

# School Work Units

Based on West Coast Natural Hazards

## Primary School Work Units

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## Secondary School Work Units

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**ENGLISH UNIT PLAN:****Civil Defence**

<b>YEAR</b>	<b>5 - 6</b>
<b>LEVEL</b>	<b>2 - 3</b>
<b>DURATION</b>	<b>3 Weeks</b>

**Achievement Objective Being Assessed**

Transactional Writing

**Learning Outcomes**

Identifying civil disasters

Gathering of information

Presentation of findings in brochure or Pamphlet format

**Processes**

*By Processing Information*

i.e. to gather, select, record and present coherent, structured information from a variety of sources, using different technologies and explaining processes used

**Supporting Achievement Objectives**

*Viewing*

*Learning Outcome*

Being able to view a variety of visual texts to retrieve, interpret, organise and present information coherently

*Presenting*

*Learning Outcome*

Being able to assemble relevant text and graphics to create a brochure or pamphlet which will convey information .

**Learning Activities regarding WC Civil Defence**

**1. *Brainstorming:*** alone then as a group. Record information learned (book, computer). Set homework to gain background and then have morning talk. Build up a picture. Again record.

**2. *Make class list*** of known WC disasters or emergencies which they know required Civil Defence action. Add to this by:

**3. *Researching from other Sources:*** See Appendix 3 of WC Nat Haz Kit for ideas. Include search techniques for newspapers, internet, video viewing here.

**Focus student study** on ONE topic.

Guidelines for focus on a Natural or Civil Disaster: Which disaster are you researching?

- Write a short paragraph on the historical facts.
- In what ways would this disaster have disrupted the daily lives of those living in the area?
- What assistance and support did the people need or receive during this time?
- What could we learn from this disaster that would help us be more prepared to cope with a similar disaster today?

### **Internet Search**

You may handle this according to established practices at your school. I would bookmark the sites I wanted children to use and equip them with a list of questions which would guide their searching - suggestions for this activity (see internet\_activity.rtf).

#### **4. Visit from Civil Defence Officer**

Call your nearest District Council and ask to talk to their Civil Defence Officer (CDO). On the West Coast these positions are part time. Alternatively call the Regional Council and ask for their CDO or the Environmental Information Officer.

*Prepare appropriate questions with children in advance, e.g.*

- Why do we need a Civil Defence Organisation?
- Who works for the Civil Defence?
- What kinds of tasks do you perform?
- How do you get people to do what you want them to?
- Who decides when a disaster needs Civil Defence assistance?
- Students include questions related to their specific study

*Have different children welcome, introduce and thank speaker.*

Use key students to listen for specific data relating to particular questions. After visitor has left give children 5 minutes to jot down notes of valuable information learned. (See Note Making in Class at [www.sheridanc.on.ca/career/study/note.htm](http://www.sheridanc.on.ca/career/study/note.htm)). Read points with class, discuss steps/ sequence to form a report.

**5. View Civil Defence video/s.** For example:

- "It could happen here" available from Civil Defence - 8mins.
- "Be Turtle Safe" (Earthquake Safety) available from West Coast Regional Council
- "Be a Survivor" (Your Guide to a Positive Response) available from WCRC

**Discuss** consequences and action plans with children.

**Make predictions.** What kind of disaster could happen in our community?

**What would we do** if we were at school? Your school has to have emergency management plans – what is in place for floods, for earthquakes at your school?

**Make up an emergency plan** by working together in a group to brainstorm the necessary points you would have if there were a big earthquake at a one teacher rural school.

**Present** your plan to the class.

**6. Reading.** Use the “Events in New Zealand History” series by Kevin Boon or similar booklets. Allocate one book to each group, e.g.

- *The Wellington Flood*
- *The White Island Eruption*
- *The Napier Earthquake*
- *The Influenza Epidemic*
- *The Tangiwai Rail Disaster*

**Children to read independently** or with a 'buddy' and write summary with headings showing main points and relate to rest of class.

**Leading questions to guided reading:**

- Which disaster did you read about?
- When and where did it happen?
- What damage was caused by the disaster?
- What problems did this create for the people who lived there?
- How did they manage to restore things to normal?
- What preparation could they do to minimise the effects of another similar disaster?
- How would you have felt if you had been there at the time?

**7. View poster** “The Alpine Fault”, using this as a tool to gather/retrieve information from visual context. (NB could also see this as an overhead)

- Find the area of our community on the map. Discuss the level of potential hazard
- Review instructions on what to do in the event of an earthquake
- Discuss list of vulnerable services. How would we cope without these things?
- View a variety of websites (see appropriate list at end of this Unit).

**8. Visit a local Civil Defence Headquarters.** Set children up for this visit by discussing:

- What they might expect to see?
- What roles people play in times of emergency?

**9. Make a chart** showing items learned about during above visit. List steps followed in times of civil emergency. Draw items needed for a survival kit.

**10. Make up a Class Survival Kit** (see CDEM Website for gathering appropriate items. It may not be practical to find samples to provide for whole class. In this case, collect samples of items that children agree 'should' be in the kit. Decide upon a safe and accessible place to store kit. Discuss need to replace items from time to time. See Disaster Resources - How to Prepare (<http://www.ag.uiuc.edu/~disaster/prep.html>)

**11. Bumper Stickers** - a short enjoyable activity which could be done prior to making brochures or instead of

- Discuss the use of bumper stickers
- Visit Internet Bumper Stickers (<http://www.directodave.com/ibs/>)
- Discuss slogans - look at kind of language used
- Limit children to one sentence or phrase
- Discuss impact of persuasive words & phrases
- Using the computers, design a bumper sticker warning people about the need to be prepared in case of civil disaster
- Allow one picture or graphic to be added to work

**12. Create /write a brochure.** Look at available sample brochures about survival.

- Discuss layout, content, text, graphics, priorities
- Analyse a model for features of layout and style
- Set expectations for children's own work

#### **Brochure Links:**

- The My City English On-Line unit ([http://english.unitecology.ac.nz/resources/units/my\\_city/](http://english.unitecology.ac.nz/resources/units/my_city/)).
- Brochure Lesson Plans for the K-12 Classroom (<http://desktoppub.miningco.com/compute/software/desktoppub/library/weekly/aa0828b.htm>)

### Discuss plans for the brochure:

- What will my readers want to know?
- What do I need to put on my brochure?
- How will I present the information?
- What visual features will I need to use?

**Give children time to work on brochure.** A brochure could be produced with paper/pencils, paint etc, computer and include:

- A4 page divided, folded into 3 parts with both sides used mixed text & graphics
- Statements about Civil Defence and emergencies
- Instructions on How to react in Civil Emergency
- Contents of Survival Kit

### ASSESSMENT

After deciding on objectives of unit, choose appropriate assessment methods

### Paper Resources

- ***School Journals*** - Learning Media, Wellington
- ***Events in New Zealand History Series*** by Kevin Boon, Kotuku Publishing, Ltd., Wellington
- ***Ruapehu Erupts*** by Karen Williams, Godwit 1996
- ***The Violent Earth Series***, Wayland Publishing, 1992  
*Earthquake* by John Dudman *Volcano* by John Dudman  
*Flood* by Julia Waterlow *Storm* by Jenny Wood
- ***Natural Disasters Series***, Heinemann Publishing Ltd. 1996  
*Tidal Waves and Flooding* by Jane Walker  
*Hurricanes and Typhoons* by Jaqueline Dineen  
*Volcanoes* by Jaqueline Dineen
- ***War - the World Reacts*** by Paul Bennett, Belitha Press, 1998
- ***Natural Disasters*** by Tim Wood, Wayland Publishing, 1993.

## Electronic Resources

### General Information Sites

<a href="http://www.civildefence.govt.nz">www.civildefence.govt.nz</a>	Re overall role of Civil Defence, sets out regions, basic information. Excellent for overall picture.
<a href="http://www.gsnz.org.nz">www.gsnz.org.nz</a> associated	NZ Geological Society. Excellent site for links to groups NZ and worldwide.
<a href="http://www.eqc.govt.nz">www.eqc.govt.nz</a>	The NZ Earthquake Commission provides natural disaster insurance for property owners. Good site for information about property protection.
<a href="http://www.gns.cri.nz">www.gns.cri.nz</a>	Best site for data on earthquakes. On line and up to date monitoring. Much useful information including recent, past earthquake data
<a href="http://www.geonet.org.nz">www.geonet.org.nz</a> good	Offshoot of the Institute Geol. & Nuclear Sciences. Very good for earthquakes (on-line seismograph) and landslides
<a href="http://www.learnz.org.nz">www.learnz.org.nz</a>	Has some online geology activities. Teachers need to purchase password for schools to utilize site (\$45, from pete@learnz.org.nztasks
<a href="http://www.naturalhazards.co.nz">www.naturalhazards.co.nz</a>	Expert consultants, engineers re disaster prevention, mitigation, recovery: regular newsletter online

### Regional Information Sites

<a href="http://www.wcrc.govt.nz">www.wcrc.govt.nz</a>	Regional Civil Defence & Emergency Management information, regional hydrology data including online data.
<a href="http://www.bullerdc.govt.nz">www.bullerdc.govt.nz</a> information	District Council CIVIL DEFENCE & EMERGENCY and contacts for more information
<a href="http://www.greydc.govt.nz">www.greydc.govt.nz</a> information	District Council CIVIL DEFENCE & EMERGENCY and contacts for more information
<a href="http://www.westlanddc.govt.nz">www.westlanddc.govt.nz</a> information	District Council CIVIL DEFENCE & EMERGENCY and contacts for more information
<a href="http://www.ecan.govt.nz">www.ecan.govt.nz</a> Coast.	Canterbury is one of two key regions adjoining West Coast.  Civil Defence information about them as our neighbour, their resources in time of our emergency

[www.tdc.govt.nz](http://www.tdc.govt.nz)

Tasman District is one of two key regions adjoining WC. Civil Defence information about them as our neighbour, their resources in time of our emergency

[www.westcoast.org.nz/doc/docwestcoast.html](http://www.westcoast.org.nz/doc/docwestcoast.html)

General information about DOC managed land coastal land plus contacts to offices on WC.

### **Archival Information Websites**

[www.alliedpress.co.nz/greymouth](http://www.alliedpress.co.nz/greymouth)

Greymouth Evening Star Office: this holds back - copies of this paper, the Westland Times and Messenger. Microfilmed copies available Nat. Lib NZ

[www.natlib.govt.nz](http://www.natlib.govt.nz)

Access NZ Microfilmed Newspapers Index for research into chosen hazard on West Coast

[www.library.christchurch.org.nz](http://www.library.christchurch.org.nz)

Has a large database of information in the Aotearoa Centre which could be useful for research into chosen hazard on the West Coast

[www.bullerdc.govt.nz/libraries.html](http://www.bullerdc.govt.nz/libraries.html)

Buller District Library: useful for local research.

[www.westlanddc.govt.nz/index.cfm/libraries](http://www.westlanddc.govt.nz/index.cfm/libraries)

Westland District Library: useful for local research.

## SOCIAL STUDIES UNIT PLAN

# Historic Landslides

Landslides have been the single largest cause of loss of life due to natural hazard events (earthquakes, heavy rainfall, other factors since European occupation on the West Coast. Study in this area can give students insight into the impact landslides can have on people's lives, on communities and on the land.

<b>YEAR</b>	7 & 8
<b>LEVEL</b>	3 – 4
<b>DURATION</b>	10 – 12 (hours)

### Strand Achievement Objective Being Assessed

“Time, Continuity and Change”

**Learning Outcome:** Students will be able to:

- Understand relationships between people and events through time

### Supporting Achievement Objectives

Causes of effects of events that have shaped the lives of groups of people

**Learning Outcome:** Students will be able to:

- Describe the effects of a natural hazard event on different communities
- Identify the causes of landslides
- Discuss how communities can avoid future catastrophes

### Processes

#### 1. Inquiry

##### **Learning Outcome**

Students will be able to: Collect, process and communicate information about the impact of landslide events on communities

#### 2. Social Decision Making

##### **Learning Outcome**

Students will be able to: Make decisions about actions which could be taken to mitigate future landslide events

### Requirements

- **Setting:** New Zealand
- **Perspective:** Regional Study about current and local issue
- **Essential Learning** Living with the every day threat of the occurrence of natural hazard events in view of knowledge of past events  
(ELANZS)

**Assessment:** choose either:

***Be a reporter*** and write a 150 - 200 word media article about a selected landslide event which has previously occurred on the West Coast. To include points about the time, date, effects on the landscape and effects on people

OR

***Make up an A3 size wall poster*** depicting key points about a selected landslide event. To include location map, photographs/pictures and an account of effects on local people.

### **Teaching & Learning Activities**

Suggested activities (no particular order). Recommend have a field trip and/or a visit to museum, history house, library or similar to offset classwork.

- Research/learn through reading accounts of landslide events from books, newspapers
- Research/learn through the Internet
- Find out how many lives have been lost to landslides associated with earthquake events on the West Coast
- Interview someone who lived through Inangahua Earthquake
- Have a visiting person give their personal account of how a big slip, landslide affected them, their livelihood
- Have a visiting person talk about their role in maintaining road or rail links\* on the West Coast with respect to slips, rockfalls, landslides
- Visit a landslide/slip site
- Find out from Civil Defence in your area about potential landslide places
- View videos, films about disastrous landslides

### **Major Past Events which could be researched are:**

- |                                 |                           |
|---------------------------------|---------------------------|
| • 1929 Arthur's Pass Earthquake | 1929 Murchison Earthquake |
| • 1962 Westport Earthquake      | 1968 Inangahua Earthquake |
| • 1991 Westport Earthquake      | 1998 Mt Adams Landslide   |

Other areas where there have been slips in the past and which cause ongoing problems for the relevant District Council and Civil Defence are:

- |                                  |  |
|----------------------------------|--|
| • Omoto Slip (near Greymouth)    | Little Wanganui (Sub-Division<br>near Karamea) |
| • Callery River (at Franz Josef) | Otira Valley west to Rocky Point               |

### **Followup**

Make notes of any future student learning needs which have become apparent as a result of this study or from the assessment methods used.

## Print Resources

***A Review of Earthquake Hazards of the West Coast:*** Report for WCRC by John Benn, 1992. Key resource with long bibliography

***Landslide Dambreak Floods at Franz Josef Township, Westland, NZ:*** by TRH Davies, 2002. Published NZ Journal of Hydrology, Vol 41, pp 1-17

***An Alpine Highway at Risk:*** by I. Whitehouse, 1989. Streamland 4, DSIR Publishing Wellington. (Otira area)

***Landslide Investigation & Hazard Zonation in the Greymouth Urban Area:*** by PL Metcalf, 1993, Engineering Geology Thesis, Geology Dept. Uni. of Canterbury.

***Doherty Creek Landslides:*** Greymouth Coalfield: Mark Yetton Report, 1999, prepared for WCRC.

***The 1999 Landslide Dam in the Poerua River, Westland, NZ:*** by GT Hancox, MJ Mc Saveney, MJ Davies & K Hodgson, 2000. Published in "Dams Management and Best Practice", IPENZ

***Stories of Murchison Earthquake, 17th June 1929:*** by Murchison District Historical & Museum Society

***Westland District Plan, 2002, 5.7: Waiho River Severe Flood Hazard Policy Unit*** (available from Westland District Council or at [www.westlanddc.govt.nz](http://www.westlanddc.govt.nz))

## Media Resources

**Greymouth Evening Star Office** (*Greymouth*): holds paper copies back from present to 1940. Before that back to 1901 on microfilm. Copies for research held at the Star Office, Albert St., Greymouth, 03 768 7121 or [grey.star@xtra.co.nz](mailto:grey.star@xtra.co.nz)

**Westport News Office** (*Westport*): holds paper copies from present back 3-4 months, then onto microfilm back to 1977. Before 1977 paper copies are bound in large volumes. Apply to the office for research, 03 789 7319 or at [info@westportnews.co.nz](mailto:info@westportnews.co.nz)

**West Coast Times Office** (*Hokitika*): has paper copies from present back to 1988 only. Apply to WC Historical Museum for earlier copies. WC Times, Weld St., Hokitika, 03 7558422

**West Coast Historical Museum**, (*Hokitika*): apply to the office direct on 03 755 6898. To view back copies of many old newspapers and archives about the West Coast, especially Westland.

**Greymouth District Library**, (*Greymouth*): apply to Chief Librarian, 03 768 5597 or [greylib@xtra.co.nz](mailto:greylib@xtra.co.nz) for access to the "Pioneer Library Archives" which includes books, booklets, photographic prints (not originals), magazines and newspapers (including the Grey River Argus) of the period 1866 – 1966.

## Electronic Resources

[www.naturalhazards.co.nz](http://www.naturalhazards.co.nz)

Expert consultants, engineers re disaster prevention, mitigation, recovery

[www.gns.cri.search/index.asp](http://www.gns.cri.search/index.asp)

Landslides can be searched with the Institute of Geological & Nuclear Resources archives. Enter key words at SEARCH and then download as pertinent. Quick way of finding information.

[www.geonet.org.nz](http://www.geonet.org.nz)

Refer to landslides in index on main page. Very good information Years 7 – 10

[www.wcrc.govt.nz](http://www.wcrc.govt.nz)

See Landslides Section of Natural Hazards Resource Kit. Prepared from July 2002 Dtec Report on West Coast Natural Hazards online

[www.wcrc.govt.nz/aspcommon/search.aspx](http://www.wcrc.govt.nz/aspcommon/search.aspx)

Go to SEARCH THIS SITE and enter name of particular landslide, e.g. Mt. Adams. Also see main web page for council staff contacts

[www.wcrc.govt.nz](http://www.wcrc.govt.nz)

Natural Hazards Kit, Landslides Section, Resource Example 4, "Rain Generated Slips affecting Midland Line from Otira to Greymouth from 1886 to 2002" (or see own CDRom)

## TECHNOLOGY UNIT PLAN

# Earthquake Monitoring

**YEAR:** 5 - 8  
**LEVEL:** 3 - 4  
**DURATION:** 10 – 15 hours

**Main Technological Area:** Information & Communication Technology

**Supporting Technological Area:** Structures & Mechanisms

**Contexts:** Home – School - Community

Technological Knowledge and Understanding

**1** - understanding the use and operation of technologies

Technological Capability

**6** - with reference to identified needs and opportunities

**d** - evaluating designs, strategies and outcome

Technology and Society

**8** - understanding the impact of technology on the environment

- in the past, present and possible future

### Links with other Learning Areas:

- **Mathematics:** Statistics, Graphs, Spreadsheets
- **Science:** *Earth Science, Geology*
- **Social Science:** Earthquake Effects on Communities, Civil Defence

### Development of Essential Skills:

- **Communication** Using modern information/communication technologies
- **Information** *Planning research and carrying out, processing data*
- **Numeracy** Using data to compile report
- **Applied ICT** Interpreting, identifying, presenting, correlating
- **Physical** Using computer competently especially with respect to health and safety needs
- **Problem Solving** Evaluating data to make connections and predictions
- **Self management** Completion of set tasks within a set time-frame
- **Co-operation** Collaboration in groups to achieve time-frame by all
- **Work and Study** Completing homework, use of class time effectively

**Learning Experience:**

**Summary:** the following tasks should give the student

- General knowledge about the history of Seismology
- Hands on experience of the online monitoring of earthquakes through the New Zealand wide network of seismographs
- Experience of trying to make their own seismograph as per some of those described historically

*PART A*

**Formulating Brief 1.** To **find out** history of Seismology

*Activity* Research via paper references, internet

*Learning Outcome* Developing background on the topic

**Formulating Brief 2.** To gain **hands on experience** of NZ's online earthquake monitoring system

*Activity* To record the number of earthquakes over a set period, logging magnitude, location, depth

*Outcome* To have built up a real picture in real time

**Understanding (of Terminology)** To **know** the difference between Richter and Mercalli Scales

*Activity* To research this via paper &/online resources to establish difference. Record via examples.

*Learning Outcome* To form an understanding of key earthquake terminology

*PART B*

**Design Task** To **design** a device which will record a "good shake"  
*Activity* After having read up about previous designs on this design a "seismograph" which would be made of basic everyday materials (non-workshop).

<b>Construction Task</b>	To construct the device utilizing everyday objects plus glue, magnet, a small wire relay coil.
<i>Learning Outcome</i>	That this task may be harder than initially meets the eye
<i>Challenge 1.</i>	To make a workable seismograph which indicates "shake"
<i>Challenge 2.</i>	To make a workable seismograph from which "direction" or "line of path of the shake" can be ascertained.
<b>Evaluating</b>	To <b>test</b> the construction as per above. Does it work consistently? If not why not? What are the limitations encountered?
<i>Activity</i>	Organize a series of tests and record results in tabular form
<i>Learning Outcome</i>	That the device needs to be robust to meet demands of testing
<i>Challenge:</i>	To ensure conditions for each test are standardised so that results are comparable

### References with tips for making seismographs:

- ***Caught in the Crunch: Earthquakes and Volcanoes in New Zealand:*** Rebecca Ansell & John Taber, Institute of Geological & Nuclear Sciences, 1996, Ch.5, "Recording Earthquakes." Includes notes on making home seismometers and seismographs.
- ***Search the Internet:*** including [www.gns.cri.nz](http://www.gns.cri.nz)

## MATHEMATICS UNIT PLAN

# Statistics Using Online Data

Flood warning data is available to West Coasters via the West Coast Regional Council's (telephone) Infoline or the Infoline River & Rainfall Database online at [www.wcrc.govt.nz](http://www.wcrc.govt.nz) Data is gathered from monitoring sites strategically placed across the region to monitor potential rises in river levels due to heavy rain (see Appendix 2 of West Coast Natural Hazards Resource Kit).

**YEAR** 5-8  
**LEVEL** 3  
**DURATION** 4-8 hours

### Specific Achievement Objectives:

- To plan and carry out a statistical investigation
- To interpret data collected to form a report
- To use data to make a prediction about probability (e.g. of flooding)

### What we are using it for:

- To show data available from an online source in graph format
- To look at trends and patterns within the data
- To learn to present data in a manner which explains it best

### Implementation:

- Use a computer to access the data from a website
- Record data manually on a spreadsheet
- Choose appropriate graph type
- Draw up graph/s, label
- Add title, illustrate, display
- Report to class on findings
- Repeat process for other graph types
- Repeat process and draw up graphs on Excel Programme spreadsheet (or other similar computer programme)
- Present material to viewers on a Power Point programme (or similar format)

**Skills Required:**

- Using computer to download data
- Interpreting online data
- Choosing data to create own spreadsheet
- Choosing an appropriate graph type
- Drawing up the graph
- Oral interpretation of findings
- Making computer graphs
- Making a powerpoint presentation of graphed data

**Print Resources:**

*WCRC Natural Hazards Resource Kit: Appendix 2* on Monitoring of flood hazards

Appropriate *Maths texts* for graphs work

**Electronic Resources**

[www.wcrc.govt.nz](http://www.wcrc.govt.nz) See River & Rainfall Database for up to date Infoline data

See *other Regional Council websites* for similar data in other parts of New Zealand

## SCIENCE UNIT PLAN

# Coastal Hazards

<b>CONTEXTUAL STRAND:</b>	Making Sense of Planet Earth and Beyond
<b>CONTEXT:</b>	home, community, school
<b>LEVEL:</b>	3 - 4
<b>DURATION:</b>	10 – 12 hours

### Achievement objectives

Students can:

1. Investigate and describe New Zealand land forms
2. Investigate changes in a chosen landform due to natural phenomena

### Specific learning outcomes:

For 1. investigation of all the different parts of the coastline and how they were formed / are being formed

For 2. investigation of changes wrought on the coastline due to phenomena which are perceived as hazardous by humans

### Integrating strands:

1. Making Sense of the Nature of Science and its Relationship to Technology
  - Make **observations** of erosion and describe.
  - Take **measurements** of wave actions and **record** data.
2. Developing Scientific Skills and Attitudes
  - **Planning** where to make observations
  - **Information gathering** on site
  - **Processing / interpreting** data
  - Choosing **suitable reporting back** method/s

### Possible assessment:

- Knowledge test of factual material learned
- Student ability to explain orally one natural hazard cause & effect
- Student presentation of data into a visual format (graph, diagram) which shows their understanding

**Science background knowledge:**

- Of cause and effect
- Of human perceptions being different to nature's ones: what is hazardous to us is everyday in nature
- Of the importance of historical context, the long view and short view

**Teaching and learning activities:**

- Identifying all types of NZ shorelines – read, video, observation
- Identifying all weather and natural phenomena which act on those shoreline – read, video, observation

**Other teaching and learning activities .....**

- Researching via the Internet about less well known hazards
- Planning and carrying a beach visit to investigate wave action: repeat at different tide levels
- Learn about basic wave motion and the accompanying terminology
- Read up about past changes and look at ongoing trends re erosion and aggradation patterns locally, for all West Coast
- Study ocean currents and their relationship to shaping our coastline
- Comparing West and East Coast of South Islands patterns / trends
- Compiling graphs to portray data collected
- Make up a glossary of new terms learned: present as a wall chart

**Paper References:**

***Coastal Hazards in the West Coast Region:*** by JL Benn & D. Neale, 1992: WCRC  
Publication

***Tephra Magazine,*** Oct. 1999, article by W. de Lange, R. Fraser: CDEM Publication

***Environmental Changes in Okarito Lagoon, Westland, NZ:***\_report by J. Goff,  
C.Chague – Goff & S.Nichol 2001: DOC Publication

**Appendix:** please turn over for lesson material about Tsunamis

## Tsunamis

*The following material was used by the WCRC EI Officer in March 2003 as the basis for a 1.5 hour field lesson with Franz Josef School students at Okarito Lagoon. The group talked about key issues and then walked round the village looking where water would go, at possible escape routes and the effects on people/dwellings.*

"Tsunami is a Japanese word for a special type of wave can occur in the sea or large lakes. They used to be called tidal waves but this is incorrect because they have nothing to do with the tide.

In the sea tsunamis usually occur when a change takes place on the sea bottom due to volcanic activity, an earthquake or an underwater landslide or both. The displacement of water because of the change causes water to move and it this movement, which causes waves. Think what happens when you drop a rock in a pool. Similar things can happen in lakes when a big landslip slides down into a lake.

The waves can vary from huge – as tall as a house or more – to mere ripples depending on how big the displacement is and how far away you are. For example if a hole opens up in the sea bottom and swallows an area as big as Mt. Cook a huge amount of water would rush inward and if there was an island nearby it would soon have a big tsunami pounding on its shore.

Luckily though the West Coast is far from much of the big volcanic and earthquake action around the Pacific rim and we only get the smallest ripples from earthquakes, say in California or Japan. However scientists have worked out that we have probably had bigger ones a few times, because they have found evidence of this by looking at what the soils can tell us, especially around the shores of lagoons like Okarito. Sometimes too there will be archaeological evidence in the soils – proof that people used to live at a place but then suddenly stopped doing so for no apparent reason. These bigger tsunamis may have been caused by earthquakes along offshore faults (like an Alpine Fault under the sea) but no one is quite sure.

A wave from an offshore earthquake would only have needed to be three or four metres high to wreak total destruction on a Maori community living somewhere around the shores of Okarito Lagoon. People and whares would have been swept away, stored foods ruined and canoes smashed on the shore. A few people, further inland at a favourite eeling spot, or visiting another group might just have escaped.

Because the sea is slowly rising due to global warming, and because we may one day have a tsunami somewhere along the West Coast, people need to be very aware when they build houses or other types of developments (farms, wharves, factories, seawalls) near the sea. It is the duty of their local District Council to make sure people follow their local Building Plan and the duty of the Regional Council to remind people about what may happen when natural hazards occur (a tsunami is a natural hazard) and the reason why I am telling you all about this today.

Today our task is to think about all this then imagine a big wave coming in to the lagoon – one as high as your garage at home – and see which buildings you think might be safe, which ones you think might get swept away and where flooding might take place. Where do you think you might run to be safe yourself? And afterwards, who would do all the cleaning up and who would pay for it to done?"

**SENIOR SOCIAL SCIENCES****Role of Lifelines Utilities**

In Civil Defence & Emergency Management

<b>SUBJECT</b>	Geography
<b>TOPIC</b>	Natural Hazards
<b>YEAR</b>	11
<b>DURATION</b>	1 - 2 hours (post preparation time in topic area)

**Student Needs:** Set of lesson work sheets and pencil

**Student Tasks:**

- To listen to the teacher
- To ask questions
- To fill in the missing words

**Teacher Needs:** Set of lesson answer sheets, whiteboard and pens

**Teacher Tasks:**

- Work through the answer sheet using whiteboard where necessary
- Keep in the order of the work set
- Take your time but don't repeat yourself more than once
- Emphasise the key points
- Write unfamiliar words on the board so students spell them correctly
- Don't wait for those persistently missing words
- Either go over the answers at the end OR students to work in pairs, threes to cross check the answers together

## Student Worksheet: Introduction: Read only

# Civil Defence & Emergency Management

The Civil Defence Emergency Management Act (CDEM Act) 2002 came into effect on the 1<sup>st</sup> December 2002 and replaced the Civil Defence Act 1983.

*The following information has been derived from the CDEM Website at [www.civildefence.govt.nz](http://www.civildefence.govt.nz) For more information refer to the CDEM Act 2002 pages.*

### Principal Provisions of the new CDEM Act 2002

- This new act updates and redefines the duties, functions and powers of central government, local government, emergency services, lifeline utilities and the general public.
- The new Act ushers in a regime of comprehensive and integrated management with emphasis on the 4R's (Reduction, Readiness, Response and Recovery).

**More details are available from your school's Natural Hazard Resources CD Rom, Items 1-9 Appendix 3 OR from the relevant website page.**

## Student Worksheet: Lesson: fill in missing words

# Lifeline Utilities

One key aspect of modern Civil Defence Management

*[This worksheet material has been adapted from the Guidelines Page, CDEM website]*

### A. Definition

Lifelines are essential "utility" services which support l.....in our community. They include such services as water s....., sewerage systems, s..... water drains, p....., gas, t..... and transportation networks (r..... & r.....).

**B. Documents** relevant to Lifelines Utilities under the new CDEM Act 2002 are:

1. The Director's Guidelines' or DGL 3/02 (pursuant to section 8(2)e of the Act). This document is called **W..... T..... - Lifeline Utilities and Emergency Management.**
2. A 'best p..... guide' supplement to the Director's Guidelines called **Lifelines and CDEM Planning** which explains in detail how c..... - o..... CDEM planning can occur between utilites and CDEM agencies.
3. A discussion paper about **Improving Utility Disaster Resistance** which is available on the Papers page of the CDEM website.

### C. Lifelines in New Zealand

The Lifelines concept originated in the United States in the 1.....'s following the realisation that while considerable effort had been put into the s..... response of buildings and other structures, relatively little was known about the likely performance of utility services.

The focus of lifelines in New Zealand is on r..... scale events that are beyond the ability of individual organisations to respond to and control. Nevertheless the responsibility for taking appropriate mitigation (p.....) and preparedness steps remains with these individual organisations.

While early work focused on earthquakes as the principal hazard, lifelines projects now encompass an a..... hazards approach – that is, working through all of the natural hazard agents that could affect a region.

*The overall objectives of lifelines projects are:*

- to reduce d..... levels following a major disaster event; and
- to reduce the t..... taken by these lifeline services to restore their usual level of service

*Utility and transportation network operators are brought together within a region, with input also provided by scientists and e....., emergency managers, and planners. In this way, lifelines groups facilitate and motivate a c..... physical risk management process for regional scale events/impacts.*

*The actual process involves the following key steps:*

- I..... the hazards which could affect each lifelines network
- List the various n..... in the given region
- Assess the v..... of the lifeline network to those hazards
- Assess the potential d.....to and consequences for each network
- Identify and implement practical mitigation m.....
- Prepare of comprehensive emergency r..... plans

The principal output from lifelines projects is the identification of possible physical m..... measures that operators of utility and transportation systems can undertake to reduce the risk from the major identified hazards.

#### D. The Benefits from Lifelines Projects

For more information about the benefits of lifelines projects look at the work of the A..... Engineering Lifelines Group on the CDEM website. This provides a framework by which utilities can apply lifelines projects results.

#### E. Current Status of Lifeline Utilities Projects in New Zealand

At the end of 2003 lifelines utilities projects which had gone through the steps outlined above had been completed for each of the ..... main centres, with another ..... well underway for the remaining regions and cities.

The new Civil Defence Emergency Management Bill places emphasis on lifeline utilities and encourages integrated planning across and between sectors, and is therefore likely to increase the focus on lifelines projects.

#### F. About Lifeline Utilities on the West Coast

*Lifelines Utilities come in 2 main classes. These are:*

##### **Specific Entities:**

- |                   |                               |
|-------------------|-------------------------------|
| • r..... stations | e.g. Coast FM, National Radio |
| • airports        | e.g. H..... Airport           |
| • shipping        | e.g. Port of G.....           |

**Other Classes of Entity:**

- generation/distribution electricity e.g. T.....
- maintaining a water supply e.g. for .....  
by Grey DC
- provision of a sewage system e.g. for Kaniere residents by  
.....DC
- provision of a roading network e.g. by T.....
- provision of a r..... network e.g. by Tollrail
- distribution of p.....products e.g. by S..... tankers from  
Nelson
- provision of telecommunications e.g. by T..... to  
whole region

***As well as these criteria lifeline utilities can also be characterised as being:***

- **N**..... e.g. telecommunications, energy transmission,  
road & rail, broadcast media (T...and r.....)
- **Regional** e.g. lines companies, a....., ports
- **Local** e.g. w....., supplies, waste-water systems

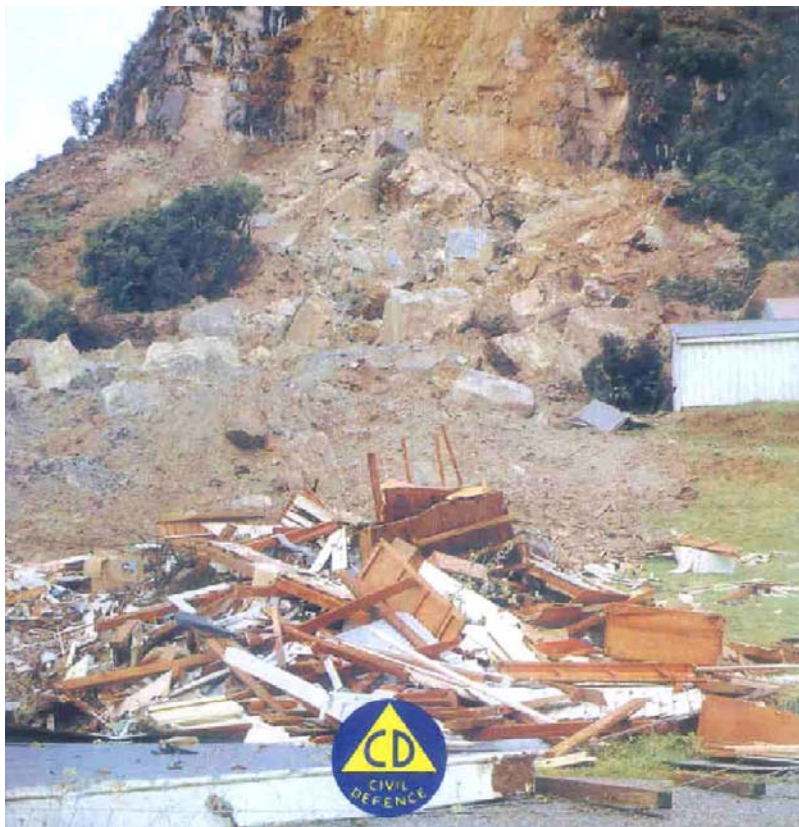
As a general rule of thumb in the event of a civil defence emergency **safety of life issues will always get first priority**. For instance the evacuation of persons trapped by f..... to safety or getting injured persons to h..... will take precedence initially in an emergency but ensuring personnel and transport are assigned to maintaining or repairing lifelines must take place from the outset because the h..... and economic viability of communities depends upon their continued operation.

It is essential that lifelines utilities are resilient to emergencies and that their emergency planning is integrated with the wider community's CDEM planning in order for both to be effective. Effective planning can only be assured through sound relationships between utilities, and with local government and the emergency services. **In general "P..... make the Difference, not Plans."**

**G. West Coasters making a difference:**

A number of groups ensure that regional plans are carried out here. They include:

- West Coast CDEM Group (representatives from the ..... councils)
- Members of the West Coast Lifelines Utilities
- Members of the Greymouth F..... Committee
- C..... Civil Defence Officers
- Local Civil Defence Wardens
- R..... trained in Civil Defence
- Ambulance Service
- A..... Ambulance
- Rescue Helicopters
- F..... Service
- Search & Rescue Groups (Urban, Land, M..... )
- M..... Rescue



One of the main slips caused by the 1968 Inangahua Earthquake.  
The readily recognisable Civil Defence logo shown in front

## H. West Coasters Taking Responsibility

### Community responsibilities:

The West Coast community can be defined as all the individual residents, institutions, businesses, tourism operations and government agencies. These have a collective responsibility to undertake the **4 R's** which are:

- a) **R**..... of hazard effect or hazard occurrence
- b) **Readiness** to c..... with projected hazard
- c) **Response** in the event of hazard occurrence (e..... response)
- d) **Rehabilitation** of the e.....of the hazard including forward planning for better a) and b)

### Before an Emergency: [a) Reduction and b) Readiness]

Before an emergency all groups need to put themselves out to reduce the effects of any hazards or even prevent. Much of this can be done:

- by applied commonsense forward planning in the h..... as per public education
- by preparing emergency plans and procedures in institutions (s....., retirement homes)
- by developing contingency / emergency plans for businesses (s....., factories, offices)
- by having local lifelines utilities p..... in place
- by t..... operators recognising and providing for clients overstaying due to hazard events

### At the time of an Emergency: [c) Response and d) Rehabilitation]

Adult residents on the West Coast have a one, two or even three fold role with respect to civic responsibility at the time of a CD defence emergency. The roles are:

- Caring for t....., those in their own households and in their immediate vicinity.
  - Self
  - Immediate family members
  - Pets
  - Neighbours and/or elderly r..... nearby

- Caring for the c..... through organizations they belong to
  - District /Regional Council (staff on call)
  - Civil Defence
  - P.....
  - St. Johns Ambulance
  - Fire Brigade
  - Urban Search & R.....
  - Other sections of Search & Rescue e.g. C.....
  
- Caring for visitors from o..... the region by the provision of:
  - Continued accommodation – m....., hotels, motor camps
  - Emergency accommodation – schools, halls, p..... homes
  - Food and clothing
  - A..... transport
  - Medical c.....

### **I. Help for the West Coast from Outside Neighbouring Regions**

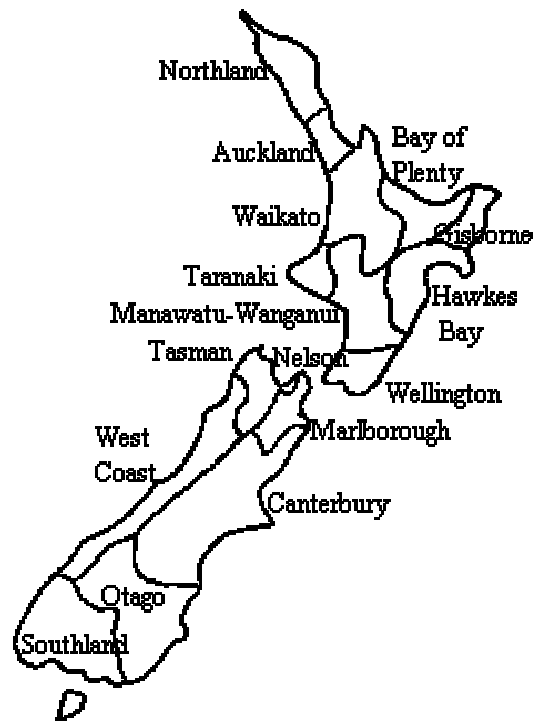
Help is available for the West Coast Region in the event of either a regional or national level civil defence callout due to major natural hazard event. Neighbouring regional councils in the South Island are:

- T..... District Council (TDC) HQ in Motueka
- Canterbury Regional Council (Ecan) HQ in C.....
- O.....Regional Council (ORC) HQ in Dunedin

West Coasters could also reasonably expect aid in one or another format from Christchurch, Dunedin and Nelson City Councils and if the event was really disruptive (e.g. a Force 7 or 8 earthquake), from the National Government in W..... and other North Island agencies.

**QUIZ:** Think about this!! How did the first message about the 1929 Murchison Earthquake get out from Westport to the rest of NZ?

## CD Regional Administrative Areas in New Zealand



Map showing regions adjoining the West Coast from NZ Councils Website at <http://www.oultwood.com/localgov/newzealand.htm>

### J. Photo Gallery: Answer the Questions in spaces provided



What does this rock groyne on the Waitangi-taona River, South Westland do?

.....



Which lifeline is at risk in this photo? .....

What is the digger trying to prevent? .....



Which lifeline is at risk here? .....

Name 2 places on the West Coast this could happen. ....



Flooding at Omoto Valley Road, Kaiata. Name some other lifelines which flooding could render unserviceable. ....



Which major natural hazard can be seen from this satellite photo? .....

When is the next movement on this predicted to happen? .....

How do you think West Coast Lifelines will stand up to this? .....

## Teacher Answer Sheet: Introduction: Read only

### Civil Defence and Emergency Management

The Civil Defence Emergency Management Act (CDEM Act) 2002 came into effect on the 1<sup>st</sup> December 2002 and replaced the Civil Defence Act 1983.

*The following information has been derived from the CDEM Website at [www.civildefence.govt.nz](http://www.civildefence.govt.nz) For more information refer to the CDEM Act 2002 pages.*

#### Principal Provisions of the new CDEM Act 2002

- This new act updates and redefines the duties, functions and powers of central government, local government, emergency services, lifeline utilities and the general public.
- The new Act ushers in a regime of comprehensive and integrated management with emphasis on the 4R's (Reduction, Readiness, Response and Recovery).

**More details are available from your school's Natural Hazard Resources CD Rom, Items 1-9 Appendix 3 OR from the relevant website page.**

**Teacher Answer Sheet:** Read the following, allowing students time to fill in the missing words on their worksheets. The missing words are shown here in **bold**. Go over at end of lesson.

### Lifeline Utilities

One key aspect of modern Civil Defence Management

*[This worksheet material has been adapted from the Guidelines Page, CDEM website]*

#### A. Definition

Lifelines are essential "utility" services which support **life** in our community. They include such services as water **supplies**, sewerage systems, **storm** water drains, **power** gas, **telecommunications** and transportation networks (**road & rail**).

**B. Documents** relevant to Lifelines Utilities under the new CDEM Act 2002 are:

4. The Director's Guidelines' or DGL 3/02 (pursuant to section 8(2)e of the Act). This document is called ***WORKING TOGETHER. - Lifeline Utilities and Emergency Management.***
5. A 'best **practice** guide' supplement to the Director's Guidelines called ***Lifelines and CDEM Planning*** which explains in detail how **co – operative** CDEM planning can occur between utilities and CDEM agencies.
6. A discussion paper about ***Improving Utility Disaster Resistance*** which is available on the Papers page of the CDEM website.

### C. Lifelines in New Zealand

The Lifelines concept originated in the United States in the **1970's** following the realisation that while considerable effort had been put into the **seismic** response of buildings and other structures, relatively little was known about the likely performance of utility services.

The focus of lifelines in New Zealand is on **regional** scale events that are beyond the ability of individual organisations to respond to and control. Nevertheless the responsibility for taking appropriate mitigation (**prevention**) and preparedness steps remains with these individual organisations.

While early work focused on earthquakes as the principal hazard, lifelines projects now encompass an **all** hazards approach – that is, working through all of the natural hazard agents that could affect a region.

*The overall objectives of lifelines projects are:*

- to reduce **damage** levels following a major disaster event; and
- to reduce the **time** taken by these lifeline services to restore their usual level of service

*Utility and transportation network operators are brought together within a region, with input also provided by scientists and **engineers**, emergency managers, and planners. In this way, lifelines groups facilitate and motivate a **collective** physical risk management process for regional scale events/impacts.*

*The actual process involves the following key steps:*

- **Identify** the hazards which could affect each lifelines network
- List the various **networks** in the given region
- Assess the **vulnerability** of the lifeline network to those hazards
- Assess the potential **damage** to and consequences for each network
- Identify and implement practical mitigation **measures**.
- Prepare of comprehensive emergency **response** plans

The principal output from lifelines projects is the identification of possible physical **mitigation** measures that operators of utility and transportation systems can undertake to reduce the risk from the major identified hazards.

#### D. The Benefits from Lifelines Projects

For more information about the benefits of lifelines projects look at the work of the **Auckland** Engineering Lifelines Group on the CDEM website. This provides a framework by which utilities can apply lifelines projects results.

#### E. Current Status of Lifeline Utilities Projects in New Zealand

At the end of 2003 lifelines utilities projects which had gone through the steps outlined above had been completed for each of the **four** main centres, with another **twelve** well underway for the remaining regions and cities.

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#### F. About Lifeline Utilities on the West Coast

*Lifelines Utilities come in 2 main classes. These are:*

##### **Specific Entities:**

- |                         |                               |
|-------------------------|-------------------------------|
| • <b>radio</b> stations | e.g. Coast FM, National Radio |
| • airports              | e.g. <b>Hokitika</b> Airport  |
| • shipping              | e.g. Port of <b>Greymouth</b> |

**Other Classes of Entity:**

- generation/distribution electricity e.g. **Trustpower**
- maintaining a water supply e.g. for **Runanga**  
by Grey DC
- provision of a sewage system e.g. for Kaniere residents by  
**Westland DC**
- provision of a roading network e.g. by **Transit**
- provision of a **rail** network e.g. by Tollrail
- distribution of **petroleum** products e.g. by **Shell** tankers from  
Nelson
- provision of telecommunications e.g. by **Telecom** to  
whole region

***As well as these criteria lifeline utilities can also be characterised as being:***

- **National** e.g. telecommunications, energy transmission,  
road & rail, broadcast media (**TV** and **radio**)
- **Regional** e.g. lines companies, **airports**, ports
- **Local** e.g. **water** supplies, waste-water systems

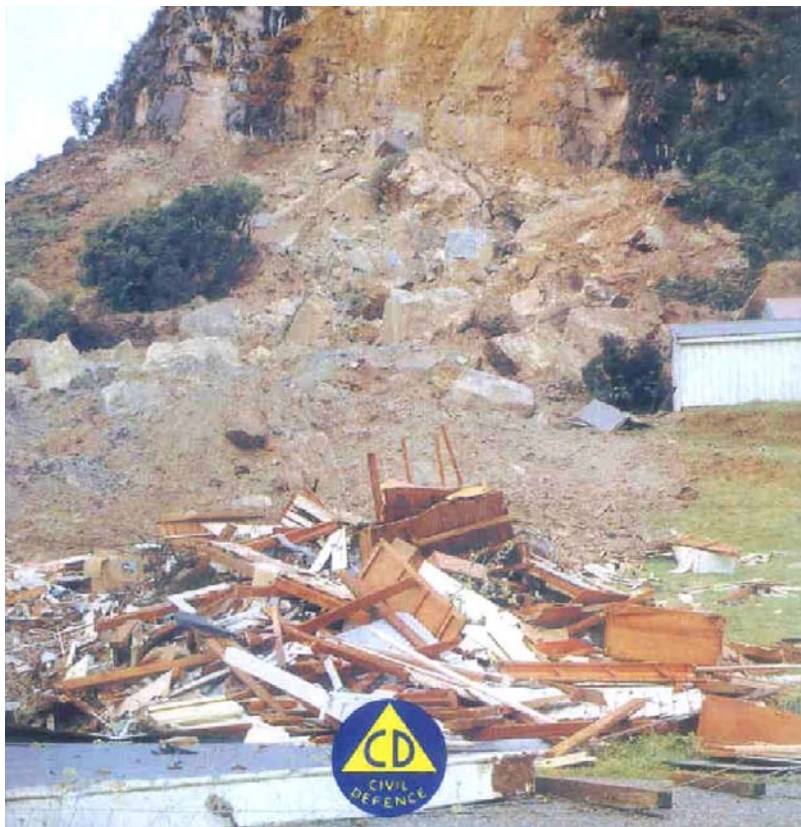
As a general rule of thumb in the event of a civil defence emergency **safety of life issues will always get first priority**. For instance the evacuation of persons trapped by **floodwaters** to safety or getting injured persons to **hospital** will take precedence initially in an emergency but ensuring personnel and transport are assigned to maintaining or repairing lifelines must take place from the outset because the h..... and economic viability of communities depends upon their continued operation.

It is essential that lifelines utilities are resilient to emergencies and that their emergency planning is integrated with the wider community's CDEM planning in order for both to be effective. Effective planning can only be assured through sound relationships between utilities, and with local government and the emergency services. **In general "PEOPLE make the Difference, not Plans."**

**G. West Coasters making a difference:**

A number of groups ensure that regional plans are carried out here. They include:

- West Coast CDEM Group (representatives from the **four** councils)
- Members of the West Coast Lifelines Utilities
- Members of the Greymouth **Floodwall** Committee
- **Council** Civil Defence Officers
- Local Civil Defence Wardens
- **Residents** trained in Civil Defence
- Ambulance Service
- **Air** Ambulance
- Rescue Helicopters
- **Fire** Service
- Search & Rescue Groups (Urban, Land, **Marine** )
- **Mines** Rescue



One of the main slips caused by the 1968 Inangahua Earthquake.  
The readily recognisable Civil Defence logo shown in front

## H. West Coasters Taking Responsibility

### Community responsibilities:

The West Coast community can be defined as all the individual residents, institutions, businesses, tourism operations and government agencies. These have a collective responsibility to undertake the **4 R's** which are:

- e) **Reduction** of hazard effect or hazard occurrence
- f) **Readiness** to **cope** with projected hazard
- g) **Response** in the event of hazard occurrence (**emergency** response)
- h) **Rehabilitation** of the **effects** of the hazard including forward planning for better a) and b)

### Before an Emergency: [a) Reduction and b) Readiness]

Before an emergency all groups need to put themselves out to reduce the effects of any hazards or even prevent. Much of this can be done:

- by applied commonsense forward planning in the **home** as per public education
- by preparing emergency plans and procedures in institutions (**schools**, retirement homes)
- by developing contingency / emergency plans for businesses (**shops**, factories, offices)
- by having local lifelines utilities **plans** in place
- by **tourism** operators recognising and providing for clients overstaying due to hazard events

### At the time of an Emergency: [c) Response and d) Rehabilitation]

Adult residents on the West Coast have a one, two or even three fold role with respect to civic responsibility at the time of a CD defence emergency. The roles are:

- Caring for **themselves**, those in their own households and in their immediate vicinity. Think:
  - Self
  - Immediate family members
  - Pets
  - Neighbours and/or elderly **relatives** nearby

- Caring for the **community** through organizations they belong to
  - District /Regional Council (staff on call)
  - Civil Defence
  - **Police**
  - St. Johns Ambulance
  - Fire Brigade
  - Urban Search & **Rescue**
  - Other sections of Search & Rescue e.g. **Cave, Whitewater**
- Caring for visitors from **overseas** in the region by the provision of:
  - Continued accommodation – **motels**, hotels, motor camps
  - Emergency accommodation – schools, halls, **private** homes
  - Food and clothing
  - **Alternative** transport
  - Medical c.....

### **I. Help for the West Coast from Outside Neighbouring Regions**

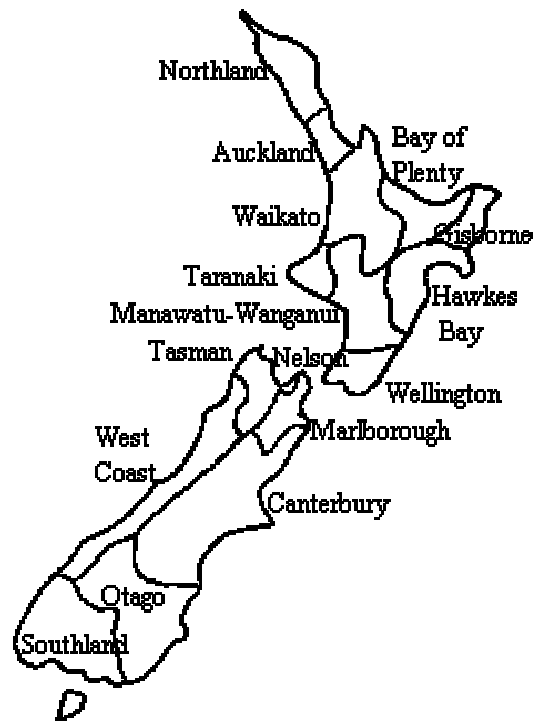
Help is available for the West Coast Region in the event of either a regional or national level civil defence callout due to major natural hazard event. Neighbouring regional councils in the South Island are:

- **Tasman** District Council (TDC)                      HQ in Richmond, Nelson
- Canterbury Regional Council (Ecan)    HQ in **Christchurch**
- **Otago** Regional Council (ORC)                      HQ in **Dunedin**

West Coasters could also reasonably expect aid in one or another format from Christchurch, Dunedin and Nelson City Councils and if the event was really disruptive (e.g. a Force 7 or 8 earthquake), from the National Government in **Wellington** and other North Island agencies.

**QUIZ:** *Think about this!! How did the first message about the 1929 Murchison Earthquake get out from Westport to the rest of NZ? ANS: **Ship's radio***

## CD Regional Administrative Areas in New Zealand



Map showing regions adjoining the West Coast from NZ Councils Website at <http://www.oultwood.com/localgov/newzealand.htm>

### J. Photo Gallery: Answer the Questions in spaces provided



What does this rock groyne on the Waitangi-taona River, South Westland do? **It diverts water toward the other side of the river to prevent erosion.**



Which lifeline is at risk in this photo? **Access road to Franz Josef glacier**

What is the digger trying to prevent? **The river taking out the floodwall**



**Which lifeline is at risk here? Road** between Nelson Creek and Haupiri

Where else on the West Coast this could happen. **Otira, Lewis Pass**



Flooding at Omoto Valley Road, Kaiata. Name some other lifelines which flooding could render unserviceable. **Sewers, water supplies, 'phones**



Which major natural hazard can be seen from this satellite photo? **Alpine Fault**  
When is the next movement on this predicted to happen? **Within 30–50 yrs**  
How do you think West Coast Lifelines will stand up to this? **Not very well**

# Alpine Fault Study

## “Investigate the Geological Features of an Area”

<b>SUBJECT</b>	Science
<b>TOPIC</b>	Earth Science
<b>YEAR</b>	12
<b>UNIT STANDARD 6361:</b>	Part C of Assessment, “To Investigate the Geological Features of an Area”
<b>DURATION</b>	8 – 10 hours (for Part C only)

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## Alpine Fault Study

### Part C Assessment Description

***C: A geologist has to be open minded and think laterally in order to be able to construct what has happened in the past from the evidence available in the present. Geologists must be able to think in 3D and consider what has happened below the ground as well as on top. After completing the class field trip tasks and making observations and notes:***

1. Write a short paragraph describing the landscape features at the study site, e.g. the position of the mountains and main rivers
2. Write a short paragraph describing the geological features at the study site, e.g. the trace of the Alpine Fault. Ensure you describe the direction in which the fault lies.
3. Draw a series of labelled diagrams describing the sequences of geological events that have happened at this site. Arrange the sequence from youngest to oldest. You will be given information to help you do this on:
  - The different types of rock
  - Faulting and fault movements
  - The major displacement along the Alpine Fault
  - The uplift which has created the Southern Alps
  - Metamorphism and shearing at the time of major fault movements
  - An overview/history of the Alpine Fault from its beginnings until now
  - The various methods used to predict future Alpine Fault movement
  - The implications of an Alpine Fault movement/earthquake in Civil Defence terms

*Your teacher/tutors will explain the background at the study site but you will need to work out for yourself much of what has happened. Make sure you utilize your own observations and sketches from the field trip in presenting your series of labelled diagrams.*

4. What else could we have found out from the general area of the study site? For example, did we find out about the Mt Griffin Serpentine? Write a short paragraph describing what aspects of the local geology require further investigation.

### Element 3:

Report on the geological history of a specified area.

### Performance Criteria:

- 3.1 The report describes the landscape features of the specified area
- 3.2 The report describes the geology of the specified area
- 3.3 The report outlines for the specified area the sequence of geological events in order from oldest to youngest
- 3.4 The report identifies issues that require further investigation of the geological features of the area

## **Field Trip**

On this field trip you will be making field observations and gathering data to complete the above assessment tasks. The data will be gained by studying a section of the Alpine Fault, and the mountains on either side of it, in an area where it runs along the valley of the Taramakau River.

The Alpine Fault trace can be seen readily in this area and beyond toward Haupiri. The point where the main road crosses from the Australasian Plate onto the Pacific Plate is marked by a definite "step" just east of the Wainihinihi Bridge. Long term action along the Alpine Fault has given rise to three very different types of mountains in the area on either side of the fault. These mountains have also been shaped by the Taramakau Glacier in the last Ice Age.

On the Australasian Plate [west] side there are large blocks of igneous rock (e.g. Mt Te Kinga, the Hohonus and Mt Turiwhate while on the Pacific Plate [east] side the basement Greenland Group rocks have been altered by metamorphism due to past movement/earthquakes along the Alpine Fault, to other rock forms. The most common alteration rock is schist from greywhacke but there are limited areas of ultramafic basement rocks in the Mt Griffin – Mt Tara Tama area which have been altered in varying degrees to produce green coloured rocks ranging from talc through serpentine to nephrite jade.

## Field Trip Tasks

Tasks will fall into two areas at the study area.

### 1. Forming the big picture:

To do this use the base work map given to you to:

- Draw in the Alpine Fault trace
- Draw in the Hope Fault trace
- Note where you think they intersect
- Add in the mountain blocks, colour coding these as to type
- Label the utilities running through down the Taramakau Valley
- Work out the line of direction of the Alpine Fault
- Work out the line of direction of the Hope Fault
- Show path of last glaciation with arrows
- Show area affected by glaciation with light cross-hatching or shading

### 2. Forming the "on the spot" picture

a) Take a sheet of A4 paper and a pencil and using the paper in landscape format:

- Stand where you can see the road as it moves up the step from plate to the other
- Note the direction you are looking along the fault
- Note which plate is on right and which is on left
- Estimate in metres how high the step from one to the other is
- Estimate over what width in metres this happens
- Sketch the information onto your page as a side view
- Label both plates
- Put in your estimated measurements
- Put in scale for your measurements
- Give your page a title which includes the direction in which you viewed all this

b) Repeat this exercise again at Inchbonnie where the Jackson's – Moana road drops down off the Pacific Plate onto the Australasian Plate. Once again note the viewing direction and use the same scale for your measurements.