

Frozen Paradise



An Application of Geographic Skills and
Concepts

Level 1

Teacher information

It is the intention that this resource aids in the teaching and learning of geographic concepts in New Zealand secondary schools. It is hoped that by widening student's conceptual understanding of the Antarctic environment, they will then be able to apply the same understandings to environments they are familiar with, or may encounter in NCEA assessment. Further information on Geography concept definitions can be found in the Geography Teaching and Learning Guidelines: <http://seniorsecondary.tki.org.nz/Social-sciences/Geography>

It is also intended that students carry out key geographic skills that will enable them to interpret the Antarctic environment. These skills have been chosen with achievement standard 91004 in mind and are also derived from the Geography Teaching and Learning Guidelines.

The environment of Antarctica will be explored using three settings, each of a different scale. These settings are:

1. The Antarctic continent
2. The Ross Dependency
3. Ross Island

A resource booklet is also supplied that contains information (maps, photographs, tables etc) needed to complete the tasks in the question booklets. Links have also been given to YouTube clips that are intended to give students a first-hand experience of the Antarctic environment. Access to these clips would be beneficial as this resource has been developed with the digital classroom in mind.

It is suggested that students are supplied with hard copies of the question booklet and have digital access to the resource booklet.

A "skills checklist" is included at the back of the resource which may be helpful in identifying areas that need further development.

Suggested uses for the resource include:

- as introductory exercises near the start of the year
- as relief lessons
- homework exercises
- because of time pressures in the classroom and the amount of content in this resource, teachers could also select sections (certain skills or concepts) to use throughout the year as they see fit.

Note: This resource has been trialled in classrooms and is purely intended to aid in the teaching and learning of Geography skills and concepts. It has not been moderated in any official NZQA/NCEA capacity.

Acknowledgements

I would like to sincerely acknowledge the following organisations for their help and commitment to providing outreach from what is such a stunning landscape:



Manaaki Whenua
Landcare Research



meridian

Student Information

There are three main objectives in this booklet:

1. To broaden your knowledge of some of the geographic concepts that you will encounter in your NCEA Geography class.
2. To get better at applying the geographic skills associated with this subject. A number of these skills will more than likely be in your NCEA geography skills and concepts external examination for Achievement Standard 91004
3. To become more aware of Antarctica and the issues that it currently faces. Antarctica is a truly unique and beautiful place that has immense geographic and biological significance. It is hoped that you will gain knowledge of the continent, and even be inspired to travel there in the future. Scientists, geologists, biologists, zoologists etc go to Antarctica every year to carry out research. Why can't you be one of them one day?

The Antarctic environment is going to be explored using three settings:

- The Antarctic continent
- The Ross Dependency
- Ross Island

When completing the activities make sure you understand all key words in the questions. These include instruction words like "describe", "explain" and "in detail" and subject specific words such as "distance", "latitude" and "hemisphere". These words are very important when it comes to your assessments throughout the year. Check with your teacher if you need clarification.

At the back of this booklet is a glossary. If you do not have one in your own books, feel free to use it to record and define key words you feel are important.

Use Resource 2 from the resource Booklet to answer question 4.

Location is a concept that geographers need to consider when interpreting an environment

4. Describe, in detail, the location of Antarctica. (consider size, latitude, its position in relation to other features).

Use Resource 4 from the Resource Booklet to answer questions 5 to 9.

5. Give the names of the features found at each of the following coordinates, and for each state whether it is a natural or cultural feature:

Latitude and Longitude	Name of feature	Natural or cultural
78°S 40°E		
80°S 114°E		
67°S 68°W		

6. Give the latitudes (to the nearest degree) of each of the features listed below:

- South Pole lat: _____
- Vinson Massif lat: _____
- Scott Base lat: _____

7. What direction would you travel if you went from Dumont d'Urville to Amundsen/Scott Station?

8. Identify the countries that are responsible for each of the following research stations:

Research Station	Country
Maltri	
McMurdo	
Halley	
Vostok	
Dumont D'Urville	
Syowa	
Casey	
Scott	

9. Approximately how far does the Antarctic Peninsula extend northward from the outer edge of the Ronne Ice Shelf?

Another concept in Geography is **accessibility**. When New Zealanders leave for Antarctica they fly from Christchurch Airport, which is where the Antarctic Centre is located. Click [here](#) to see a flight in a US Air Force C17 Globemaster III from Christchurch to the Sea Ice Runway near Scott Base (the New Zealand base in Antarctica).

Use Resource 3 from the resource Booklet to answer question 10.

10. Explain why Antarctica is only accessible from Christchurch between the months of October and February.

Use Resources 4, 6 and 7 from the resource Booklet to answer questions 11 to 13.

11. What is the **distance** of the flight from Christchurch to Scott Base?

12. What is the name of the mountain range that the aircraft fly over when they first reach Antarctica, when flying from Christchurch to Scott Base? (use BOTH Resource 4 AND 6 for this answer).

13. What is the distance from Christchurch to the South Pole, if flying via Scott Base?

Antarctica is very cold so ice is in abundance. The amount of ice changes throughout the year and this leads to another geographic concept – **patterns**.

Use Resource 8 from the resource Booklet to answer questions 14 and 15.

14. What hemisphere has the highest average altitude, east or west? _____

15. Name the two ice features labelled A and B (Use BOTH Resource 4 AND 8 for this answer)

A: _____

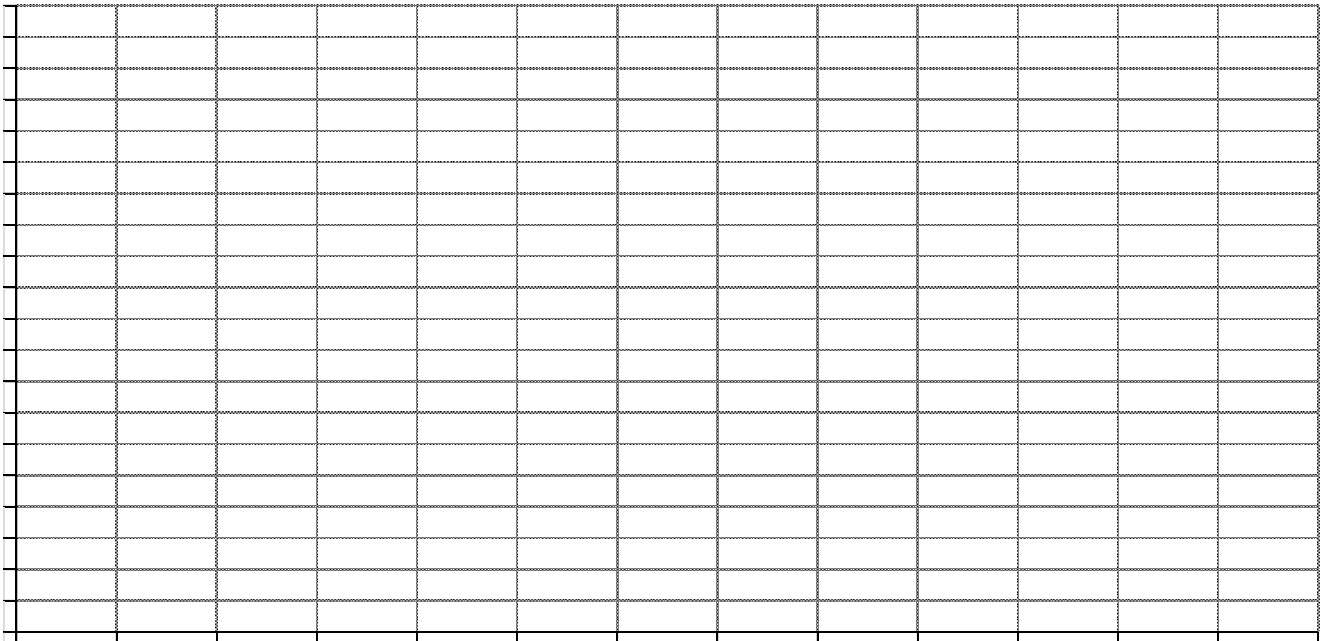
B: _____

Use Resources 9 to 11 from the resource Booklet to answer questions 16 to 23.

16. Draw a line graph on the axes provided below to show the extent of sea ice in **Summer** between 1999/2000 and 2012/2013

HINT: Make sure you include ALL graphing conventions

Title: _____



17. Describe in detail the **temporal pattern** created by summer sea ice between 1999/2000 and 2012/2013 (a temporal pattern is one that occurs over time).

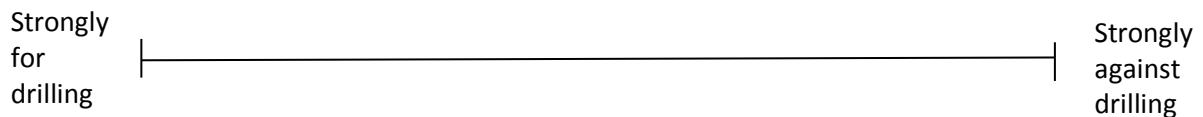
Perspectives is another geographic concept. It involves identifying what people think about something, and understanding why they have those opinions. The issue of Lake Vostok is useful for exploring differing perspectives.

Use Resource 12 from page 8 in the resource Booklet to answer questions 18 to 20

24. Explain, in detail, the **significant characteristics** of Lake Vostok:

25. Place the names of the four people from resource 12 onto the continuum below to show their perspectives on the drilling of the ice sheet to access Lake Vostok.

Viewpoints on Drilling into Lake Vostok



26. Choose **TWO** of the people you located on the continuum, and explain (give reasons) why you located them where you did.

Person 1: _____

Person 2: _____

The Ross Dependency

The Ross dependency is an area of Antarctica that New Zealand has claimed sovereignty over. Our criminal justice system extends to any crime that may be committed there, and any person born in the Ross Dependency would become a New Zealand citizen.

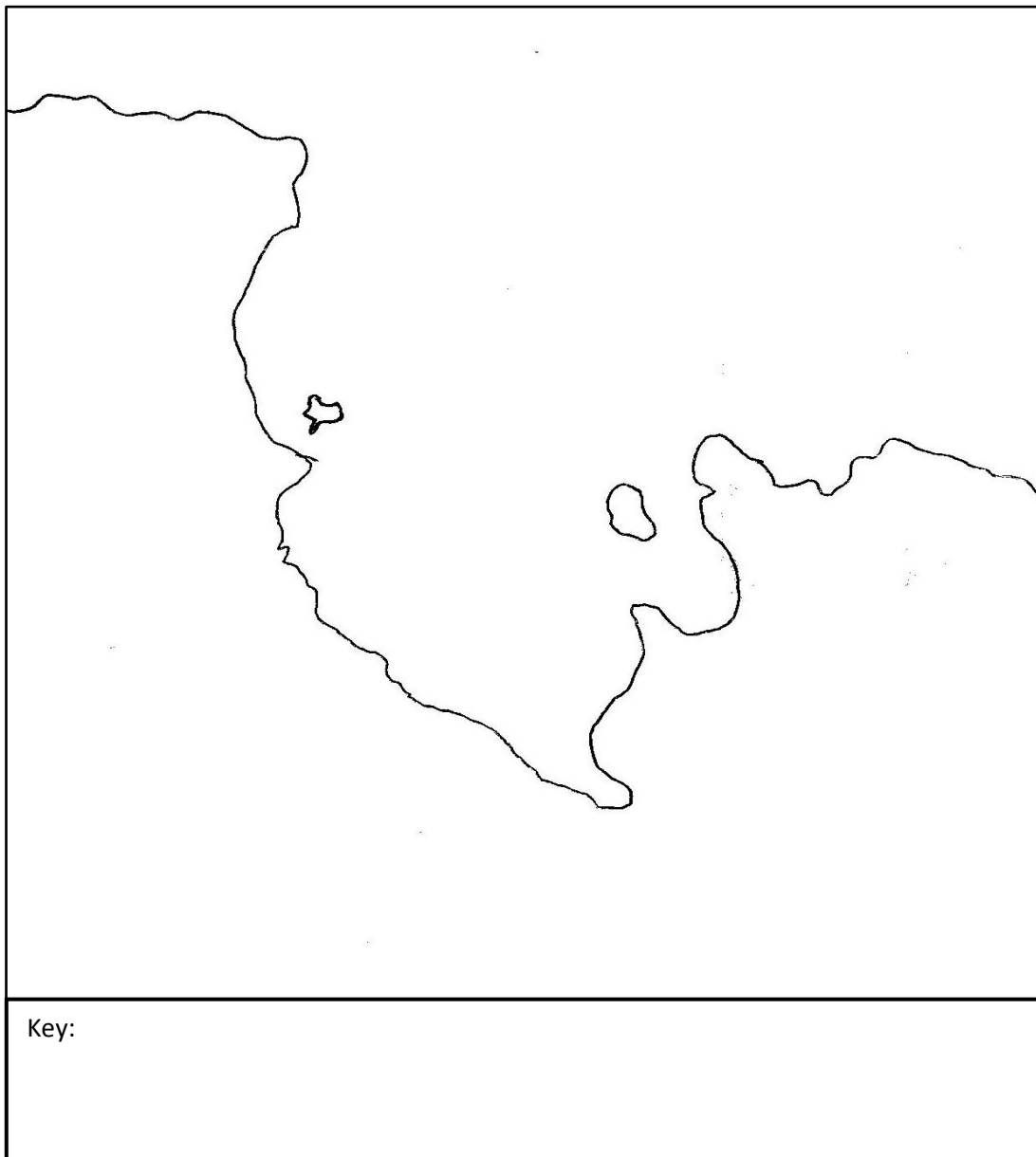
Use Resource 13 from the resource Booklet to answer question 27

27. On the map below locate and label the main features of the Ross Dependency:

HINT: make sure you include ALL mapping conventions

- The Ross Dependency boundary
- The Ross Ice Shelf
- Ross Island
- Roosevelt Island
- The Ross Sea
- The Trans Antarctic Mountains
- The South Pole

Title: _____



Use Resource 14 from the resource Booklet to answer questions 28 to 30

28. What direction was the photographer facing when Photograph 1 was taken?

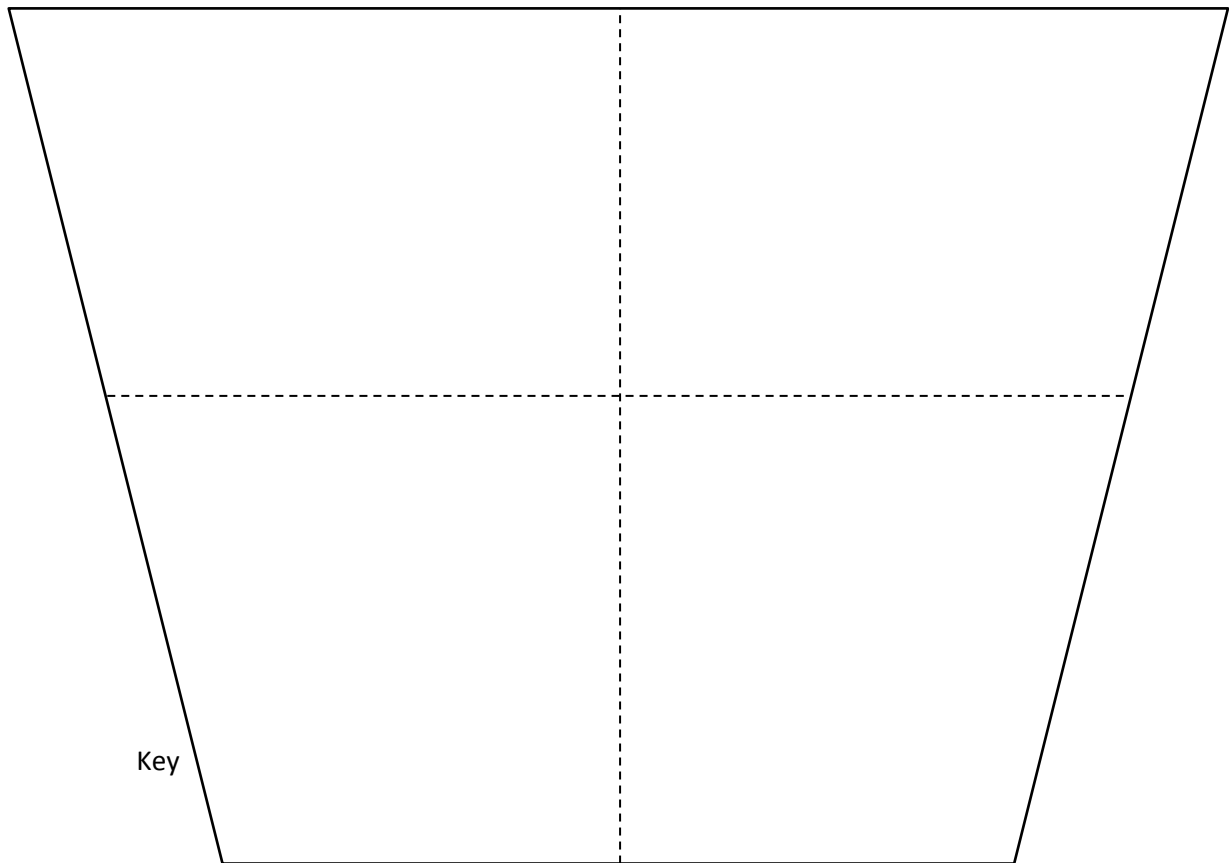
29. What is the distance of the Ferrar Glacier from point X to point Y in Photograph 2?

30. Draw a précis sketch of Photograph 1 to show the following features:

- The snow-capped Trans-Antarctic Mountains
- The McKelvey Valley
- The Wright Valley
- Both parts of the Olympus Range

HINT: make sure you include ALL mapping conventions

Title: _____



Trans Antarctic Mountains		Wright Valley	
McKelvey valley		Olympus Range	

Use Resource 15 from the Resource Booklet to answer questions 31 and 32

31. Show the route that Robert Scott took to reach the South Pole by **constructing a cross section for his journey** on the axes provided below. On the route locate and label:

- a) The place of departure
- b) The Ross Ice Shelf
- c) The name of the glacier he used to travel up to the polar plateau
- d) The Polar Plateau
- e) The South Pole

Make sure that you include all graphing conventions.

Title: _____



32. Using your cross section and Resource 15, explain two of the main problems Scott and his men faced on their journey.

Problem 1: _____

Problem 2: _____

Ross Island

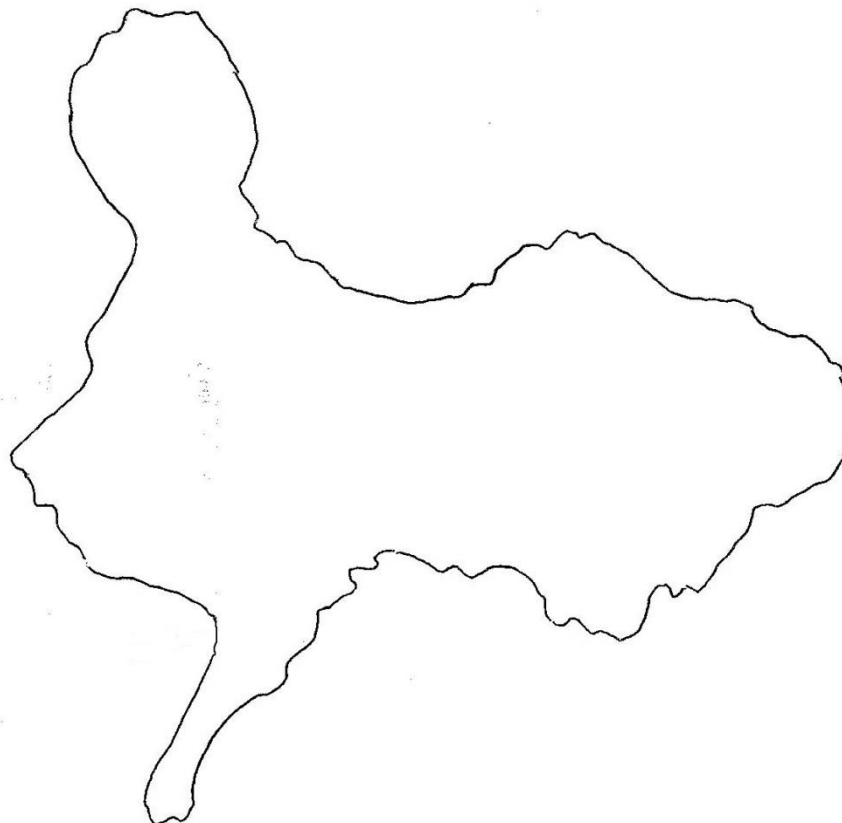
Ross Island is where New Zealand's scientific research station (Scott Base) is located. It is also the site of New Zealand's [worst ever air tragedy](#) – Air New Zealand's Flight 901 that crashed into Mt Erebus in 1979.

Use Resource 16 from the Resource Booklet to answer question 33

33. Locate and label the following features on the précis map of Ross Island below:

- Mt Erebus
- Cape Bird
- Cape Evans
- Cape Crozier
- Scott Base
- McMurdo Station
- Mt Terror

Title: _____



Key

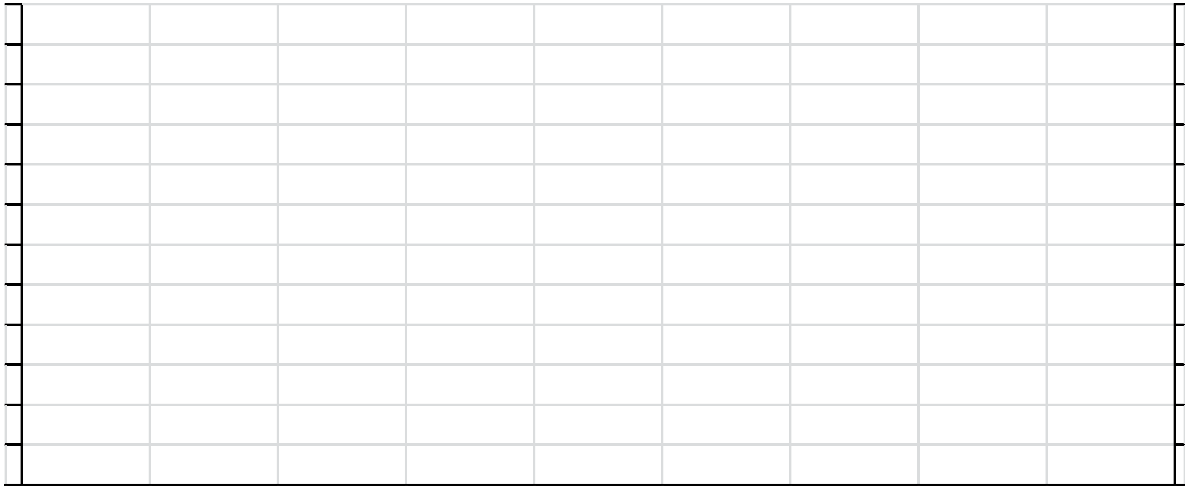
Mt Erebus		Cape Crozier	
Cape Bird		McMurdo Station	
Cape Evans		Mt Terror	
Scott Base			

Use Resource 17 from the Resource Booklet to answer questions 34 to 36

34. What is the distance between Scott Base and the intersection at 865143 in McMurdo Station?

35. On the axes provided below, draw a cross section of the Hut Point Peninsula from point A to point B

Title: _____



36. Fill in the table below by identifying the feature found at each grid reference, and also stating whether it is a natural or cultural feature:

Grid reference	Name of feature	Natural or cultural
890193		
885140		
902182		

Use Resource 20 from the Resource Booklet to answer question 37

37. Explain, in detail, the **relationship** between energy produced by diesel and wind

Interaction is another important concept in Geography. It involves different parts of an environment affecting each other – being linked. This usually involves what are called inter-relationships, or connections. The Ross Sea is an excellent example of how interaction can be applied, especially when looking at the connections between people and the Ross Sea Food Web.

Use Resource 22 from the Resource Booklet to answer questions 38 to 40

38. Name the 6 predators of Krill

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

39. Name the two species of animal that are at the “top” of the Ross Sea Food Web (these are the species that have no predators)

1 _____

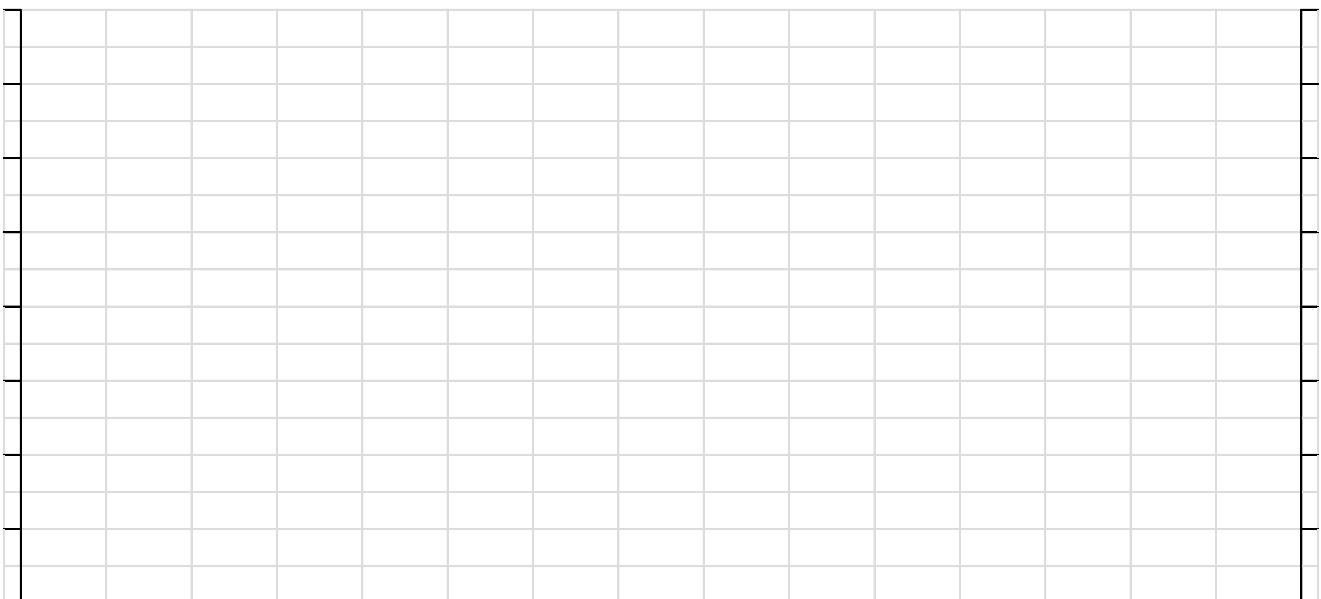
2 _____

40. Name the species that is harvested by fishing vessels _____

Use Resource 23 from the Resource Booklet to answer question 41 and 42

41. Draw a bar graph on the axes below to show the Toothfish harvest in the Ross Sea Area since 1998

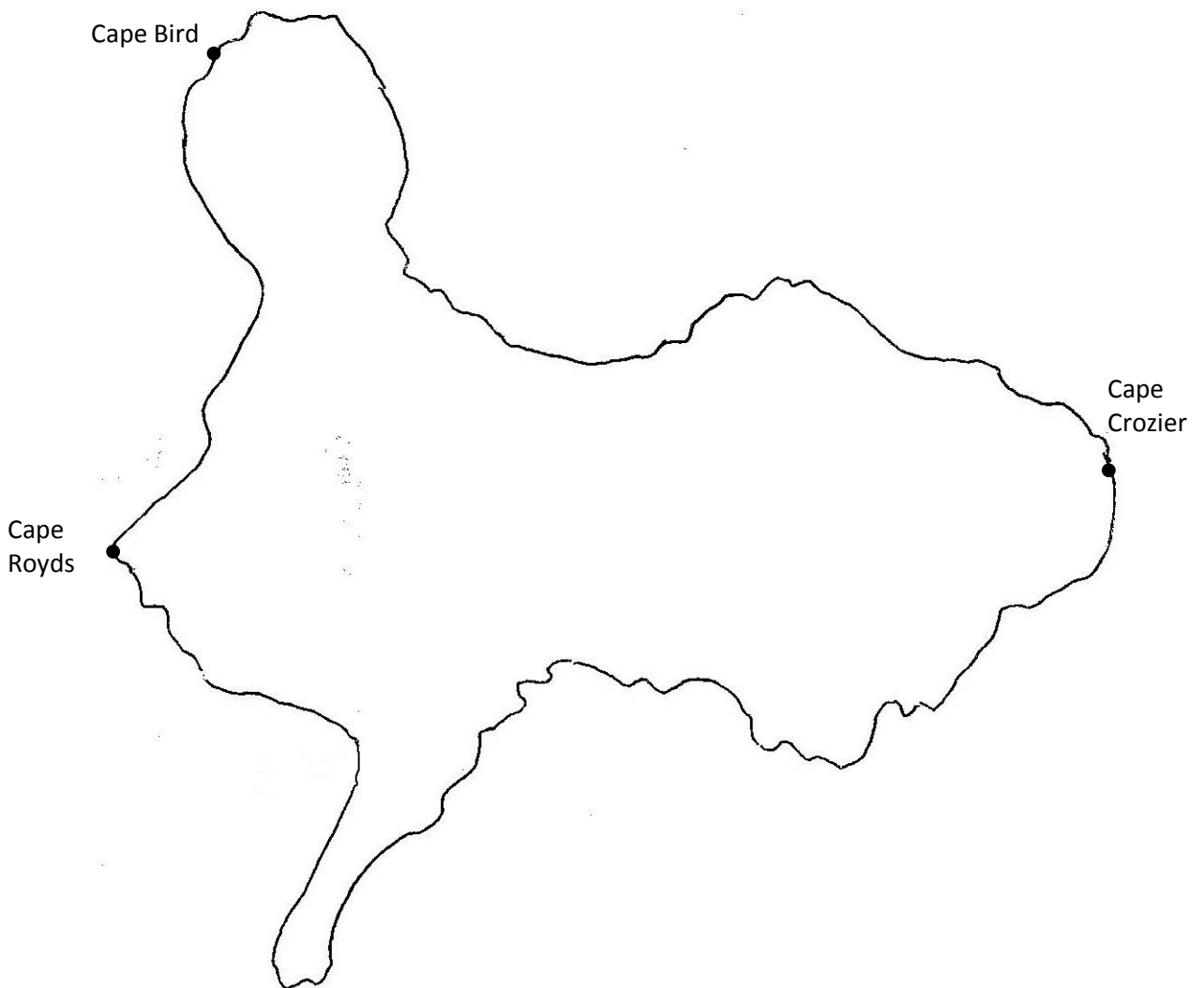
Title: _____



- 42 Explain, in detail, how the harvest of Toothfish may affect the connections/linkages that exist in the Ross Sea Food Web. Try to focus your answer those species that may be advantaged, and/or disadvantaged, from there being less Toothfish.

Use Resource 24 from the Resource Booklet to answer question 43

- 43 On the map below, draw a statistical map to show the population counts of the 3 Adelie Penguin colonies at Ross Island in 2012.



Cultural Features:

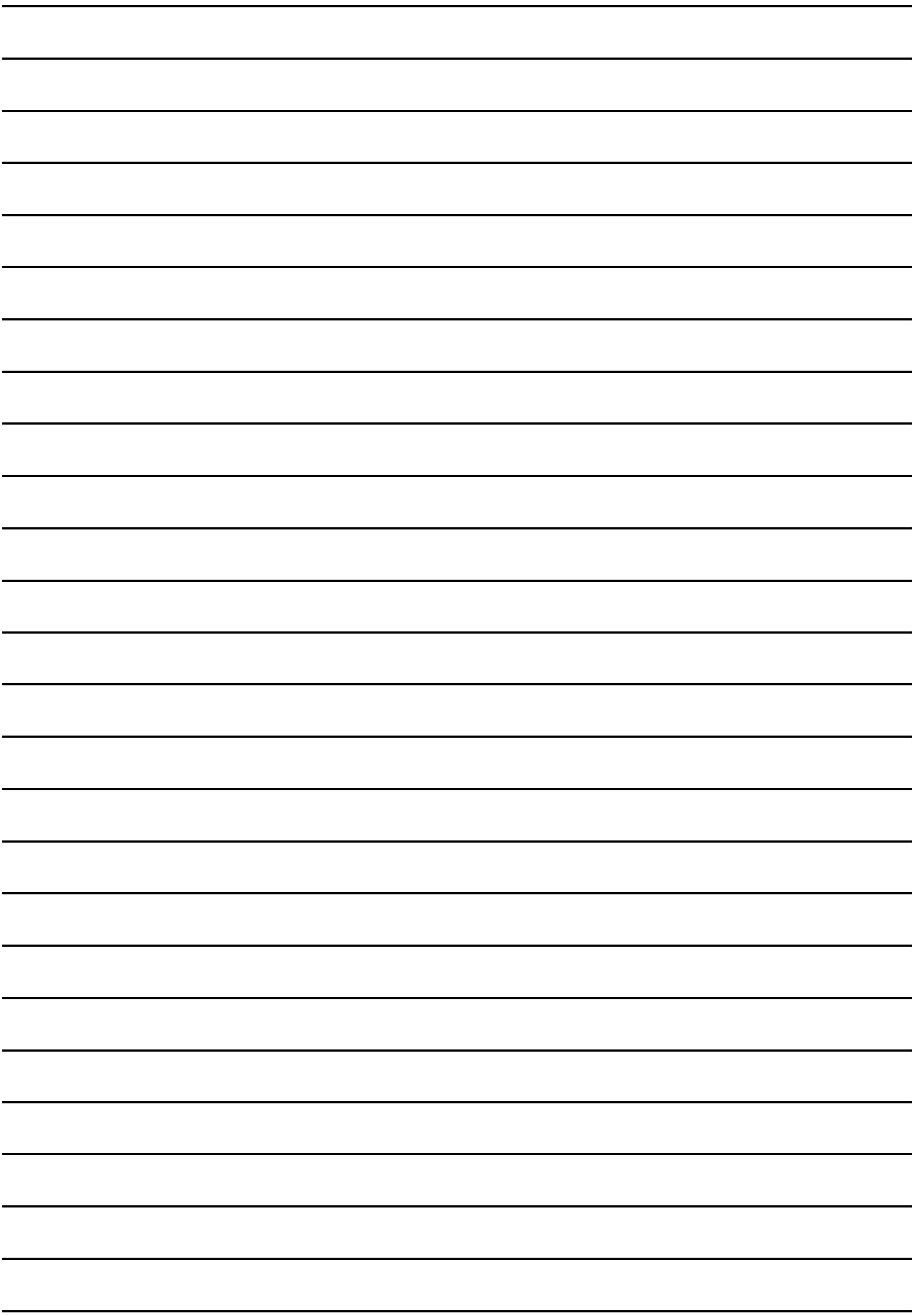
Geographic Concept: Change

Antarctica is an excellent example of how the concept of change can be applied to an environment.

Read Resource 26 from the resource booklet.

You will now be required to apply the concept of change to Antarctica – but don't stress, this will be easy if you plan your answer. Do this by filling in as much of the table as you can (you may not be able to do all boxes) by using the information you have learned in this booklet.

Type of Change	Antarctica example	Specific fact
Natural environment	<i>Toothfish numbers decreasing</i>	<i>Harvested in the Ross Sea. 30 tonnes taken in 1998, 3500 tonnes taken in 2012</i>
Cultural environment		
Temporal change (over time)		
Spatial change (between places)		
Different rates (fast/slow)		
Different times		
Different places		
Predictable (not a surprise)		
Cyclic (regular)		
Unpredictable (is/was a surprise)		
Lead to further change		



Geographic Concept: Sustainability

Because Antarctica has had very little human impact it is considered to be pristine. The extreme cold and inaccessibility of the continent for much of the year mean that our human footprint is very small. Therefore it is important that we look after it, which is the reason why so many countries have signed the Antarctic Treaty. This is slowly changing however, as more scientific bases are being constructed and immense resource wealth is being discovered, the future of the “untouched” environment could come under threat. The harvest of Toothfish and krill are the first of the resources to be exploited. Will they be the last?

This final activity will require you to assess the sustainable practices that New Zealanders are following – mostly in and around Ross Island. Is what we are doing on the continent today going to have impacts on it in the future?

Read Resource 27 and then re-read resources 16 to 23.

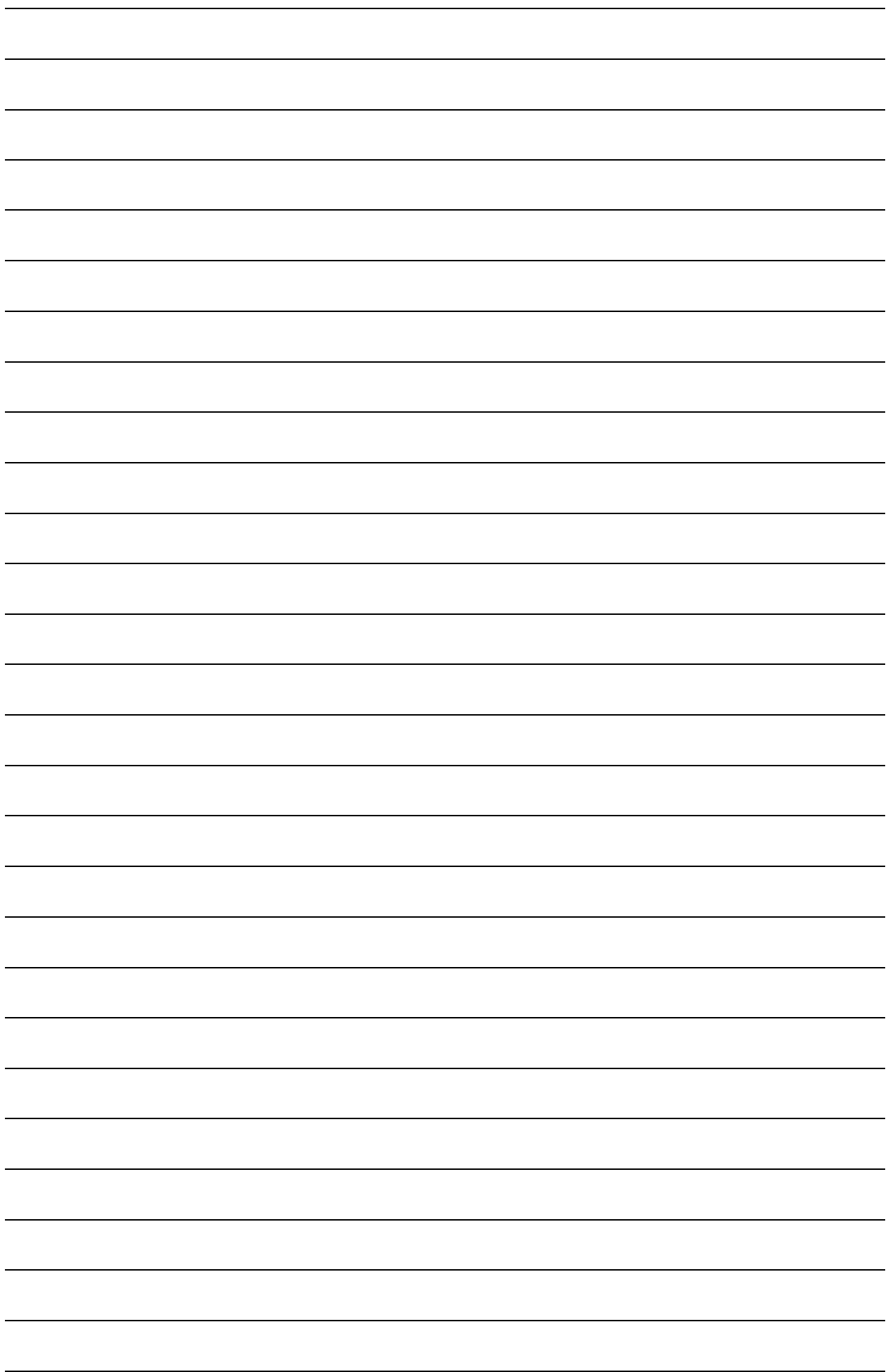
Now consider the following question:

“How sustainable are New Zealand’s activities in Antarctica, particularly in the Ross Island/Sea area? Justify your answer”

In order to answer this question another plan is needed (it takes a little effort but makes writing your answer easier in the long run – fail to plan, plan to fail!)

Fill in the tables below to show the issues faced and some of the solutions taken to minimise them:

Need	Issues(s)	Solution(s) –ways to prevent, limit, or fix	Specific Detail	Effectiveness (high/med/Low)
Electricity	<i>Diesel is used to produce power – pollutes the air</i>	<ul style="list-style-type: none"> • <i>Wind Turbines have been installed</i> • <i>Solar panels used</i> 	<ul style="list-style-type: none"> • <i>Meridian have installed 3 turbines near Scott base reducing CO2 emissions by 1242 tonnes a year</i> • <i>Cape Bird Hut has 4 solar panels</i> 	<i>Your call !</i>
Water supply				
effluent				
heating				
Toothfish profits				



Progress Chart

<u>Skill</u>	<u>Needs improvement (tick)</u>	<u>Mastery (tick)</u>
Interpreting text (Q1,2, 24, 26, 31, 32)		
Justifying an opinion (Q3)		
Latitude/longitude (Q5,6)		
Direction (Q7)		
Map interpretation (Q4, 8, 12, 14, 15)		
Using scale (Q9, 29)		
Diagram interpretation (Q10, 24, 38, 39, 40)		
Photograph interpretation (Q11, 13, 28)		
Line graph construction (Q16)		
Graph interpretation (Q17, 37)		
Table interpretation (Q18,19)		
Performing calculations (Q20, 21, 22)		
Explaining relationships (Q23)		
Values continuums (Q25)		
Precis mapping (Q27, 33)		
Precis Sketching (Q30)		
Cross sections (Q31, 35)		
Grid references (Q36)		
Bar graph construction (Q41)		
Statistical mapping (Q43)		
Concept application (44, 45, 46)		

