the self study package once the cadet has finished.

5. Correct the self study package with the self study package answer key located at Attachment C.

6. Provide feedback to the cadet and indicate whether or not they have completed the Enabling Objective (EO).

7. Return the completed self study package to the cadet for their future reference.

8. Record the result in the cadet's logbook and Cadet Training Record.

SAFETY

Nil.

END OF LESSON CONFIRMATION

The cadet's completion of the self study package will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK / READING / PRACTICE

Nil.

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METHOD OF EVALUATION

Nil.

CLOSING STATEMENT

The ability to analyze map topography is a skill that aids in understanding terrain, allowing you to get the most out of a topographical map.

INSTRUCTOR NOTES / REMARKS

The cadet may keep the created relief map.

REFERENCES

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C0-118 ISBN 978-1-55365-209-0 Zuehlke, M. (2001). *Canadian military atlas*. Vancouver, BC: Douglas & McIntyre Ltd.

C2-255 Locke, W. (1998). *Topographic map interpretation*. Retrieved October 19, 2009, from http://www.homepage.montana.edu/~ueswl/topotechs/map_profiles.htm

C2-256 New Mexico State University. (2009). *Creating topographic profiles*. Retrieved October 19, 2009, from http://www.cs.nmsu.edu/~jbj/index_auxil/idaho_virtual_campus/topo_profiles.htm

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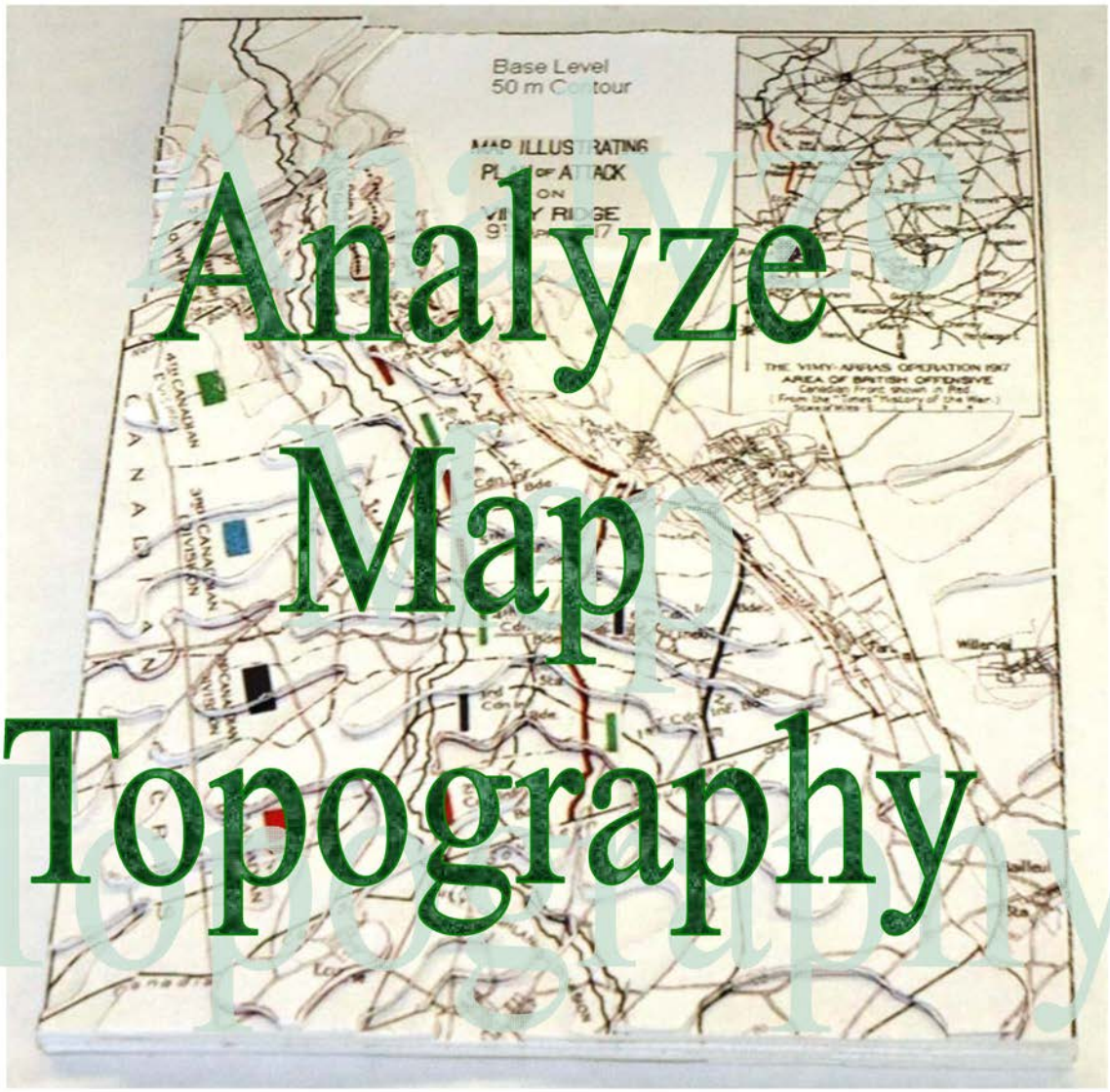
C2-280 ISBN 0-662-42602-9 Canada Remembers Division of Veterans Affairs Canada. (2006). *Canada and the Great War 1914–1918: A nation born*. Canada: Her Majesty the Queen in Right of Canada.

C2-282 Library and Archives Canada. (2008). *Vimy Ridge*. Retrieved January 29, 2010 from http://www.collectionscanada.gc.ca/premiereguerre/025005-1300-e.html

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Analyze Map Topography

SECTION 1: REVIEW TOPOGRAPHY

SECTION 2: CREATE A RELIEF MAP OF THE BATTLE OF VIMY RIDGE

SECTION 3: TOPOGRAPHY AND THE BATTLE OF VIMY RIDGE

The Background of the Battle

Using Topography to Analyze the Battle of Vimy Ridge

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SECTION 1
REVIEW TOPOGRAPHY

What is Topography?

According to *Canadian Oxford Dictionary*, topography is defined as:

- a detailed description, representation on a map, etc, of the natural and artificial features of a town, district, etc, and
- such features.

Throughout your time as a cadet, you have learned about topographical maps and how to use them. Knowing the locations of roads, trails, rivers, campsites, forests, etc, allows you to better plan / lead an expedition. One of the difficulties of using a map is that it is a two dimensional representation of three dimensional terrain. Understanding and interpreting the map's contour lines allows you to identify features on the map as they relate to the shape and elevation of the ground. The following activity is a review of material learned during Green Star.



The distance between contour lines indicates the type of slope on the ground.

Define the following slopes in terms of contour lines:

Steep Slope:

Gentle Slope:

Uniform Slope:

Spurs:

Re-entrants:

Concave Slope:

Convex Slope:

This information was covered in M122.03 (Interpret Contour Lines).

As the activity shows, understanding contour lines allows you to interpret the shape of the ground. Another way to interpret the shape of the ground is to use a relief map.



Do you remember seeing a relief map?

If so, did it help you to better understand contour lines?

A relief map is one where the heights and shapes of the ground are either represented in the vertical plane or represented by colour.

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Verify against the official publication.



Note. From Amazon.ca, 2010, Relief Map. Retrieved January 27, 2010, from http://www.amazon.ca/gp/product/images/1906473021/sr=8-4/qid=1264610428/ref=dp_image_0?ie=UTF8&n=916520&s=books&qid=1264610428&sr=8-4

Figure A-1 Relief Map in the Vertical Plane

A relief map in the vertical plane shows the hills, valleys, peaks, etc. This type of relief map tends to be bulky, making use and storage more difficult than flat maps. It is common for this type of relief map to exaggerate the vertical scale.

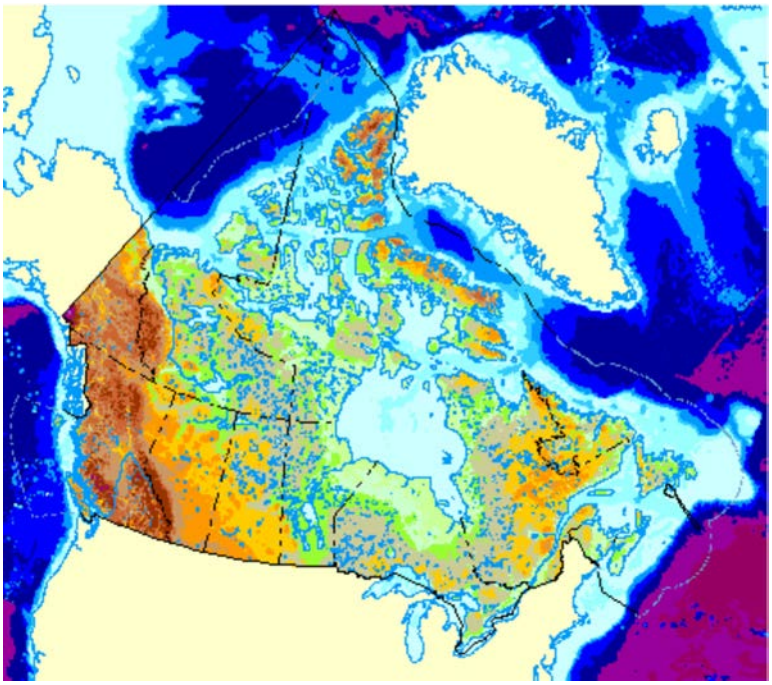
Vertical exaggeration. The vertical scale is not the same as the horizontal scale. For example, a relief map may have a horizontal scale of 1:50 000 and a vertical scale of 1:5 000 making the vertical exaggeration equal 10; that is, the vertical scale is 10 times the horizontal scale making features appear 10 times higher than they actually are.



Did you know?

For a topographical map with a scale of 1:50 000, 2 cm on the map equals 1 km on the ground. If the contour interval for the map is 10 m, then a relief map of the same scale would represent each contour line as 0.2 mm thicker: only the thickness of two pieces of paper!

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Note. From Natural Resources Canada, 2010, Interactive Relief Map. Retrieved January 27, 2010, from http://atlas.nrcan.gc.ca/site/english/maps/reference/national/reliefinteractive

Figure A-2 Relief Map Using Colour

Coloured relief maps are more common as it is less expensive to produce than vertical plane relief maps, and since they are flat like other maps, they do not have the bulk of vertical plane relief maps.



An interactive colour relief map of Canada may be found online at http://atlas.nrcan.gc.ca/site/english/maps/reference/national/reliefinteractive



Do you remember learning in Green Star how to interpret contour lines? How have you used this knowledge since?

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SECTION 2
CREATE A RELIEF MAP OF THE BATTLE OF VIMY RIDGE

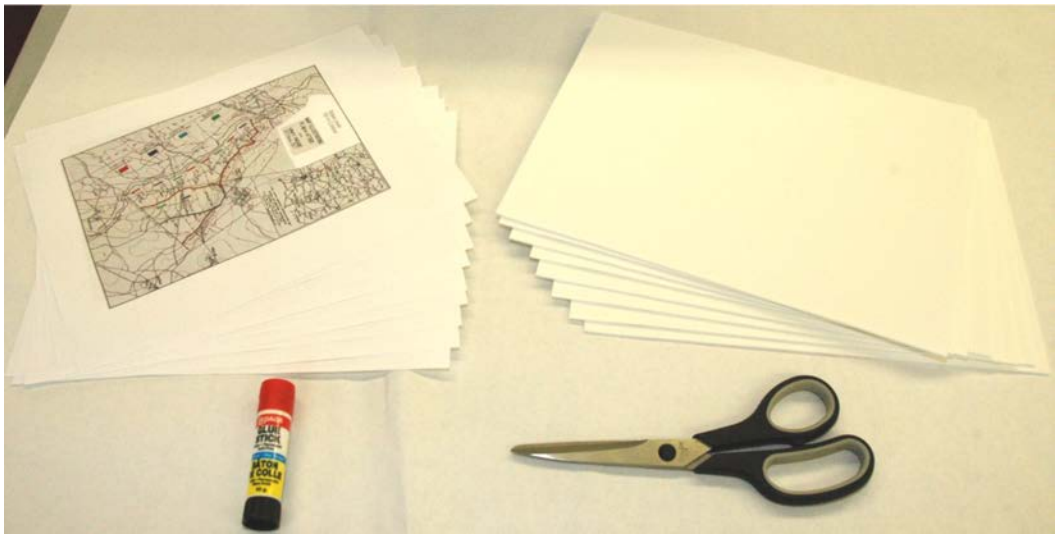
INTRODUCTION

A visual aid makes it easier to understand map topography. If you have a topographical map, you can use this method to create your own visual aid.

It is important for the steps to be followed so that one layer is not mistaken for another.

STEPS FOR CREATING A RELIEF MAP OF THE BATTLE OF VIMY RIDGE

1. Organize all resources (relief map templates, foam sheets, glue stick, and scissors).

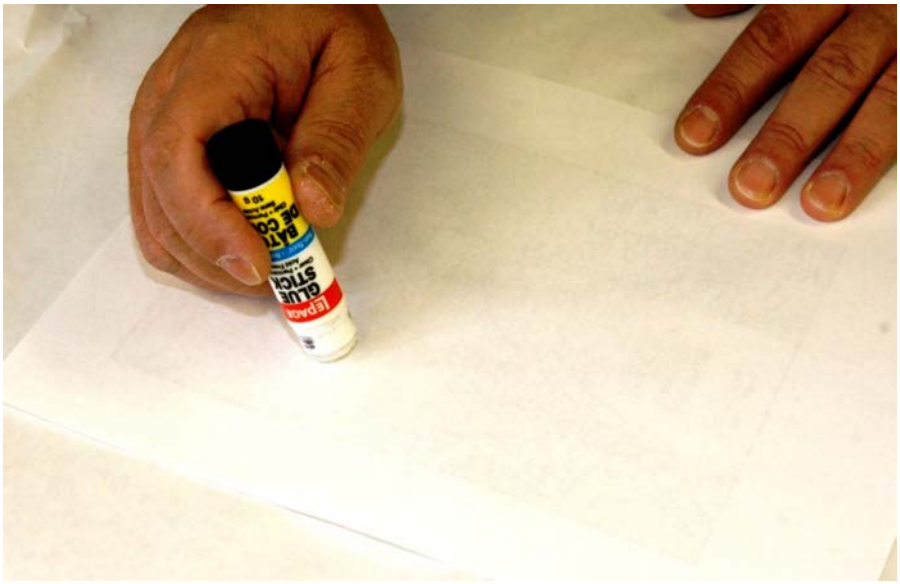


Note. Created by Director Cadets 3, 2010, Ottawa, ON: Department of Defence.

Figure A-3 Resources

2. Glue all the templates onto the foam sheets.

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Note. Created by Director Cadets 3, 2010, Ottawa, ON: Department of Defence.

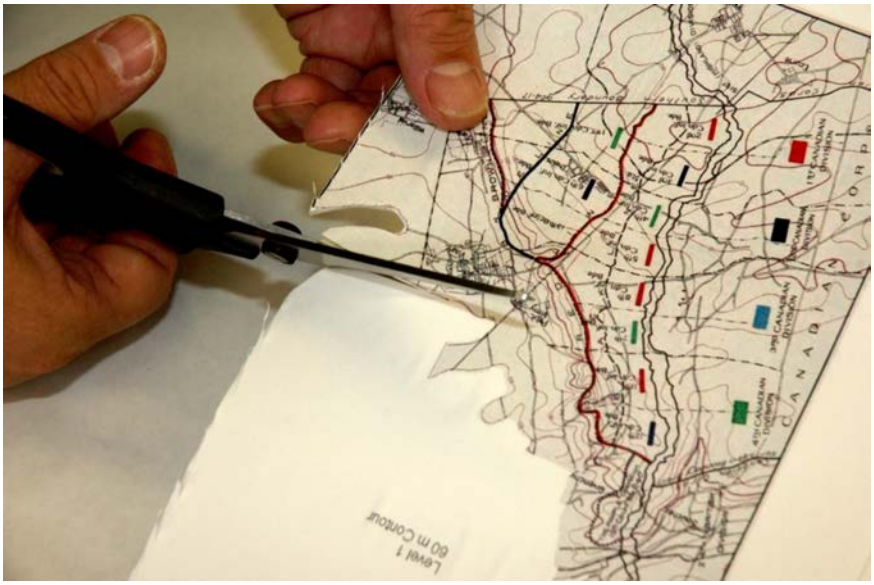
Figure A-4 Gluing the Templates Onto the Foam Sheets

3. Cut the Level 1: 60 m Contour map piece from the template.



It is important to cut along the edges of each piece of the template by cutting along the contour line and the straight segments that represent the edge of the map.

Note: All pieces, except Levels 8 and 9, contain a map edge.



Note. Created by Director Cadets 3, 2010, Ottawa, ON: Department of Defence.

Figure A-5 Cutting Out the Level 1 Piece From the Template

4. Glue the Level 1: 60 m Contour map piece to the Base Level: 50 m Contour piece, being careful to place the piece correctly. Remember, the contour lines should line up with each other.

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Figure A-6 Gluing the Level 1 Piece to the Base Piece

5. Cut the Level 2: 70 m Contour map pieces from the template.

Levels 2–6, and Levels 8 and 9 each contain **two** separate pieces to be added to the relief map.

6. Glue the Level 2: 70 m Contour map pieces over previous levels, being careful to place the pieces correctly. Remember, the contour lines should line up with each other.



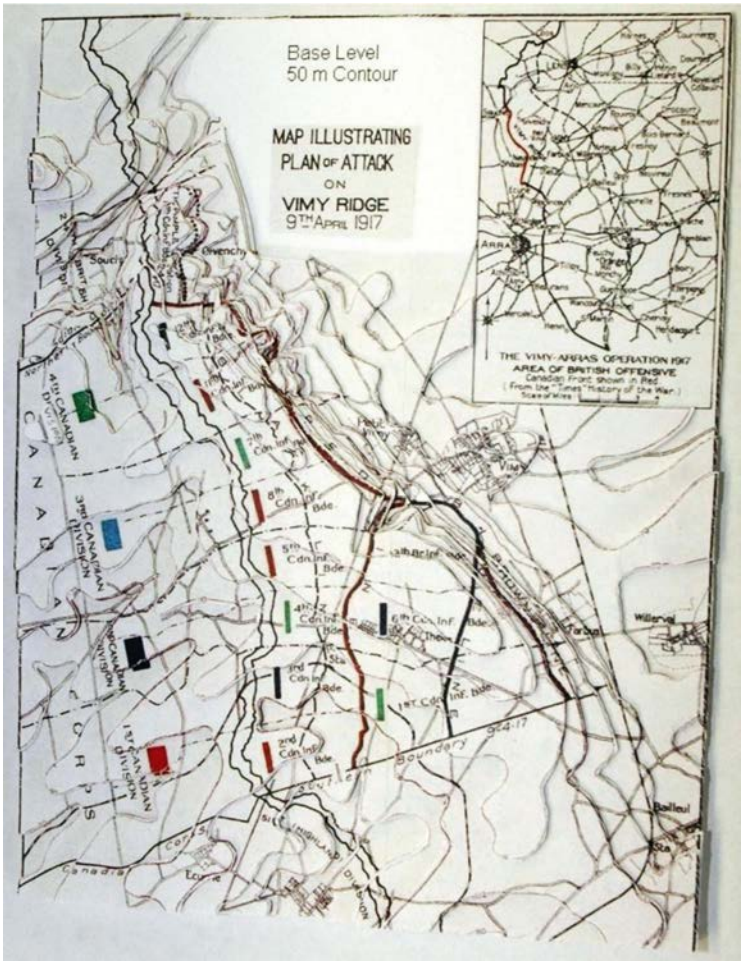
Note. Created by Director Cadets 3, 2010, Ottawa, ON: Department of Defence.

Figure A-7 Gluing the Level 2 Pieces to the Level 1 Piece

7. Repeat Steps 5 and 6 for Levels 3–9.

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The completed relief map should resemble Figures A-8 to A-12.



Note. Created by Director Cadets 3, 2010, Ottawa, ON: Department of Defence.

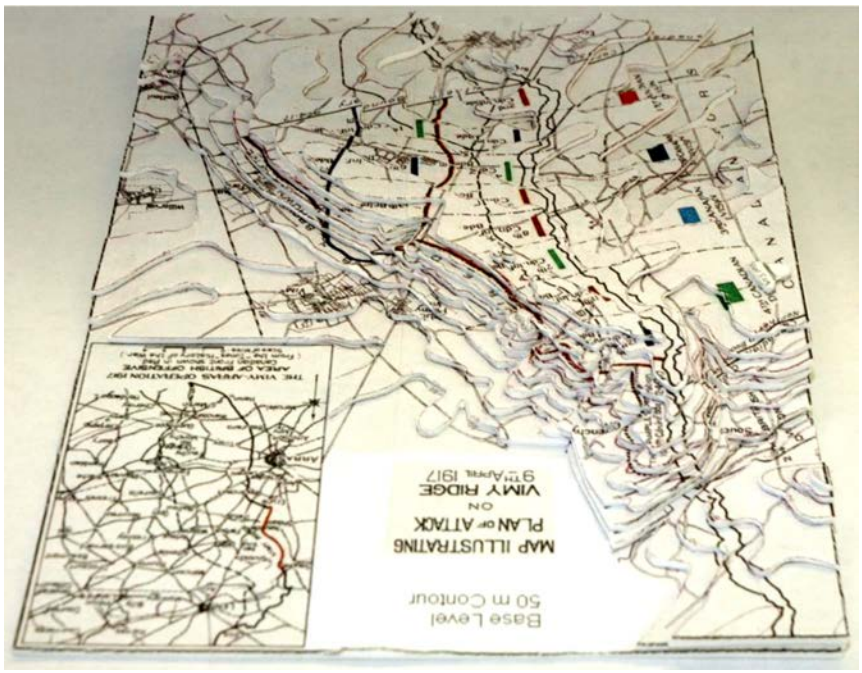
Figure A-8 Finished Relief Map as Seen From Above

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Note. Created by Director Cadets 3, 2010, Ottawa, ON: Department of Defence.

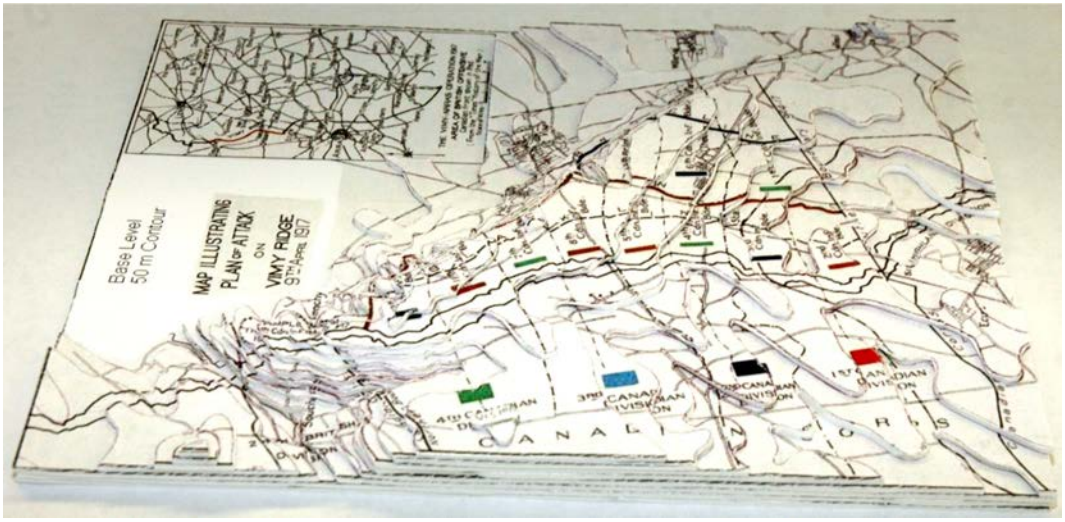
Figure A-9 Finished Relief Map as Seen From the East (Right Side)



Note. Created by Director Cadets 3, 2010, Ottawa, ON: Department of Defence.

Figure A-10 Finished Relief Map as Seen From the North (Top)

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Note. Created by Director Cadets 3, 2010, Ottawa, ON: Department of Defence.

Figure A-11 Finished Relief Map as Seen From the West (Left Side)



Note. Created by Director Cadets 3, 2010, Ottawa, ON: Department of Defence.

Figure A-12 Finished Relief Map as Seen From the South (Bottom)

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SECTION 3
TOPOGRAPHY AND THE BATTLE OF VIMY RIDGE

THE BACKGROUND OF THE BATTLE

By the spring of 1917, the Allies were desperate to break through the deeply entrenched German line which zigzagged over 800 km from the North Sea to the Swiss border. Planning began for a new offensive in the Arras (a city to the south of Vimy Ridge) Sector of the western front. Here, the Canadian Corps spent the winter of 1916–1917 below Vimy Ridge, the only significant height of land in northeastern France. Since October 1914, the Germans had transformed the ridge into an impregnable fortress which guarded the valuable Lens coal mines located in the plain to the northeast of the ridge. In 1915, the French suffered an estimated 150 000 casualties attempting to retake the ridge.



Did you know?

The term **casualties** means the number of injured / killed. Normally, most casualties in a battle are injured, not killed.

During the Battle of the Somme on July 1, 1916, at Beaumont Hamel, the Royal Newfoundland Regiment suffered a casualty rate of approximately 90%. Of the 801 members who answered roll call before the battle, only 68 were available for roll call the next day.

The Canadian role in the new Allied action was to secure the ridge and protect the flank of the British 3rd Army which was simultaneously attacking to the south of Vimy. The combined Canadian and British assaults were to provide a diversion for what would prove to be an unsuccessful French drive against the German line some 90 km farther south in the Reims-Soisson area.

The 8-km ridge rose before the Canadian line like the spine of a great beast. Its western shoulder leaned toward the Canadians, gently sloping upward (to a maximum of 145 m) through three lines of German trenches. The forward defences were pockmarked with deep dugouts and a treacherous network of concrete machine-gun emplacements and barbed wire. The ridge's eastern shoulder dropped precipitously into a tangle of forests with hidden German machine gun nests and mortars.

Moving south to north, three crests pushed through the "spine" of Vimy Ridge: Hill 135, named for the number of metres it stood above sea level; Hill 145, the highest and best-defended of the three; and Hill 120, dubbed "The Pimple" at the northernmost tip of the ridge. The unusual presence of buried chalk beds beneath the Ridge created extraordinary tunnelling opportunities for engineering and pioneer units.



***Activate Your Brain #1*:**

Some references state that the "The Pimple" was the highest point on the ridge. Is this correct? What was the height of "The Pimple"?

The Plan: A Four Division Attack

Behind a forward-moving curtain of blistering artillery fire from 850 guns, the Canadian Corps was to fight their way through two main enemy lines (the first, west of the ridge; the second, east) in just under eight hours. Twenty-four hours later, 4th Division's 10th Brigade would storm and secure "The Pimple."

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Because the German front line angled southwest from the ridge itself, the northern 3rd and 4th Divisions prepared to fight upward across the 700-m thin edge of the enemy "wedge" to take Hill 145. The southern 1st and 2nd Divisions would be forced to travel nearly six times the distance (4 000 m), albeit over more level ground for the southernmost 1st Division-to the heavily fortified town of Farbus, well east of the ridge.

The Four Keys to Victory: Artillery, Tunnels, Timetables and Intelligence

The first key to success lay in crippling German forward defences with artillery and mortar fire; the second, finding a way to bring Canadian troops unharmed to the forward lines. In what has been described as one of the great engineering feats of the war, tunnelling companies excavated or extended 11 main subways (7.6 m below the surface) to protect men from enemy counter-bombardment as they made their way to the front.

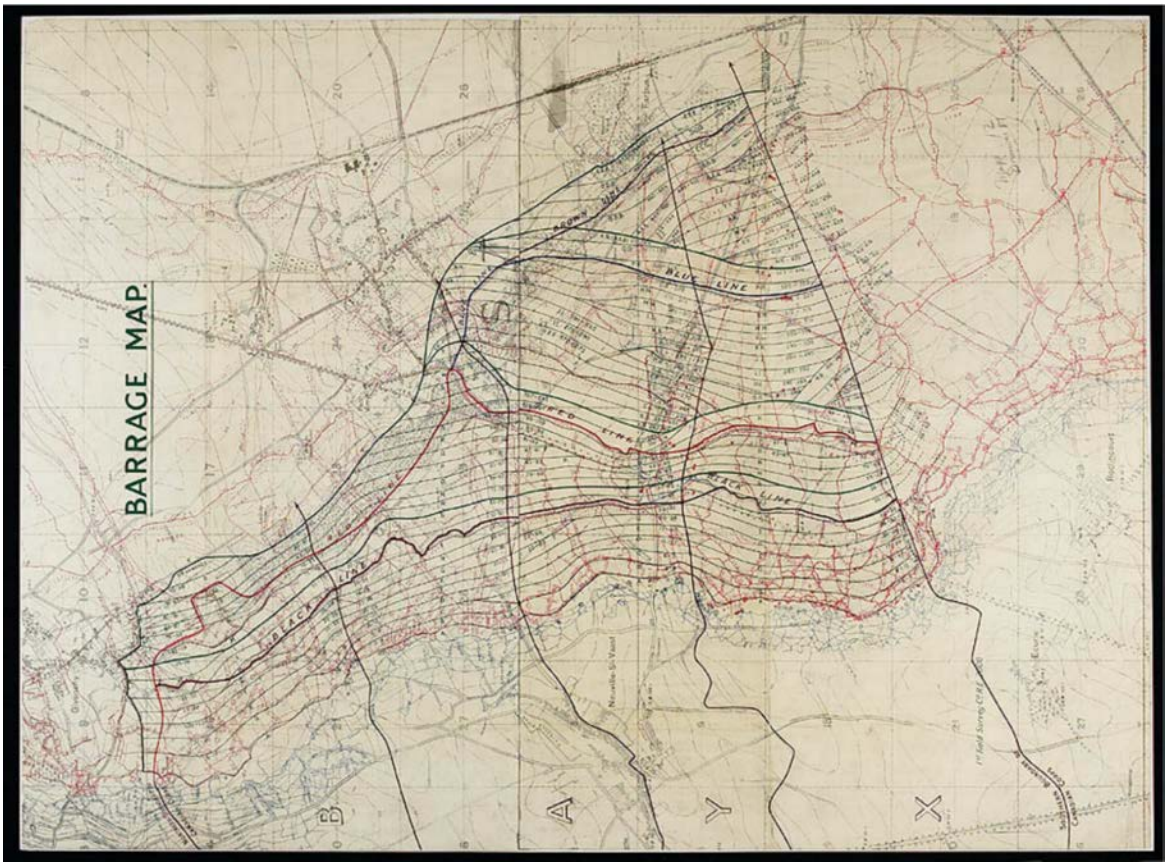


Did you know?

The Canadians reduced the German's high ground advantage through the extensive use of tunnels and underground chambers. The Germans could neither see much of the Canadian's preparations nor engage them with artillery and machine gun fire before the battle.

Men exiting these tunnels were required to follow dangerously close to the moving wall of artillery fire. This was so that at the moment the artillery curtain lifted and the guns began to roll forward, troops were in position to overpower German soldiers who emerged fighting from dugouts. The third key was exceptional co-operation between the infantry and artillery. A strict timetable, specifically addressing position and speed of attack, needed to be rehearsed and learned by every soldier. The Canadian Corps pioneered the distribution of maps to platoon sections. Battalions were rotated to the rear to practice on a full-scale battle course.

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Note. From "Library and Archives Canada", 2008, Vimy Ridge. Retrieved January 29, 2010 from http://www.collectionscanada.gc.ca/premiereguerre/025005-1300-e.html

Figure A-13 Barrage Map for the Battle of Vimy Ridge

The final key was intelligence. Trench raids were mounted into "No Man's Land" to gain critical intelligence about enemy defences. Aerial photographs from observer balloons and No.16 Flying Squadron assisted the Canadian Corps Counter-Battery officer and the men under his command to destroy 83 percent of German guns prior to the attack.

Did you know?

Lieutenant Colonel McNaughton invented a method to locate German artillery positions hidden by the ridge by having posts along the front record the time and direction of flashes / sounds of the artillery as they fired. By tabulating all this information, most of the German guns were located.

***Activate Your Brain #2*:**

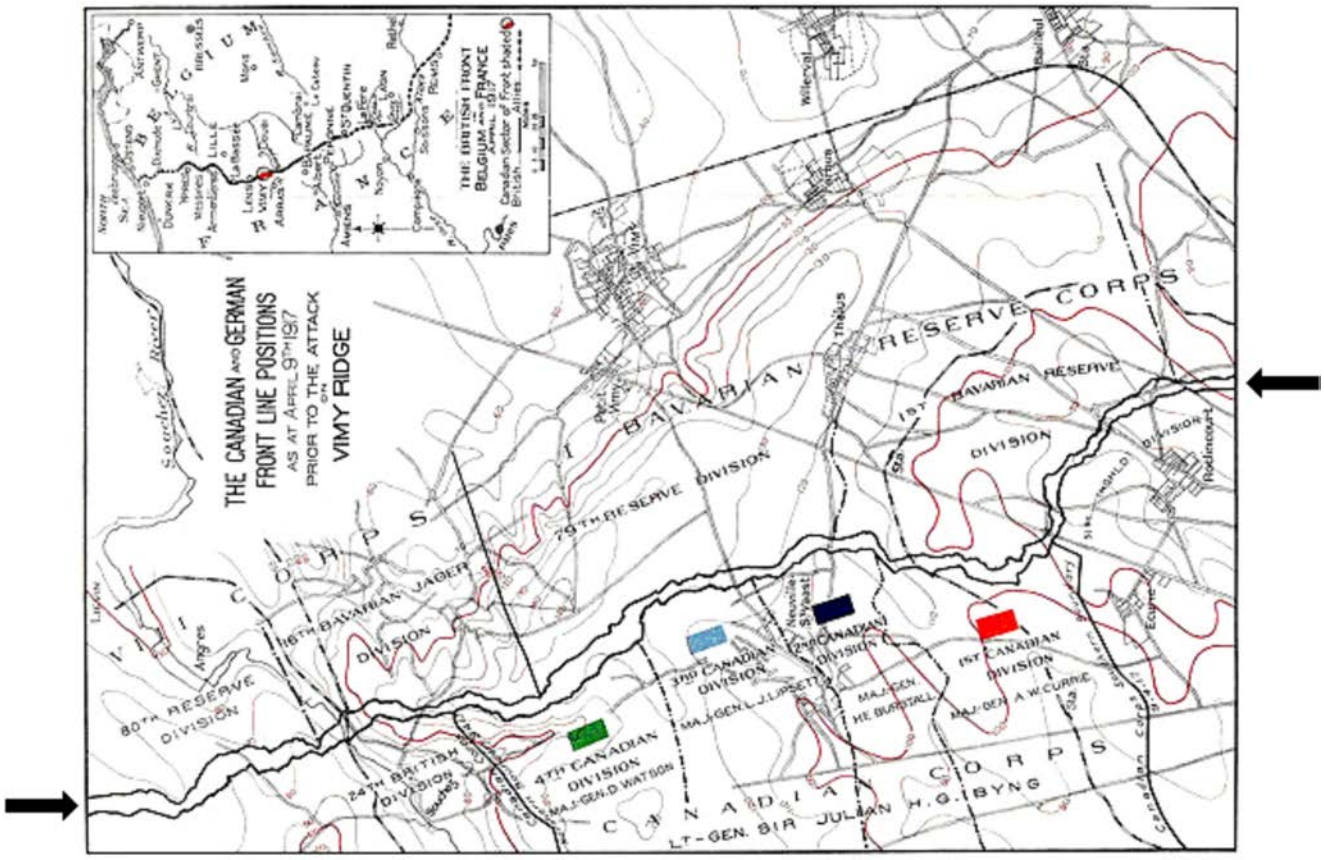
What were the four keys to victory at Vimy Ridge?

_____ _____

_____ _____

_____ _____

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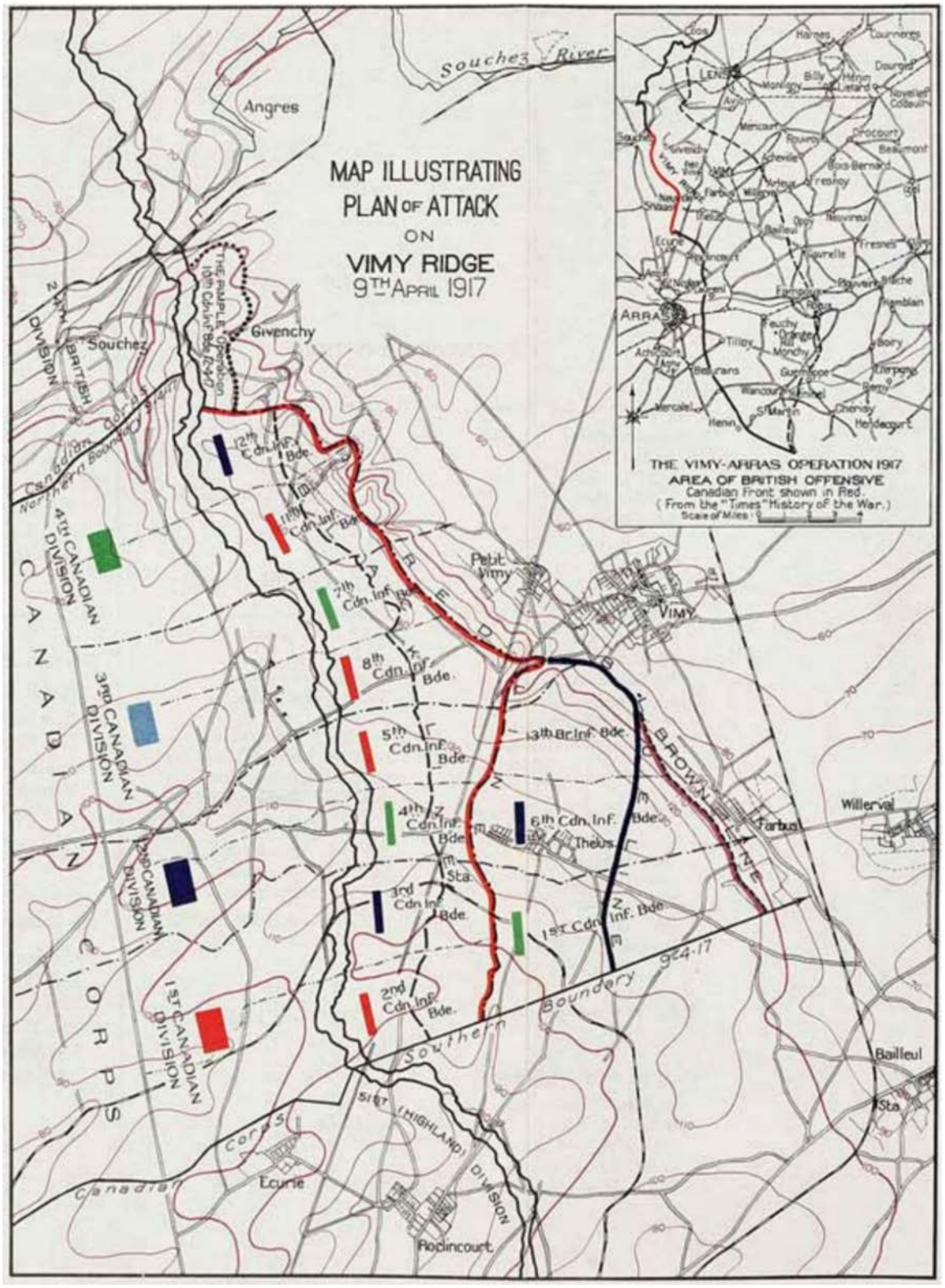
Note. From "Wikimedia", 2010, Defender and Attackers Vimy Ridge. Retrieved January 29, 2010, from http://en.wikipedia.org/wiki/File:Defender_and_Attackers_-_Vimy_Ridge.jpg

Figure A-14 Canadian and German Positions Before the Battle



As illustrated in Figure A-14, the front line trenches are the two black lines (as identified by the arrows on the left- and right-sides of the map) between the Canadian (at the bottom of the map) and German units (above the Canadians on the map). The German forces facing the Canadian Corps consisted of the 1st Bavarian Reserve Division and the 79th Reserve Division of the I (1st) Bavarian Reserve Corps and the 16th Bavarian Jager Division of the VIII (8th) Corps.

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Note. From "Wikimedia", 2010, Plan of Attack Vimy Ridge. Retrieved January 20, 2010, from http://upload.wikipedia.org./wikipedia/commoms/d/d3/Plan _of_Attack_Vimy_Ridge.jpg

Figure A-15 Map Illustrating Plan of Attack on Vimy Ridge

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The Attack

By 4:00 am on Easter Monday, April 9, 1917, all units were in position for the attack to begin at precisely 5:30 am. The attack began amidst a driving northwest storm which favoured the Canadians by sending sleet into the eyes of the German defenders.

Success: 1st Division (Major-General Currie), 2nd Division (Major-General Burstall) and 3rd Division (Major-General Lipsett)

By 6:15 am, the 1st and 2nd Divisions had battled their way to the Black Line, through well-sighted machine gun fire and oftentimes fierce hand-to-hand combat. The 3rd Division's 7th and 8th Brigades reported capture of the Black Line at 6:25 am. During the planned consolidation pause, while the artillery continued lobbing shells and mortars at key enemy gun emplacements, the original rear companies of 1st and 2nd Divisions' forward battalions spearheaded the drive to the Red Line by 8:00 am. An hour later, the 3rd Division, after a bloody struggle, gained its second and final objective, the Red Line. By 2:40 pm, the 1st and 2nd Brigades (in reserve) leapfrogged through the new Canadian line and the capture of the Brown Line was assured. The 1st, 2nd and 3rd Divisions had taken their objectives on schedule.

Setback: 4th Division (Major-General Watson); Hill 145 and Success; "The Pimple"

The 11th and 12th Brigades of the 4th Canadian Division failed to take their objective, Hill 145. The 38th, 72nd, 73rd and 78th Battalions of the 12th Brigade took heavy losses trying to hold their positions, in the face of the 11th Brigade's inability to push forward. While the initial attack of 11th Brigade's 102nd Battalion was successful, the supporting 54th Battalion was forced to retreat. The 11th Brigade's southern battalions collapsed. A section of enemy trench had not been destroyed by Canadian Corps' artillery, and thus blistering fire rained down upon 87th Battalion. Its assaulting company was wiped out in six minutes with 60 percent killed in action. In support, the 75th Battalion retreated.

Even with the combined efforts of the 11th Brigade's 75th, 85th and 87th Battalions and the 10th Brigade's 46th and 47th Battalions, Hill 145 had not been taken by the end of April 9. Before dark, two companies of the 85th Battalion managed to secure the western summit, but the hill's eastern slope remained in German hands. The next afternoon, the 10th Brigade's 44th and 50th Battalions wrested Hill 145 from the Germans. On Thursday, April 12, amidst a driving snowstorm, the 10th Brigade's 44th, 46th and 50th Battalions (two companies), with the 47th Battalion in reserve, captured "The Pimple." The Battle of Vimy Ridge was over. Canadian casualties amounted to 10 602, of which 3 598 were fatal.

USING TOPOGRAPHY TO ANALYZE THE BATTLE OF VIMY RIDGE

Compare the maps located at Figures A-14, A-15 and your new relief map. As many features that could guide the assaulting troops were destroyed by years of shelling, leaving a grey landscape of mud and shell holes, the planners of the battle used prominent topographical features as guideposts to direct the troops toward their objectives.

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***Activate Your Brain #3*:**

Analyzing your maps, what topographical features could each brigade use as its guideposts?

Note: Units are listed from south to north.

1st Division:
2nd Brigade:

3rd Brigade:

1st Brigade:

2nd Division:
4th Brigade:

5th Brigade:

6th Brigade:

13th (British) Brigade:

3rd Division:
8th Brigade:

7th Brigade:

4th Division:
11th Brigade:

12th Brigade:

10th Brigade:

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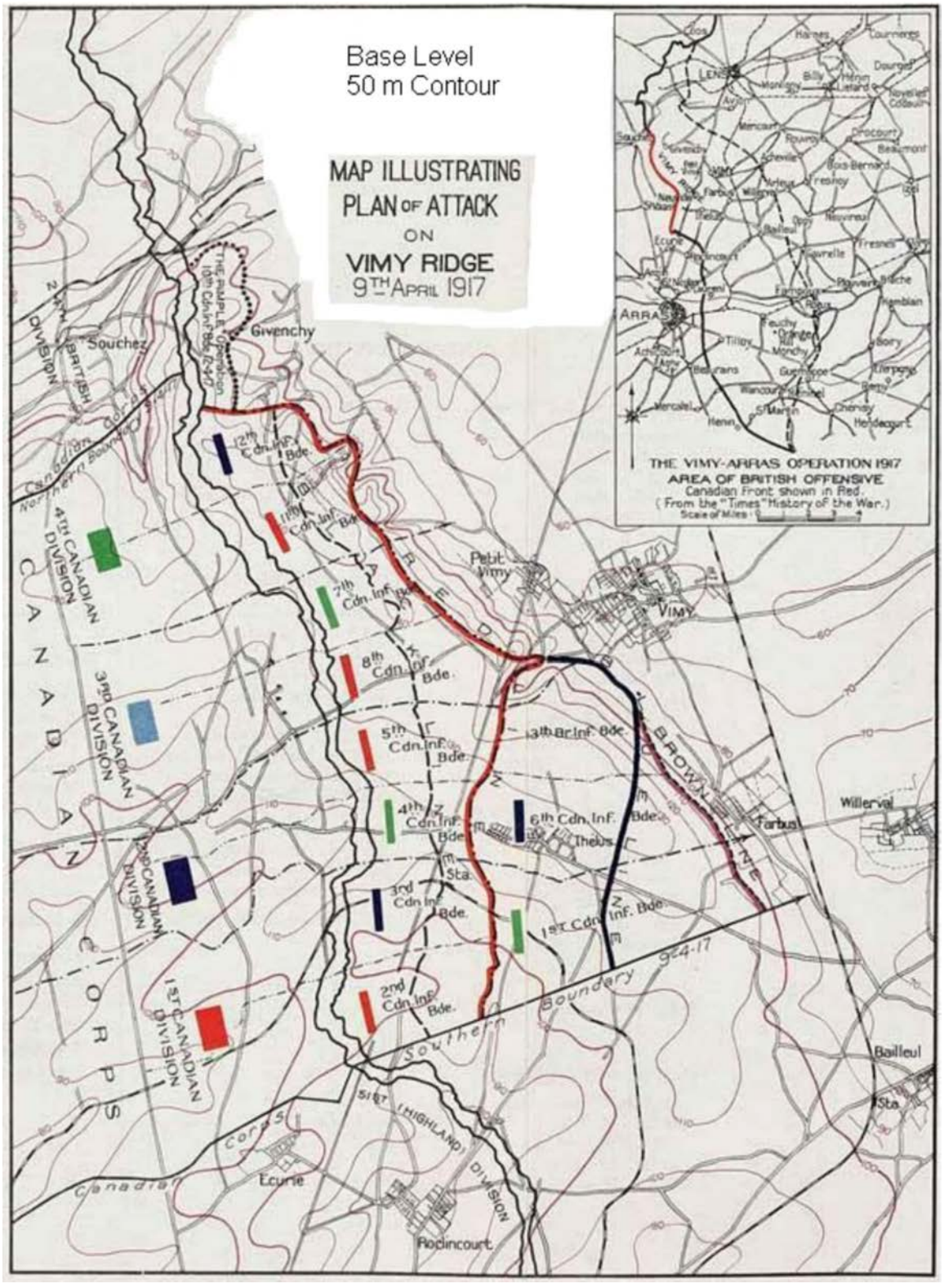
***Activate Your Brain #4*:**

One German tactic against attack was to counterattack; attacking the attacker before they could reinforce their position. However, what topographical feature made this a poor option if the Canadians took the ridge?

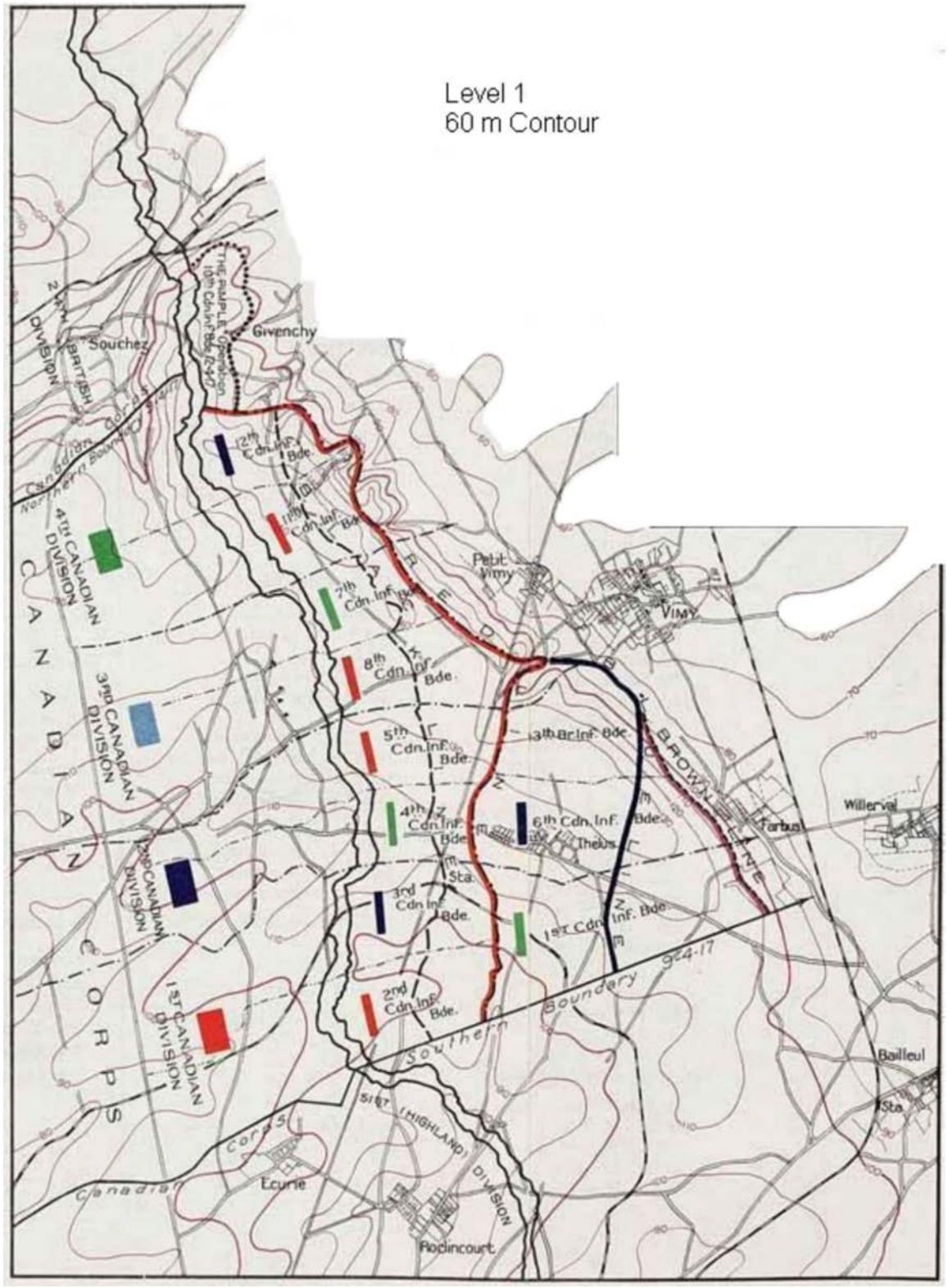


Congratulations, you have completed your self study package on EO C522.01 (Analyze Map Topography). Hand the completed package to the Training Officer / Course Officer who will record your completion in your Master Cadet logbook.

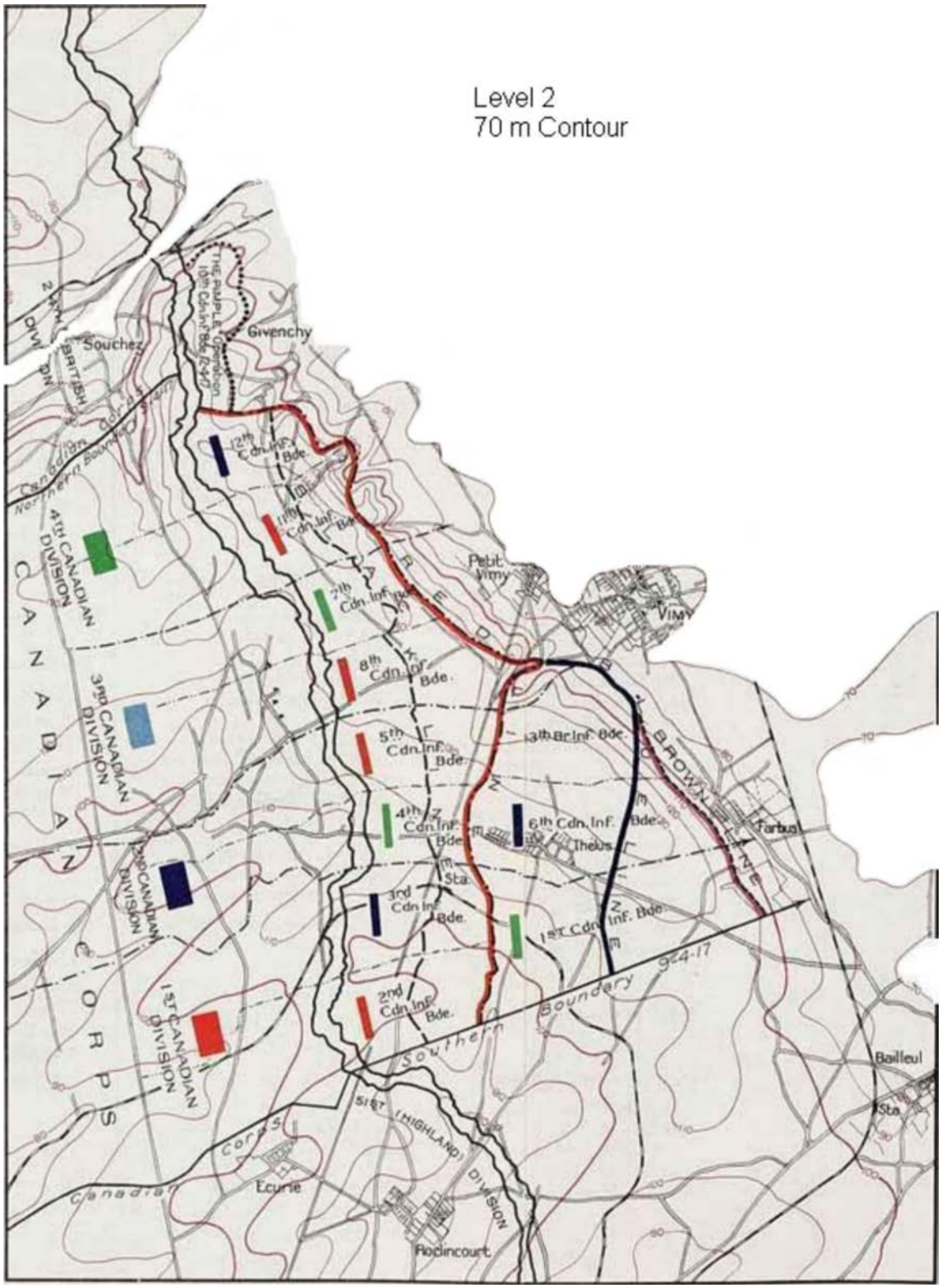
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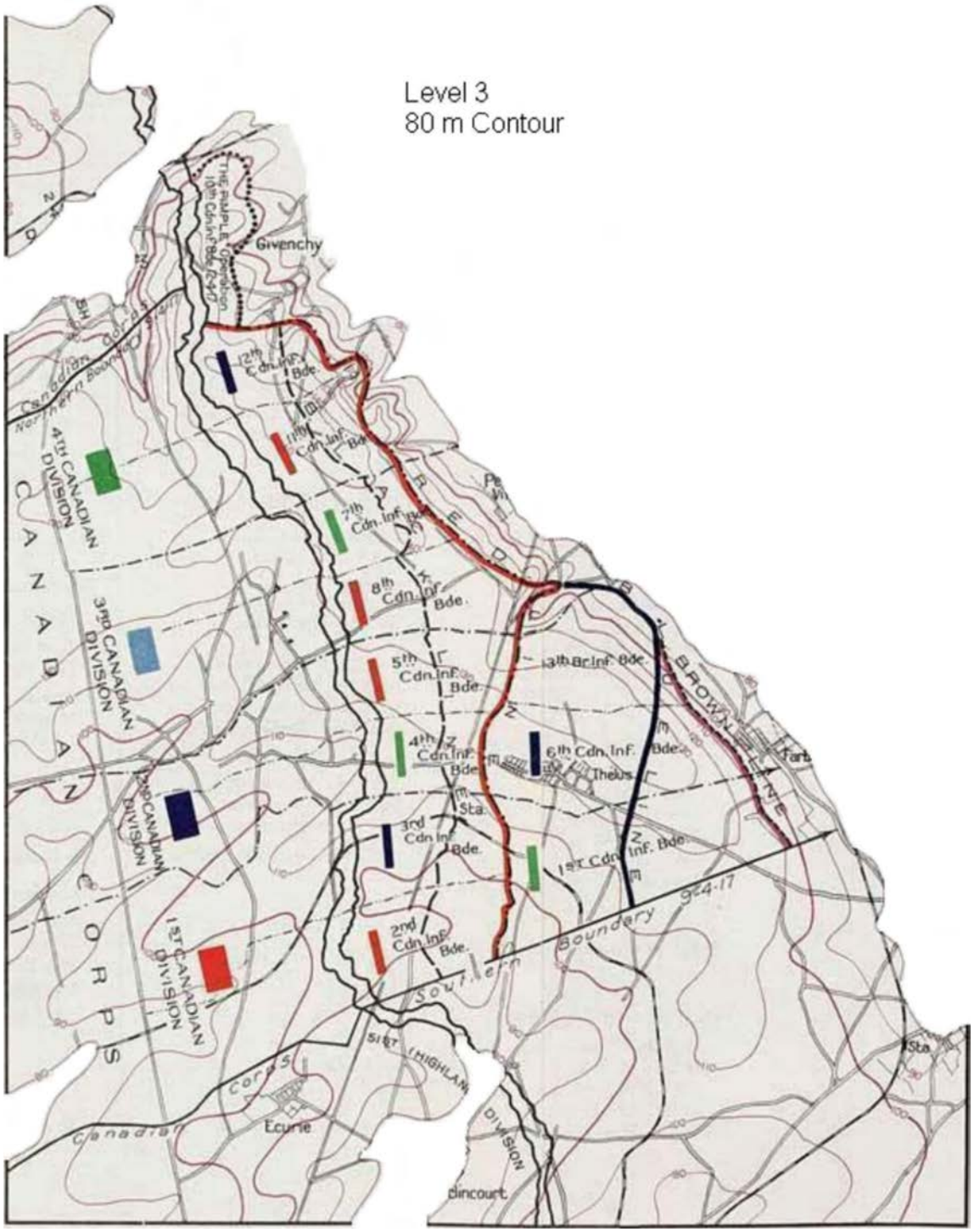
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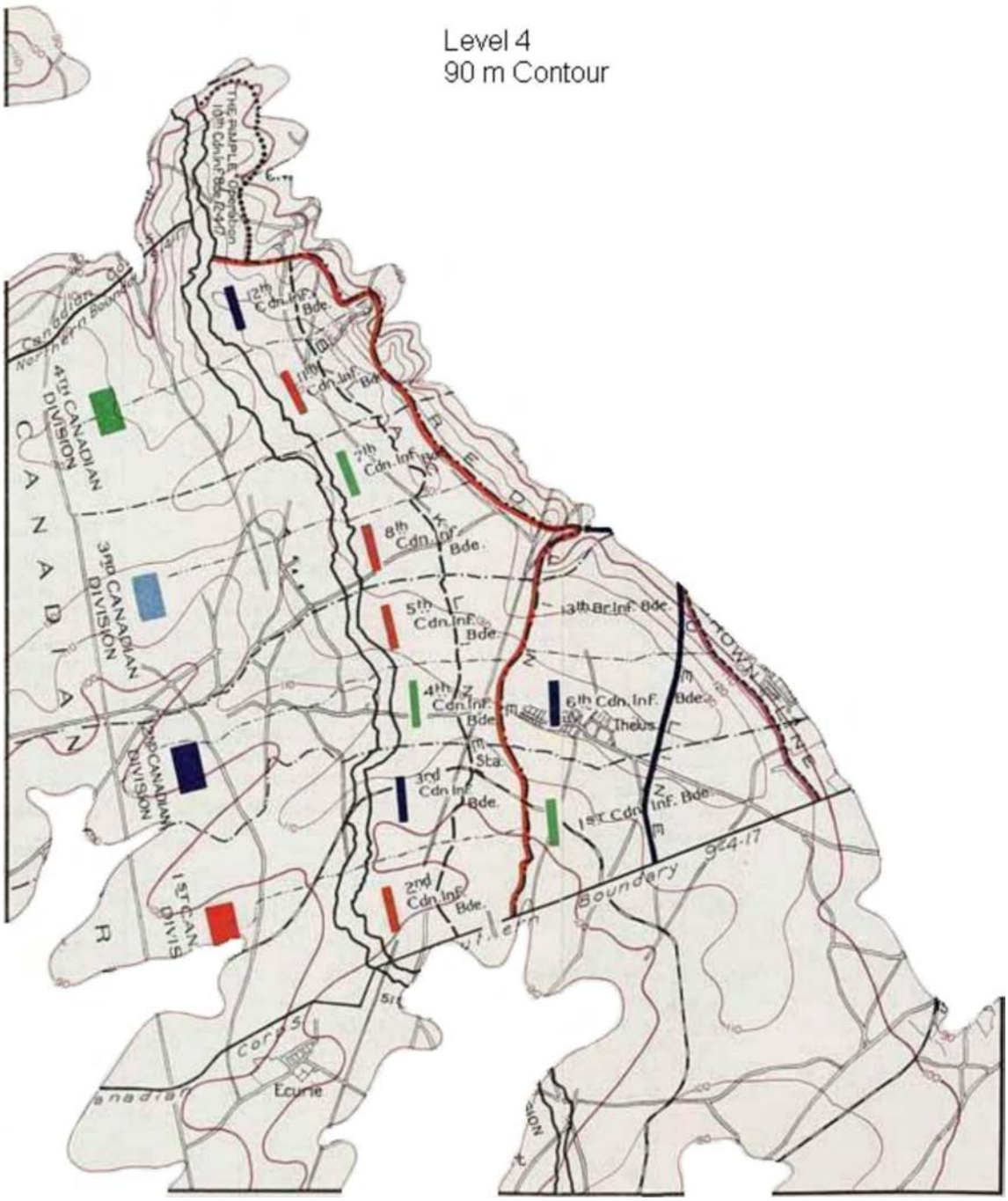
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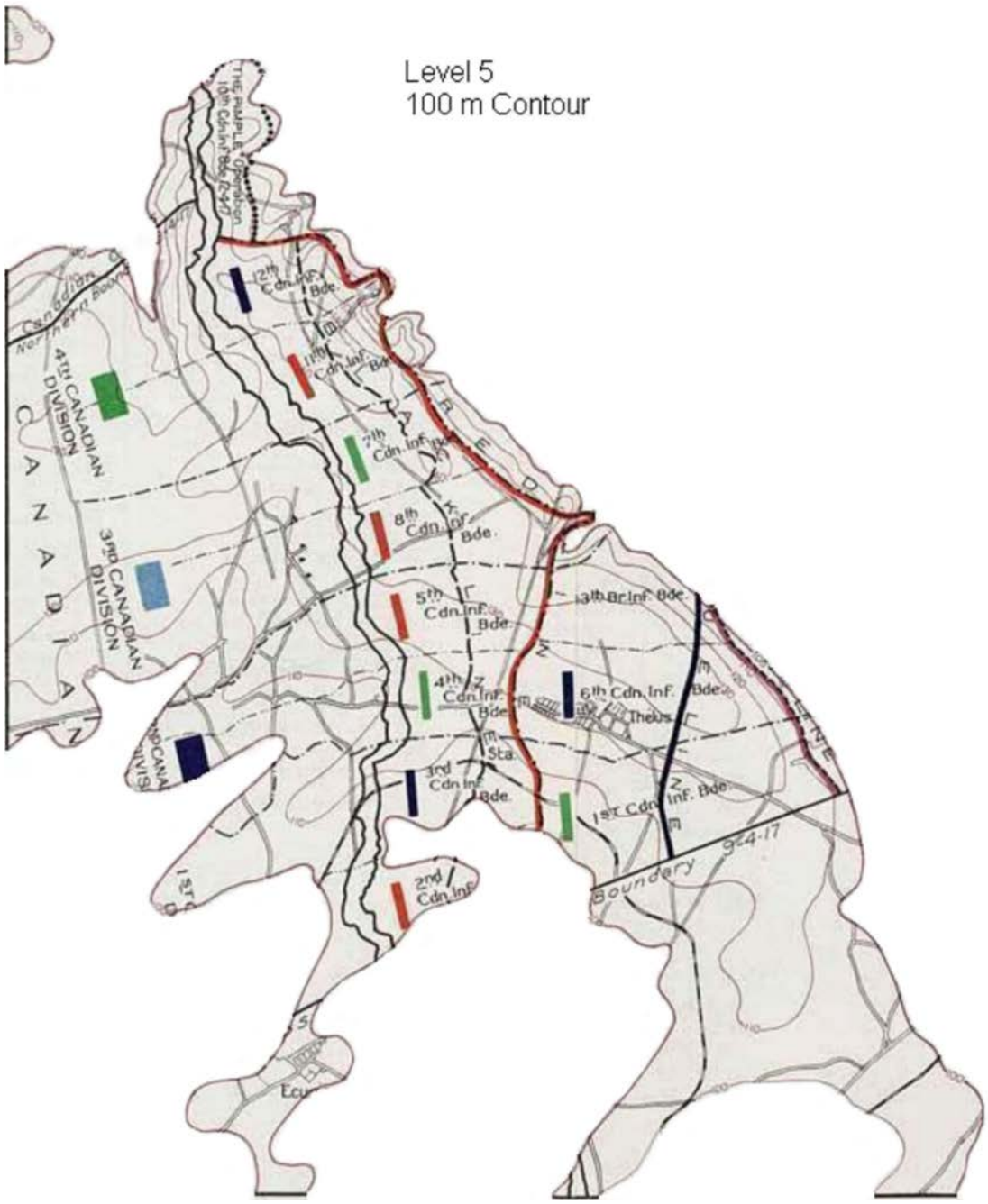
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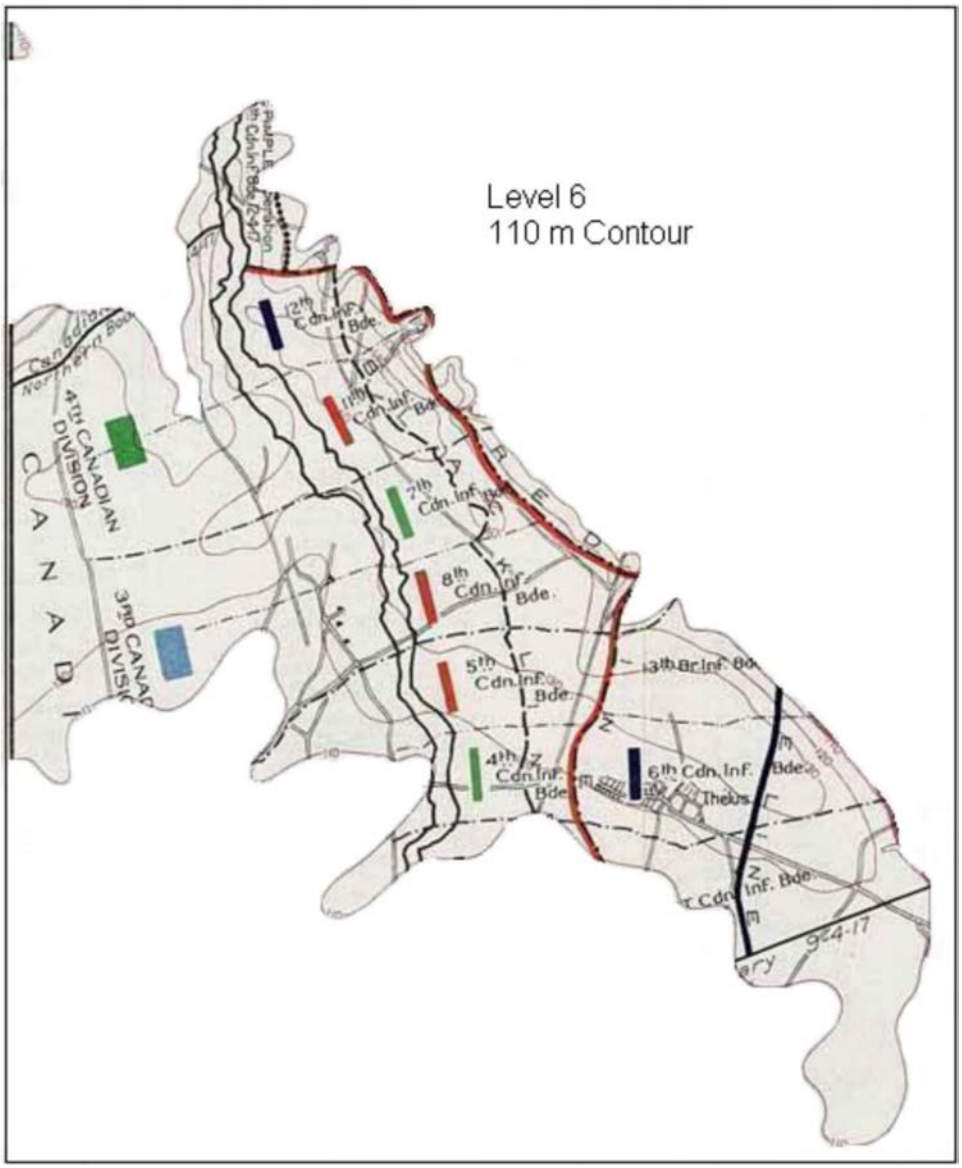
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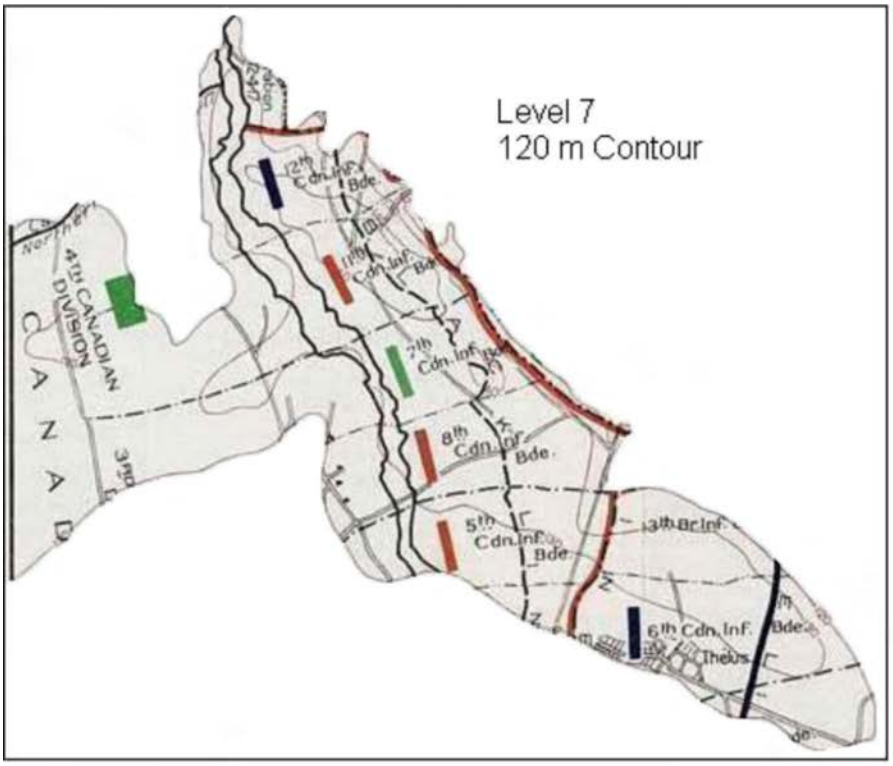
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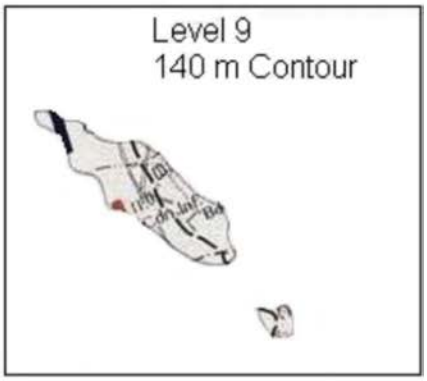


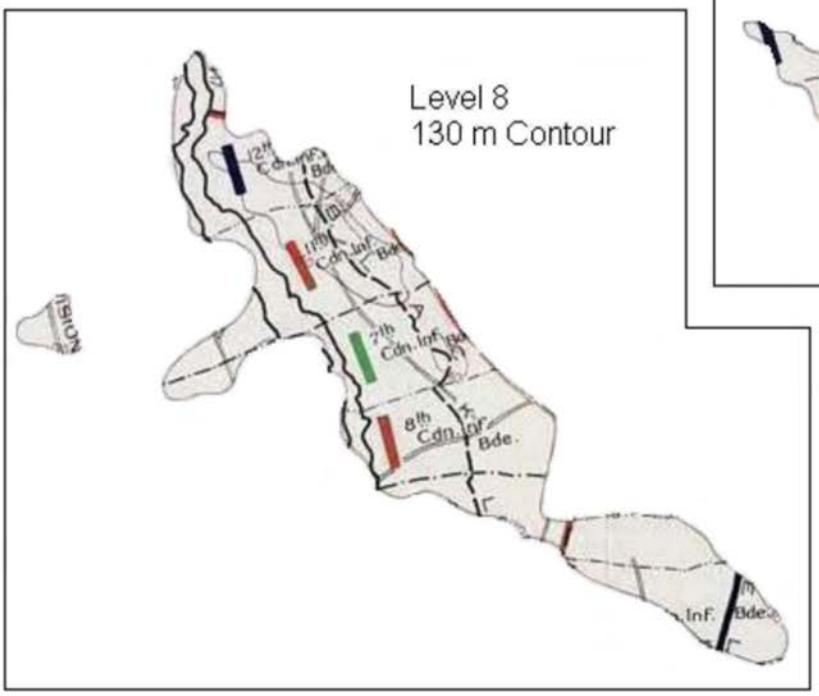
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ACTIVATE YOUR BRAIN ANSWER KEY



***Activate Your Brain #1*:**

Some references state that the "The Pimple" was the highest point on Vimy Ridge. Is this correct? What was the height of "The Pimple"?

No, Hill 145 is the highest point on Vimy Ridge and is where the Canadian memorial now stands. "The Pimple" was Hill 120; therefore its height was 120 m.



***Activate Your Brain #2*:**

What were the four keys to victory at Vimy Ridge?

Artillery	**Tunnels**
Timetables	**Intelligence**

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***Activate Your Brain #3*:**

Analyzing your maps, what topographical features could each brigade use as its guideposts?

Note: Units are listed from south to north.

1st Division:

2nd Brigade: **Follow small spur to their front to the bottom of the dip to their front.**

3rd Brigade: **Follow along the slope always keeping the convex slope at the south end of the ridge to their front and Hill 135 to their front left.**

1st Brigade: **Towards the convex slope to their front keeping Thélus, Hill 135, and the town of Farbus to their left.**

2nd Division:

4th Brigade: **To the town of Thélus.**

5th Brigade: **To the ridge to their front then stay to the right of the re-entrant.**

6th Brigade: **From the town of Thélus to Hill 135 and then to the town of Farbus.**

13th (British) Brigade: **From the small re-entrant to their left over crest of the ridge.**

3rd Division:

8th Brigade: **To the small re-entrant on just beyond the crest of the ridge.**

7th Brigade: **The dip to their front on the right of Hill 145 to just beyond the crest of the ridge.**

4th Division:

11th Brigade: **Hill 145 to just beyond the crest of the ridge.**

12th Brigade: **The height to their front to the left of Hill 145 to just beyond the crest of the ridge.**

10th Brigade: **"The Pimple" on the spur at the north end of the ridge.**



***Activate Your Brain #4*:**

One German tactic against attack was to counterattack; attacking the attacker before they could reinforce their position. However, what topographical feature made this a poor option if the Canadians took the ridge?

The German side of the ridge was the steep side making a counterattack back up the steep slope a poor option if the ridge is defended.

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