



National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Exemplar for Internal Achievement Standard Geography Level 1

This exemplar supports assessment against:

Achievement Standard 91009

**Demonstrate geographic understanding of the sustainable use
of an environment**

An annotated exemplar is an extract of student evidence, with a commentary, to explain key aspects of the standard. These will assist teachers to make assessment judgements at the grade boundaries.

New Zealand Qualification Authority

To support internal assessment from 2014

	Grade Boundary: Low Excellence
1.	<p>For Excellence, the student needs to demonstrate comprehensive geographic understanding of the sustainable use of an environment, using geographic terminology and concepts and showing insight.</p> <p>This typically involves:</p> <ul style="list-style-type: none"> • fully explaining the consequences of the use of the selected environment on people and the environment • fully explaining the sustainability, or otherwise, of the selected environment with continued use. <p>The student demonstrates comprehensive understanding through effective use of geographic terminology, and knowledge of the spatial dimension of the selected environment of the Waitaki Basin.</p> <p>This student researches the consequences of Hydro Electric Power (HEP) development on this environment, focusing on four different aspects, with loss of habitats exemplified. The explanation identifies cause and effect relationships (1) and the use of current statistical evidence to demonstrate the negative consequence (2).</p> <p>The sustainability of the Waitaki Basin with continued use for HEP generation is inferred in the beginning (3), and directly stated later in the explanation (5). The full explanation discusses a range of initiatives (4) including future development proposals (6).</p> <p>To reach Excellence more securely, the student would need to use geographic concepts in their explanations, e.g. interaction, see Explanatory Note (EN) 2. The inclusion of a map would effectively illustrate the spatial dimension (EN3).</p> <p>Insight could be demonstrated more clearly by showing understanding of causal relationships between the different initiatives, such as with Project River Recovery and future power generation. A comprehensive understanding of the sustainability of this environment should show that it relies on an integrated approach that focuses on many aspects of the environment.</p>

Student 1-Low Excellence

The context relates to Hydro Electric Power (HEP) development in the Waitaki Basin.

The development of HEP is a huge threat to the braided river habitats in the Waitaki Basin where many native and threatened plant and animal species live. The construction of dams along with drainage and water diversion at...has led to changes in the natural flow of water in the following major braided rivers When the lake levels are raised a lot of the natural habitats of both the river and wetlands are flooded and destroyed, evidence of this occurring is at... [1]

In spring and summer approximately 26 species of water birds e.g... feed and nest in the WB braided river system and one consequence of the flooding is the loss of nesting sites which directly impacts on impact on the population numbers of many species. They are forced to nest in areas more prone to flooding which would be a danger to their young. In 2008 the population of wild adult Kākī was down to 93, but with recent DOC intervention... [2]

Braided rivers also supply vital habitats for many other species of fauna and flora, these species include...

Destruction of habitats disturbs the larger ecosystem through interruption of the food chain.

A flow diagram was incorporated to illustrate this idea with species common to the WB environment.

I think that the actions currently taken by Meridian Energy are mitigating the effects of their HEP scheme on the ecology of the Waitaki Basin [3]. Meridian Energy is currently trying various ways of balancing meeting the demand for electricity with the need to protect the environment...They work to minimise the environmental effects of the generation of HEP, making sure that water that flows through the hydro-scheme is used efficiently and they work with both national and local groups to help identify and manage any environmental issues. Meridian Energy works with the DOC to help protect braided river and wetland ecosystems...Project River Recovery was formed in 1990 and is funded by Meridian Energy. Its activities include monitoring the environment, controlling river bed predators, building new wetlands...this project is extremely successful with positive impacts on the native and threatened species. Meridian Energy funds the release of salmon smolt in the lower Waitaki River to ensure...Meridian Energy has been working with local iwi on a programme to enable elver to travel safely over the dams... [4]

Development of hydroelectric power in the Waitaki Basin has proved to be a huge threat to the braided river ecosystem as outlined in section 2 of my report, but by taking action early and with a many pronged approach it must be considered a sustainable use of this environment. The projects undertaken all focus on the long-term and secure the future for many species e.g. the creation of replacement wetland habitats... [5]

The proposal for future HEP development in the Waitaki basin [6] between Lake Pukaki and the Pukaki-Ohau Canal ... This proposal will include construction of temporary buildings, ...but the water levels will not need to be raised so the braided rivers and wetlands, and the habitats that they contain, will not be flooded. This demonstrates that lessons have been learned regarding the implications of HEP development for the environment and the commitment to ensure future sustainability of this environment and this use.

	Grade Boundary: High Merit
2.	<p>For Merit, the student needs to demonstrate in-depth geographic understanding of the sustainable use of an environment.</p> <p>This typically involves:</p> <ul style="list-style-type: none"> • explaining the consequences of the use of the selected environment on people and the environment • explaining the sustainability, or otherwise, of the selected environment with continued use. <p>The student demonstrates in-depth understanding through clear explanations using some relevant geographic terminology.</p> <p>The student researches the consequences of HEP development on the Waitaki Basin, focusing on three aspects of this environment; the river, wetlands and surrounding area. Extracts from the river section are used.</p> <p>Maps clearly support the explanation and demonstrate understanding of the spatial dimension (1). The response is well structured, with the development and linking of key ideas demonstrating an in-depth understanding of the consequences to the affected rivers (2) (3).</p> <p>The student has clearly addressed the extent to which HEP is a sustainable use of the Waitaki Basin (4) (6). Actions taken are clearly explained with a view to sustainability (5).</p> <p>To reach Excellence, the student would need to use more specific evidence in the explanations. While the geographic concept of change is clear in the explanation of the consequences for the environment (2) (3), this requirement for Excellence would need to be evident throughout the response.</p>

Student 2 - High Merit

The context relates to Hydro Electric Power (HEP) development in the Waitaki Basin.

HEP development in the Waitaki has reduced the area of braided rivers which is a major part of this environment, see highlighted areas on the map. The flooded areas shown in blue have created more issue for the areas south of the ... *Two annotated maps showed the major rivers before and after dam construction* [1].

When construction of the dams and canals were finished, areas of braided river were either completely submerged or diverted, and in all cases the natural channels were changed. The dams reduced seasonal flooding which is necessary for the health of the river and creation of new braids. The seasonal/natural flow has been replaced with controlled release of water, much of which is diverted from the river into canals. This has reduced the water volume and changed the characteristics of the river. With less water in the lower reaches, weeds especially Russell Lupins, have tended to invade the channel covering the open gravel nesting habitat used by various species of birds [2]. These plants provide better cover for predators such as feral cats, stoats...and these two factors have affected the native bird populations...

Above the dams the characteristics of the braided river have also been changed to form lakes. The submerged areas resulted in the loss of river beaches and small islands that form in the river channel. Loss of these nesting areas and reduction of those downstream has seriously impacted on bird populations... [3]

The lakes that have been formed as storage for the HEP process are used for recreation and this has led to infestations of didymo which is causing major problems in the Waitaki affecting both other species using the river ecosystem and the dams.

HEP generation is a sustainable use of the Waitaki Basin environment Even though it has affected the environment a lot of people have worked to ensure that the flora, fauna and quality of the river are protected now and in the future [4]. Meridian energy works alongside DOC, Fish and Game, local iwi etc. to address environmental issues. The role of Meridian Energy is largely through funding key projects.

Project River Recovery is important to ensure sustainability of the environment as it focuses on maintaining the braided river and wetland habitat with an aim to protecting populations of native plants and animals. One action that directly responds to improving sustainability is the development of wetland habitats [5] to replace those lost after dam construction. Predator fencing will be used and this will provide a safer environment for endangered species compared to before the changes... Ecological research is also funded and is ongoing, this is important to make sure that issues are identified and acted on before they seriously affect the environment...

...Meridian could improve energy output, with minimal effect on the environment by adding a power generating station at the dam on Lake Pukaki. This could use a turbine on the spillway and this wouldn't result in any more flooding... This proposal shows that future use for power generation does not need to create any new risks to the environment, so it would have to be considered a sustainable use of the Waitaki Basin [6].

	Grade Boundary: Low Merit
3.	<p>For Merit, the student needs to demonstrate in-depth geographic understanding of the sustainable use of an environment.</p> <p>This typically involves:</p> <ul style="list-style-type: none"> • explaining the consequences of the use of the selected environment on people and the environment • explaining the sustainability, or otherwise, of the selected environment with continued use. <p>The student demonstrates in-depth understanding by explaining the consequences for the environment with specific evidence (2) (3). The two main forms of aqua farming are explained as impacting on the environment of the Marlborough Sounds.</p> <p>Understanding of the concept of sustainability in relation to aquaculture in the Marlborough Sounds is explained, with examples of actions taken that are clearly linked to 'future sustainability'. For example, reference to NIWA's research (5) and other interest groups with a long term commitment to sustainability (4).</p> <p>To reach Merit more securely, the explanation of the consequences for people (1) needed to be developed further. This could be achieved through the use of statistical or case study evidence, and more detail provided for the actions taken by different groups (4).</p> <p>When explaining the extent to which aquaculture is a sustainable use of the Marlborough Sounds (6), the student would need to refer to salmon farming, since this is identified earlier in the response as a potential risk to the sustainability of the environment (3).</p>

Student 3 - Low Merit

The context relates to aquaculture in the Marlborough Sounds.

Consequences on people: Aqua farming is a growing employer in the Marlborough Sounds... Businesses like King Salmon NZ, has farms in Tory Channel and employ people out on the water and also in the processing plants. Aqua industry is important for the region's economy because it employs a lot of people... [1] (A simple flow diagram was included but it lacked specific context evidence.)

Consequences on the environment: Aqua farming has impacted the coastal marine environment. Mussel farms are seen from the inter-island ferry in Tory Sound and some people think this is ugly and a blot on the landscape but their environmental impact is fairly limited.

Mussel farms are fairly temporary, being made mostly of lines of ropes and floats... Mussels are native to this area and live off single cell algae and plankton and do not require additional food to be added to the ecosystem [2]. There could be an impact from the large numbers of mussels in an area but because of the high tidal change the water and the fact that mussels filter water, the water quality in the Sounds is maintained.

Salmon farms have more serious impacts. The salmon are fed fish meal which is imported and contains proteins, vitamins and carotene which can seep into the surrounding marine life. The feeding times increase the reliance of other animals e.g. seals, on the salmon, the risk of disease is high and the fast swimming salmon have eroded the sea bed...[3]

Processing of fish products has also led to some waste being dumped in to the sea... Increasing the number of salmon and mussels in the area changes the balance and this can attract more of some fish and fewer of others e.g. blue cod...

Sustainable use of the environment: Some forms of aquaculture are more sustainable than others... protection of the environment is essential for long term aquaculture... An action group Guardians of the Sounds has been set up to ensure that any future development of the Sounds is sustainable. Other organisations involved in research and monitoring of aqua farming are DOC, Ministry for the Environment, NIWA, Green Peace, local councils etc. using a range of laws e.g. RMA... [4]

NIWA is involved in research to find out the best numbers and sizes of farms that can be supported by the Sounds environment. This involves finding out how much food is needed by the salmon and that this doesn't affect any other sea life...amount of discharge... impact on water flow...This information is critical to the future sustainability of aquaculture in the Marlborough Sounds by focusing on the wider impacts... [5]

The mussel farms have limited environmental impact partly due to the sustainable farming practices adopted, they limit noise emission, use recycling and do beach clean ups. These activities focus on the wider environment and not just the immediate mussel farming area which helps to ensure the health and productivity of the Marlborough Sounds... I think that mussel farming is a sustainable use of the Marlborough Sounds [6].

	Grade Boundary: High Achieved
4.	<p>For Achieved, the student needs to demonstrate geographic understanding of the sustainable use of an environment.</p> <p>This typically involves:</p> <ul style="list-style-type: none"> • describing how and why people use the selected environment • describing the consequences of the use of the selected environment on people and the environment • describing the sustainability, or otherwise, of the selected environment with continued use. <p>The student demonstrates some depth in their understanding as they begin to extend descriptions, to explanations of the environmental consequences of aquaculture (3).</p> <p>The annotated map clearly demonstrates understanding of the spatial dimension of the selected environment and describes how and why the Marlborough Sounds is used for aquaculture (1).</p> <p>Sustainability of aquaculture in the Marlborough Sounds environment is clearly described. Relevant actions are described (4), and some links are directly made between actions taken and the extent to which the environment is impacted, inferring the extent to which this use is sustainable (5).</p> <p>To reach Merit, the student would need to extend the descriptions, especially of the consequences for people (2), to explanations. Evidence needs to directly respond to the task focus. For example, the viewpoint of the Guardians of the Sounds (2) needs to be explained as a consequence of aquaculture.</p>

Student 4 - High Achieved

The context relates to aquaculture in the Marlborough Sounds.

[1]

A map to show how and why people use the Marlborough Sounds environment

The Sounds have sheltered waterways, bays and coves, pristine waters and lots of marine life, make it a good location for aqua farming. There is high tidal change which is perfect for mussel farming as they filter 360 litres of water a day, and places with really deep water 45-80m which is good for salmon farming.

Costs of setting up mussel farms are relatively low as they are just buoys and ropes in the water. Salmon farms are more costly as they need netted fish tanks and a permanent floating pontoon for machinery and workers accommodation.

The Sounds are sheltered from Cook Strait, so the climate is reliable and there isn't too much wind. This is another reason why aqua farming began in 1960's and has been successful ever since. There are over 560 mussel farms in the Sounds, most in Pelorus. Recently King Salmon have wanted to expand their operations to a total of 9 salmon farms within the Sounds. This environment is great for growing mussels and salmon, it is a profitable business selling products that New Zealand is famous for, King Salmon and Greenshell™ Mussels.

Access is easy as farms can be reached by boat from Picton: the main port, workers can commute easily every week. They can then be taken to the packaging plants in Picton and Havelock and then distributed around New Zealand and the world by sea or air freight (Picton and Blenheim).

KEY
 --- Ferry
 ● Salmon farms
 Land
 * mussel farms

Consequences for people

The consequences of aqua farming for people...local residents have been opposedThey see them as an eyesore and harmful to the local marine life. They have even started up a support group Guardians of the Sounds who have the motto, "Save our Sounds" to oppose expansion of aquaculture [2]. On a more positive note, the aqua farms have provided people with jobs... at a time when the region was suffering high unemployment. The farms now cover an area of about 4000 ha. and each mussel farm is about 1-20ha. People working on a mussel farm mostly work one week on and one week off.

Many tourist operators focus on the mussel farms as they operate tours and trips to see the farms in action and to taste and buy the products...

Consequences for the Environment

The impacts of mussel farms are considerably less than that of salmon farms. Mussel farms are temporary. They are made up of lines of ropes... Floats are attached to them and are all most people see. There isn't a permanent house or building...Mussels have minimal impact on the local marine life as they would naturally grow in the Sounds anyway and are part of the natural ecosystem. They could be considered beneficial to the marine environment as they filter the water [3].

I think that aquaculture in the Marlborough Sounds can be sustainable for future generations. It will depend on mussel and salmon farms continuing to manage their farm to protect the Marlborough Sounds environment...

Mussel farms already operate pretty sustainably... and the environmental impact they have is very limited. Mussel farms have a water monitoring system that ensures no toxins from the farms go into the surrounding water. This monitoring system also detects oil spills or toxic runoff from the land [4]. The ropes ensure that there is no dredging or disturbance of the sea floor and the farm can be removed leaving the environment in its original state, showing no harm to the environment [5]. The MD Council has been consulted to choose the best sites that will have minimal impact on people and the environment.

Salmon farms do adopt sustainable farming practices but could do more to secure the future of the Sounds. The salmon farms are less sustainable as they feed imported food to the fish.

	Grade Boundary: Low Achieved
5.	<p>For Achieved, the student needs to demonstrate geographic understanding of the sustainable use of an environment.</p> <p>This typically involves:</p> <ul style="list-style-type: none"> • describing how and why people use the selected environment • describing the consequences of the use of the selected environment on people and the environment • describing the sustainability, or otherwise, of the selected environment with continued use. <p>The student demonstrates geographic understanding through simple descriptive responses that meet the requirements of the standard. For example, the student describes both why and how the selected environment is used for coal mining (1) (2). The sustainability of the environment is directly stated (5) including evidence to support the decision (4).</p> <p>Photographs were included with the work, which illustrated the spatial dimension of the selected environment.</p> <p>To reach Achieved more securely, the student would need to show clearer links between the selected evidence and the specific requirements of the standard. For example, mining processes are only relevant if they show how the environment is used (3).</p> <p>Descriptions of the solutions to some of the environmental issues (4) need to be linked to the future sustainability of the selected environment. For example, the student could describe methods of keeping the creek water clean, as a polluted stream would harm a much larger area and affect the overall sustainability of this environment.</p>

Student 5 – Low Achieved

The context relates to coal mining in the Grey Valley.

Site photographs were included

Coal mining takes place at Giles Creek because there is good quality coal there. It is easy to mine because it is not too deep in the ground [1]. A road built in 1930 makes it easy for heavy machinery and people to access the mining area. This area was only bush so mining was able to happen... *photographs of the mine site were included.*

Before mining started they drilled to check where most of the coal was. The type of mine at Giles Creek is open cast which is a large pit created by clearing the bush and removing the topsoil and rock [2]. They use dynamite to get the coal out and it is then taken to be washed. Another process in mining is the sorting of the coal in to grades like grits, chips... large clumps have to be crushed [3].

The mining company takes steps to solve the environmental problems while mining is happening. They monitor the creek water to make sure chemicals and waste are not polluting it and they use filtering ponds before putting used water back into the creek... [4] After mining the pit has to be filled in and covered with topsoil, then they can replant it and bush can grow back when mining is finished. This is called rehabilitation... In future years this area should show no signs of mining. I think that the environment will be better after lots of native trees are planted and it could become a nature reserve. It is a sustainable use of the Giles Creek environment [5].

	Grade Boundary: High Not Achieved
6.	<p>For Achieved, the student needs to demonstrate geographic understanding of the sustainable use of an environment.</p> <p>This typically involves:</p> <ul style="list-style-type: none"> • describing how and why people use the selected environment • describing the consequences of the use of the selected environment on people and the environment • describing the sustainability, or otherwise, of the selected environment with continued use. <p>The student demonstrates some geographic understanding of the processes involved including rehabilitation and the consequences of mining in the environment of Giles Creek, Grey Valley.</p> <p>The chart contains some relevant information for both how and why the selected environment is used for mining, with some of the 'how' ideas described in the second section (2). Negative environmental consequences of mining are described (3) and methods of rehabilitation are described, inferring that mining is a sustainable use of this environment (5).</p> <p>To reach Achieved, the student would need to describe why the selected environment is used for mining; listing key reasons on a chart is insufficient (1). Inclusion of a map could help provide evidence of the spatial dimension of the environment.</p> <p>Geographic understanding of the concept of sustainability must be demonstrated, and clearly differentiated from renewable and non-renewable resources (4). For example, even though coal is a non-renewable resource, mining can be considered a sustainable use of the environment if rehabilitation is effective, showing use of native trees etc. resulting in sustainability of the Grey Valley environment.</p>

Student 6 - High Not Achieved

Coal mining: Giles Creek, Grey Valley

Why?	How?
Quality coal ore Near the surface Roads Workers	Open cast mining Clearing bush Sorting and crushing Transporting

[1]

At the Giles Creek they have made an open cast mine. The first job was to take all the top rock off and then the coal can be blasted out with dynamite [2]. This type of mining affects the environment because the topsoil and plants in the beech forest get removed. Removing the bush affects the birds, possums, and insects... The Giles Creek could get polluted from waste rock and chemicals used at the mine... [3] Ponds are used for the storing of dirty water but after heavy rain these could overflow and pollute the soil...

Coal mining cannot last for ever because it is a non-renewable resource. The land and the bush are renewable and after mining it can be put right... [4]

Pollution of the creek is a risk and if this happens lots of fish and birds could be poisoned which couldn't be replaced later... The last stage in the mining process is rehabilitation this is when the pit can be filled with the waste rock and then native trees can be planted. Small trees can be moved from other parts of the bush and when these grow the opencast mine will not be visible... The Giles Creek environment will be back to how it was before mining [5].