AKO AOTEAROA
NATIONAL CENTRE FOR
TERTIARY TEACHING
EXCELLENCE

Resources for Maori Second Chance Learners with a Numeracy and Literacy Focus

Project Title	**Resources for Maori Second Chance Learners with a Numeracy and Literacy Focus**
Project outputs/findings	**Two integrated projects that engage Maori learners and produce evidence to gain NCEA credits and qualifications.** **Project based approach was very successful in increasing soft skills through practical group work and self-esteem through recognised achievement.**
Evaluation of the success of the project against the goals **What is the evidence that this project benefits learners?**	**Evidence that the projects benefited learners can be seen on a number of levels.** **<u>Centre-wide Youth Gain Reports</u>** **Gain reports in numeracy and literacy were as follows:** **Numeracy: Average gain = 26.79 with 21% making significant gains** **Literacy: Average gain = 12.26 with 12% making significant gains** **<u>Ako Project Youth Gain Reports</u>** **Numeracy: Average gain = 37.5 with 32% making significant gains** **Literacy: Average gain = 17.8 with 11% making significant gains** ***These gains also support our primary focus on Numeracy with the projects.*** **<u>NCEA Credits and Qualifications</u>** **From undertaking the projects the evidence was compiled to meet the following:** **For eight students the project enabled them to complete their NCEA Level 1** **Seventeen students achieved Level 1 Statistics 26626** **Nine students achieved Level 1 Number 26623** **Fifteen students achieved level 1 Measurement 26627** **Fifteen students achieved level 1 Listening & Speaking 26625**

	<u>Skills</u> **For every student it was the first time they had actively engaged with scientific equipment (PH test, conductivity, water clarity, compass, magnifying glass.** **<u>Soft Skills</u>** **Very positive feedback from students and staff that students were engaging better around the centre. Many felt it was due to the group work and the positive experiences they had shared together.** **<u>Vocabulary</u>** **The active learning also led to discussions using the correct scientific terms that were at least Level 2 standard and some Level 3.**
Identify: **(a) number of learners involved during the project** **(b) anticipated number of learners who will benefit beyond the project** **(c) the ease with which this project and/or learnings from the project can be replicated/adopted by others**	**19 learners were engaged for the two projects** **Both projects have been confirmed as centre-wide projects for 2015 and beyond. This will engage approximately 30 students per year** **The projects were designed to be easily replicated by others. The Waka project takes a generic approach to Waka designs used by different iwi. The Stream Project can be applied to any local stream/river in the vicinity of the education centre.**
Key recommendations for good practice	**Make the learning relevant to the learner.** **Focus on your goals when designing the project content.** **Include practical activities and group work to engage students.** **Celebrate student success as it also confirms to tutors you are taking the right approach.**

Project 1

The Waka Build

INTEGRATED PLANNING OVERVIEW			
Theme/rich concept/project/ integration name	Waka Build	**Duration: 3 weeks**	
Summary of key concept	**Brief – to build a Maori waka, based on traditional designs as a team, on the beach at Gisborne, that meets the set criteria**		
Units covered and evidence requirements	**Skills required (mini lessons/teaching points)**	**Assessment activity & method**	
3503 -- Interpersonal communications – Participate in a team or group to complete a routine task	• Team structures & purpose • Routine tasks discussed • Roles and responsibilities –discussed and assigned	Assessment portfolio (Vocational Pathways) Ongoing observations Task completed - waka built	
10790 – Converse with others – converse with a colleague	• Language and responses used, fit the situation, occasion, subject matter, medium, and relationship between participants. • The conversation is maintained in a way which fits the situation, occasion, relationship between participants, and topic being discussed. • Clarification is requested in a manner that is clear and non-threatening.	Recording Combined observation sheet – waka see below Or assessment document (ATC)	
26625 – Listen & Speak to communicate – 1 sample - group	• Behaviours demonstrate participation in the interaction- Behaviours – verbal, non-verbal; participation – contributing ideas, sustaining dialogue. • Participation in interactions is appropriate to intended purpose and participants.	Recording Combined observation sheet – waka or observation sheet 26625	
26622 – Write to communicate – 1 sample	• Recount on build day • Including planning, draft copy and editing	Completed recount	
26623 – Make sense of number to solve problems - 1 sample	• Number – place value, multiplication strategies	Complete assessment worksheet – Anwyl to make – Step 5 (Use it again)	
26624 – Read with understanding - 1 sample	• Different types of waka	Completed worksheet - Step 4	
26627 – Use measurement to solve problems – 1 sample	• Pre work – measurement, conversion, estimation, angles, shapes	Completed worksheets Observation sheet on the build day	

Key competency/s and targeted skills		Matapuna Values		Matapuna Tikanga	
Managing self √	**Thinking** √	**Matauranga**	**Whanaungatanga**		
Relating to others √		**Manaakitanga**	**Aroha**		
Using language, symbols and texts √		**Kotahitanga**	**Wairuatanga**		
Participating & contributing √		**Wairuatanga**			

Remaining ER's from units that need to be covered

Units covered and evidence requirements	Skills required (mini lessons/teaching points)	Assessment activity & method
10790	Outcome 1 – Face to face with friend and on telephone - Karina	Observation sheet
18758	Outcome 1&2 - Karina	Vocational pathways worksheets

Note: 107 explanatory notes point 1 must comply with occupational H&S guidelines

Activity – Build a Waka

The students at Matapuna Training Centre spent an intensive 2 weeks in preparation for building their own Waka. The new initiative is designed to make learning more relevant and exciting for the learners whilst raising achievement and self-belief. The students' researched the history of the Waka and chose their own design. Each design was drawn up to scale and team roles were decided amongst the groups. All the literacy and numeracy was embedded into the project so students were learning valuable skills whilst having fun. The final build was originally planned for the beach out of sand but the weather had other plans. The students' were determined to go ahead and in the spirit of the project they decided to build the Waka in the hall out of newspaper.

The activity included the group having to use their original sketch and convert it, using a scale, to a full blown Waka. They had to apply strategies and classroom learning by using conversion, estimation and measuring techniques. Completing the Waka build successfully acted as evidence of the application of their learning and this was further evidenced in the next day's writing of a recount of the activity.

Your problem – To build a Maori Waka based on traditional designs

You are going to research the history of the Waka and choose your own design. Each design will be drawn to scale and team roles decided.

You will use your scaled design to build a full blown Waka. You will apply strategies and classroom learning by using conversion, estimation and measuring techniques. The final build will take place either on the beach or in the Hall depending on the weather.

Three steps for completing project

1. Prior teaching and work at Matapuna Training Centre
2. Work and assessments done at Matapuna and on the beach
3. Follow up activities and assessments at Matapuna Training Centre

Assessment for:	**NZQA**		**PLACE**	**Type of evidence**
Literacy	Actively participate in spoken interactions - groups	(I piece of evidence)	Matapuna and Beach	Observation sheet / record on iPad
Literacy	Read texts with understanding	(I piece of evidence)	Matapuna	Worksheet
Literacy	Write to communicate ideas for a purpose and audience	(I piece of evidence) Recount	Matapuna	Written sample
Numeracy	Use measurement to solve problems-measure	(I piece of evidence) Length, time, estimation, conversion	Matapuna and beach	Waka worksheet & Worksheet on return
Numeracy	Use measurement to solve problems-Shape and transformations	(I piece of evidence) Angles, area, volume	Matapuna	Worksheet
Unit 3503	Participate and communicate in a team or group to complete a routine task	Complete all	Matapuna and beach	Observation sheet / record on iPad
Unit 10790	Converse with others	Complete element 2 – converse with a colleague face-to-face	Matapuna and beach	Observation sheet / record on iPad

1. Teaching Steps/ Process

Learning and Teaching	1. View video Staff drive- Archive-2014-WAKA theme-Waka Intro 3
Learning and Teaching	2. Converse with Others booklet - Unit 19790 - complete
Learning and Teaching	3. Numeracy learning – decimals-metre ruler
Learning and Teaching	4. Numeracy learning – length, estimation, conversion and use of scale – activities, worksheets and Pathways Awarua/BBC Skillwise
Learning and Teaching Assessment task **- for Literacy - reading**	5. Reading background relating to waka – literacy circle read and complete generic worksheet and A. Design Steps- No3&4
Learning and Teaching	6. Numeracy learning – perimeter, area, volume– activities and worksheets and Pathways Awarua
Learning and Teaching	7. Task sheet for waka activity – explain to students the whole process
Learning and Teaching	8. Numeracy learning – time and angles, volume and angles – activities and worksheets and Pathways Awarua
Learning and Teaching	9. Interpersonal Communications (Group) student booklet - Unit 3503 – complete and assign team roles, structure
Assessment task **- gather evidence for Converse and Group**	10. Complete - A. Design steps
Assessment task **- gather evidence for Converse and Group**	11. Explain and complete - B. Team work -
Learning and Teaching Assessment task **- gather evidence for Numeracy- tides, zones**	12. Numeracy learning – time- Tides, Use of tide tables and knowledge of beach zones learning- teach and worksheet –apps, tide tables, newspaper
Learning and Teaching Assessment task **- for Literacy - reading**	13. Reading background on building sand structures - read and complete generic worksheet **and C. Action plan for build- No 2**
Assessment task **- gather evidence for Converse and Group**	14. Explain and complete - C. Action plan for build
Assessment task **- for Converse and Group**	15. Gear needed for build- discuss and list
Learning and Teaching	16. Numeracy learning – Shapes, 3D, Tessellations - teach and worksheet
Assessment task **- gather evidence for Converse and Group and for Numeracy**	17. ***The Grand Build on the beach!!!! -***

Assessment task **- for Numeracy- measurement**	18. Complete assessments for numeracy at Matapuna – Measure and shape
Assessment task **-recount – plan, write and edit**	19. Complete recount writing piece for assessment for literacy needs

Name:_____

Matapuna Training Centre

Waka Project

replica to scale, out of sand, on the beach, using your measurement, estimation and conversion skills. You have to follow the criteria below:

Construction criteria:

- Use stuff off the beach e.g. shells, driftwood, logs, reeds, grasses, sand etc.
- 2 hour max build within the tidal zone.
- Have to seat whole team inside.
- Name of type of waka and the traditional use of the waka displayed on the beach. (Sand writing/tagging/twigs etc.)
- Plan must be shown on the day.
- Scale and conversion are used in the build and your model matches your design.
- Assessment will be based on whether your plan matches your sand waka.
- No rulers or tape measures allowed on beach.
- Evidence needs to be recoded on I-pads.

A. Design steps:

Complete this individually

1. **Name the waka your group has chosen to build,** using the reading material given.
   _____

2. What was your waka traditionally used for?
   _____
   _____
   _____

3. **Work out** how big your waka needs to be to seat your whole team. Show your workings. (All final answers must be in **metres**)

4. **Decide on a scale** to use for your sketch so that you can build the actual full size waka on the beach. Fill in on your design page.

5. **Work out a way to estimate** a **metre** because you can't use a ruler on the beach. Fill in on your design page.

6. **Draw the design to scale**, using the worksheet given, and keeping in mind the material that might be available on the beach.

7. **Label** your design
   - Put in your measurements for the width, length and height.
   - Name the four parts of the waka discussed in the readings and worksheets, both Maori and English
   - At what **angle** have you drawn your tauihu/prow and taurapa/stern _____and_____

Formula you might need: V=lwh A=lw $A=\pi r^2$

8. How much **area** of the beach would you need to build your waka?
   Explain your thinking and show your working.

9. Using your beach zones sketch, c**hoose a site on the beach** within the **tidal** zone, taking into account the **tidal** change.

The high tide will be at 8:34am on the 17 September2015.

a) If the high tide is 53 minutes later every day, when will the high tide be on the 15 September 2015, the day of the build?

Show your working.

b) When would be the best time to start if we have a two hour build time?

Explain

B. Team work

After completing the work book on Interpersonal communications - group interactions – Unit 3503

Choose roles for each group member so that everyone has a job to do both in the planning and building of the waka. Here are some examples of roles – add or change if you need to do so.

Name	Role	Job to do
	Artist	Sketch a plan
	Site Foreman	Organise the build
	Builder	
	Resource manager	

C. Action Plan For Build:

1. **Read** the sand structures 'manual' in a literacy circle
2. As a group, using the stuff you read about on how to build a sand castle, draw up an **action plan** for the steps you will take to construct your waka on the beach,

i. _____

ii. _____

iii. _____

iv. _____

v. _____

vi. _____

D. <u>List gear needed for build and who is going to bring what :</u>
e.g. Buckets for water

_____

_____

_____

_____

Waka Design –
Matapuna Training Centre

Scale:_____:_____

_____m =_____shoes/steps

Each student needs to complete

Name of student _____Team name: _____

Type of waka:_____ Use of waka:_____

Number of paddlers:___

Waka Build Photos 2014

"WAKA BUILDING" WEDNESDAY

On Wednesday morning 11am we were heading to the hall as a class. We were sitting down in the hall listening to what the Anwyl was saying including the rules. We started the Waka Building competition we were using chairs, Newspaper, Masking Tape, 2 pool sticks, Sign and were deciding on what our name of the waka was gonna be it was very hard to decide on our decision. So we started building the (Waka) (Whakahiki Wahine) A.K.A Tenacious Women (we are the Ranga). We laid out the chair then we set out cue sticks we started taping everything together and gathering the resources the stuff we need it started going the way we wanted it started cool

just the way we wanted. We also bought Peter a wig it was so funny I thought how hilarious could this get. The Artists were Rangi & Phoebe & The Site Foreman was Shonel & The Resource Manager was Meleane, Builder in Charge was Burma - Everyone. Mitch was cooking the Kai with Papa Vic, Rora was showing us how to make Omelette. Then we finish our waka. Every class started presenting there waka's and talking about them. We had a mean as lunch which was cooked by the Tutors. Then we had Marshmallows our class had a whole Packet to themselves. We had a crack ~~mom~~ up moments together as a class. Then we had a Panui with Certificates handed to our class for: "Independently working as a team - and using their initiative") Excellence Award.

Waka Build Photos 2015

DIFFERENT WAKA FOR DIFFERENT ROLES
Waitangi Waka Display

The Waitangi Maori Waka Display is located on the Waitangi Treaty Grounds.

This is one of the most impressive displays at Waitangi. You can see the sheer size of the main waka (Maori canoe) under the purpose built shelter. It is at least 30 metres long and would have carried 60 paddlers. These waka were made by hand, usually out of a single tree trunk. The Waitangi Waka Display is definitely worth a look when you are in the Bay Of Islands.

Objective:

To understand that there are many types of waka, each designed for a special purpose. There were many different types of waka that were developed by our ancestors. Some of these waka are included in the pictures below.

Alexander Turnbull Library, Wellington, New Zealand. Photograph taken by Ian Mackley. Reference no. EP/1974/0309/3A-F

Waka taua
These were the biggest waka between 9-30 metres long and could hold 100 people. They were decorated with carvings and were often used for war. Three wooden sections were joined together and gunwales were secured to the sides.

Auckland Art Gallery Toi o Tamaki. John Kinder collection. Reference no. 1983/22/16

Waka tētē (or waka pakoko)
Shorter and planer than the waka taua, these waka were once very common and were used to carry goods, produce and people along many of the coastal and inland waterways.

Museum of New Zealand Te Papa Tongarewa. Registration no. MAI017208

Waka tīwai (or waka kōpapa)
These waka were shorter than the waka taua and waka tētē. They were the most common and were formed from a hollowed-out log, with no gunwales, carvings, thwarts, bow or stern pieces. They were used for moving small groups of people and their belongings up and down rivers, and across harbours.

Alexander Turnbull Library, Wellington, New Zealand. Rex Nan Kivell collection. Reference no. 1/2-056342-F

Waka ama

A waka ama consists of a single waka with an outrigger fastened to one side. They are an important part of the culture of Pacific people. The development of waka ama can be traced to the period of early Polynesian voyaging in the Pacific.

Museum of New Zealand Te Papa Tongarewa. Registration no. ME016510. Hektor Busby

Waka hourua

Many Māori and Polynesian people have travelled huge distances in these double-hull sailing vessels. These waka can be up to 36 metres long and have either one or two sails. Polynesian people used these waka between 3,000 and 4,000 years ago to populate the Pacific.

Museum of New Zealand Te Papa Tongarewa. Registration no. ME012263. Maui Solomon

Waka pūhara or waka kōrari

The Moriori people of the Chatham Islands (Wharekauri) did not have trees large enough to make waka like those on the mainland. Instead they made waka which were more like rafts. One of these waka was the waka pūhara or kōrari which had a flat-bottomed hull. The bottom and sides were made from dry flower stalks (kōrari) of harakeke. To help keep the vessel afloat, bull kelp (rimurapa) was inflated and stored in the base of the canoe. As long as the raft was tightly fastened together, these waka were very safe, and unlikely to fill and capsize.

(A)

Name: _____ Date:_____

Background information on Traditional Maori Waka construction and uses.

Words that need to be explained:

- Moriori
- Laminated
- Construction
- Building material

1. Please complete the following table after you have read the handouts:

Type of waka	**Waka used for:**
Waka tete	
Waka tiwai	
Waka hourua	
Waka puhara	
Waka ama	
Waka taua	

2. What is different about the building material used by the Moriori people of the Chatham Islands for their waka and why?

   _____

   _____

   _____

3. Which was the biggest type of waka built?

   _____

4. In what way was the Te Aio o Nukutaimemeha waka built differently from more traditional carving methods?

   _____

   _____

   _____

5. Name some of the more traditional types of native trees used for construction of the waka?

_____

6. What is the purpose of this text?

_____

_____

_____

7. How useful was this text for gathering the information you needed? Why?

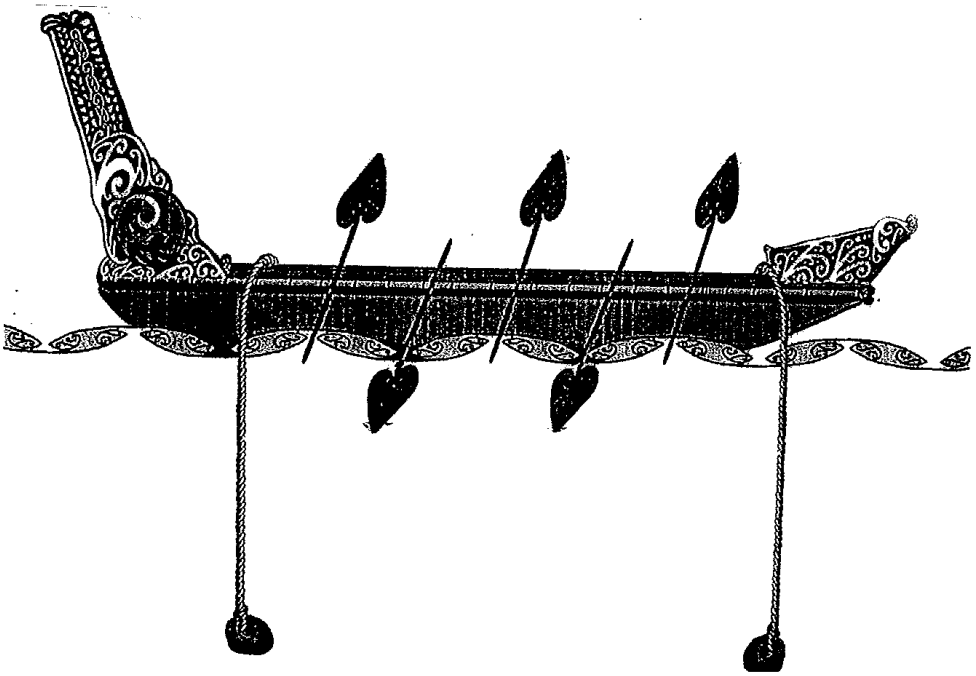
_____

_____

8. Parts of the waka- complete this table:

Maori name	English name	Description
	Hull	
		The back
Tauihu		
	Gunwales	

9. Label the parts of the waka, on the diagram below, using the names from the table above.




The sand sculpture festival at Blankenberge Photograph: PETER DECONINCK/AFP/Getty Images

1. The basics – building sandcastles

The list of ingredients for creating a simple sandcastle is misleadingly short: sand, water and a few digging and carving tools.

Sand

The first and most important thing you need to know about sand is that you can't do a thing with it unless it's wet. Here's why: when you add water to grains of sand, the liquid forms "bridges" that connect the granules to one another. This is why damp sand sticks together, so you can shape and carve it.

Packing down or "tamping" wet sand drains more water more quickly, creating even shorter bridges and an even more solid clump. Sand that has been compacted in this way can be subjected to extreme carving.

Water

1 Use lots of water. Dry sand in its natural state is lazy stuff. It wants to lie down and spread out into all sorts of nooks and crannies. The good news is that as long as you keep gravity working for you, there is really no way to add too much water. Which brings us to our second rule.

2 Let it drain. If you've ever tried to make the base of a sandcastle by filling a plastic bucket with wet sand and then trying to unmould it, you've seen how important this rule is. With no place for the excess water to drain off, the sand makes a sucking, sticking, vacuum seal with the plastic and it becomes difficult, if not impossible, to remove the bucket.

This is why successful sand sculptors do not use plastic buckets or other closed moulds but build their shapes by stacking handfuls of wet sand or by tamping it down in a topless and bottomless form.

3 Compact the wet sand to form structures. "Pounding sand into submission" is an intuitive and time-honoured method of strengthening and tightening those bridges that hold the grains together. You can use your hands or feet, or even a tamper, to compact wet sand.

Dig a water hole

If you're building at the beach, the best way to obtain an unlimited supply of H_2O is by digging a self-replenishing water hole. Start digging.

Keep digging until you hit water. Don't worry about how wide the hole is – you're aiming for depth, not width. The hole will get wider as you pull wet sand from its depths. Keep in mind that you're digging a well here, not a moat. When the water starts puddling at the bottom of your hole, you can stop digging.

The fail-safe recipe for castle concrete is one part sand to one part water. Pour the water in the big bucket first, then shovel in the dry sand for easier blending. Mix thoroughly and you're ready to scoop.

Pile the sand you excavate for your water hole into a mound about 1ft from the edge of the hole. Pack your mound of sand into a round, level base that is 2-3ft in diameter. This will serve as the foundation for your castle, giving you some added height and providing drainage for all the water you're going to use in construction.

2. The Equipment

You can, of course, dig, shape, smooth and even carry water with nothing but your own two hands. But having the right equipment will make your sandcastling experience infinitely more pleasurable. Here are the essentials:

A long-handled, lightweight shovel

If your goal is to achieve any kind of altitude – and it is! – you're going to do some serious digging. If you have the opportunity to bring or buy one object, make it a shovel, ideally a long-handled model with a small scoop. The sand-sculpture task that feels the most like work is digging the hole and mounding up the sand. A little garden spade is better than nothing.

A bucket or two

If you can't dig down to water you'll need at least two buckets: one to mix the sand and water in and one to carry water.

Carving tools

You could probably find most of these buried in kitchen drawers and toolboxes. Smoothing and shaping tools: at a minimum, find yourself an old kitchen (or plastic) knife with the tip broken off. For basic shaping, almost anything with a thin blade and straight edge will work such as putty knives, paint scrapers and trowels. The best all-round shaping tool for your kit is something with an offset handle. A pastry knife with a squared-off end (they usually come rounded) is ideal. Finishing tools: at a minimum, find yourself a soft-bristled paintbrush and a plastic drinking straw. The brush will come in handy for smoothing surfaces and the straw works well for blowing loose sand out of detailed carving. In an emergency, you can make a pretty good set of tools out of plastic eating utensils.

3. The building methods

1 – Soft-packing

Soft-packing is how the majority of the uninitiated approach sand.

Step 1 Mound up a big pile of sand.

Step 2 Stabilise the pile. Using the long handle of your shovel, poke a lot of deep holes into the pile then pour buckets of water into the holes. Stomp on the pile until it feels very solid beneath you. If necessary, go back and poke more holes and add more water.

Step 3 Pack and shape. Working from the tallest element in your composition, pack the shape with your hands until it feels stable. Take handfuls of moist sand, push them into place and roughly shape them.

Step 4 Carve and smooth. Using your smoothing tool, smooth and define the elements of your composition.

Step 5 Moisten as necessary. The longer you work on your composition, the more your sand sculpture will dry out – you must keep it moist.

Step 6 Keep pushing and smoothing.

Step 7 Work your way down the pile.

2 – Hand-stacking

When you're tired of crawling around a soft-packed sculpture on your hands and knees, you will be ready to try hand-stacking. It takes practice but once you master the mix-scoop-plop-flatten-jiggle move, you'll be building the best castles on the beach. The method is just a modified dribble technique using larger handfuls of sand – very large, very wet handfuls.

Hand-stacking involves scooping out handfuls of wet sand and helping them settle into each other in order to form structures. It's the only building technique in which you mix the sand and water in advance. With soft-packing, you start moulding with dry sand and then add water.

The most difficult aspect of hand-stacking is that it's less intuitive than soft-packing; many people have an instinctual urge to pound the sand into submission. Hand-stacking is a great way to involve the whole family in a sand-sculpture project, with duties evenly divided between "stackers" and "carvers".

Step 1 Mix. Use your hands – and even your feet – to mix up the compacted sand at the bottom of the hole. Properly mixed sand has the consistency of cake batter. It is very important to keep the wet sand moving as you build. Sand is heavier than water and, left alone for more than a few minutes, will sink to the bottom of the hole. So repeat the mixing step every time you start another structure.

Step 2 Scoop. You will soon find that big, fat things are easier to carve then little, skinny things, so build big. To do this, you need big handfuls of sand. You do not need big hands to get big handfuls if you scoop properly.

Step 3 Plop. With one smooth, swift motion (so that you don't lose too much water), plop the double handful of sand on to your base. There may be a bit of "pouring", but a common error to avoid is the "slam dunk". The taller and more delicate your structure is, the more gently you should plop. If you are building a tower, keep your hands on top of the sand; if you are building a wall, your hands will go directly to the sides.

Step 4 Jiggle. Very gently, jiggle the new pile of sand. Your goal is to get a thin, flat layer of very wet sand to melt into the layer beneath it. The common urge is to force this to happen by pounding, packing and pummelling the sand into compliance. Resist. Instead of using brute force, jiggle or vibrate the sand, helping it to settle evenly on to the layer beneath. Wet sand wants to flow downwards, and as long as you keep it moving, it will continue to settle in on itself, becoming denser and filling in spaces.

Almost as important as understanding how to jiggle is knowing when to stop. When the sand has stopped flowing, further jiggling will form cracks in your structure. Don't jiggle sand that has already settled into place.

Project 2

Stream health Monitoring Project

INTEGRATED PLANNING OVERVIEW					
Theme/rich concept/project/ integration name	Stream Health Monitoring Project			**Duration: 4 weeks**	
Summary of key concept	**Use the stream project as a real life context for integrating units and capturing numeracy evidence.**				
Units covered and evidence requirements	**Skills required (mini lessons/teaching points)**			**Assessment activity & method**	**Formative / Summative**
26623 – Make sense of number to solve problems - 1 sample	• Percentages, fractions, addition, subtraction, multiplication and division problems			Complete Testing worksheets	
26627 – Use measurement to solve problems	• Length, volume, temperature and time			Complete Testing worksheets	
26625 – Listen & Speak to communicate - 1 sample	• Behaviours demonstrate participation in the interaction- Behaviours – verbal, non-verbal; participation – contributing ideas, sustaining dialogue. • Participation in interactions is appropriate to intended purpose and participants.			Recording Observation sheet	
26626 – Interpret Statistical information for a purpose.	• Temperature worksheet – mean, median, range			Worksheet x3, one from each search engine (Vocational Pathways) Verification form	
26622 – Write to communicate – 1 sample	• Recount			Completed recount – Step 4	
26624 – Read with understanding - 1 sample	• Waka background info, building sandcastles			Completed worksheet - Step 4	
Key competency/s and targeted skills	**Matapuna Values**			**Matapuna Tikanga**	
Managing self √	**Thinking** √	**Matauranga**	**Whanaungatanga**		
Relating to others √		**Manaakitanga**	**Aroha**		
Using language, symbols and texts √		**Kotahitanga**	**Wairuatanga**		
Participating & contributing √		**Wairuatanga**			

Pre work

Statistics

- Workbook 1- measures of centre, range, trends
- Workbook 2 – types of graphs
- Workbook 3 – interpret statistics – NCEA

Percentages and fractions

- Workbook only type of percentages and fractions needed for this study

Map making

- Workbook - Use of key, Compass directions, Compass readings
- Google maps – aerial view
- Google maps - directions
- GPS
- Explain map needed to be done on the day and criteria

Temperature

- Use of thermometers
- Care of thermometers
- Celsius scale - worksheet
- Fahrenheit scale
- Conversion formula

Water Clarity

- What it means and indicates
- Use of tube
- Class experiments

Conductivity

- What it means – atoms, positive/negative
- What it is measuring and why it is important to know this
- Use of meter
- Class experiment using meter

Speed of river

- Design how you would do this using estimations.
- Use of stopwatch
- How to calculate speed
- Formula –Speed = distance/time = m/s
- Complete worksheet

Flow rate of stream

- Volume explained and practiced
- Recap volume
- Volume of bucket calculated
- How could we do this in the river that is ‘x’m wide?? Design an experiment to work this out
- Flow rate (Q) = volume of bucket /average time it takes to fill = V/t = l/s
- Complete worksheet

pH

- Terms – acid and alkaline
- What they mean
- Neutral
- Use of pH paper
- Interpreting the scale

Healthy stream parameters

Bugs study

- Habitat – pool -riffle –run
- Types
- Life cycles
- Good bugs vs bad bugs

Matapuna Training Centre
Stream Health Testing Worksheets (A)

Unit standard: 26627, 26623, 26626

Name:

The Problem:
You are scientists working on the important project of monitoring the status of the natural environment in Aotearoa. In class you are going to learn how to use an environmental SHMAK Kit. You will then use these new skills to go on a field trip to monitor the stream health of the Wharekopae River in terms of:
Temperature
Clarity
Conductivity
pH
Speed of River/Flow Velocity
Flow Rate
Invertebrates/Bugs

Purpose

You will then be assessing the overall stream health using graphs provided by NIWA (National Institute of Water and Atmospheric Research) and reporting back to the 'Council' on your findings.

1. Temperature:

- At **3** different sites, pool, riffle, run, take a **temperature** reading,
- **Record** your readings in Celsius (C°) in the table below.
- **Conversion formulae:**
  $T_{(°F)} = T_{(°C)} \times 1.8 + 32$
  $T_{(°C)} = (T_{(°F)} - 32) / 1.8$

Individually convert the temperature readings from C° to F°

Site	Temperature - C°	Temperature - F°
Riffle		
Run		
Pool		

Temperature Statistics

We have collected all the temperature readings from the other students in the tables below for Sites A, B, and C - for the pool and riffle.

Pool sites			
Student	**Site A**	**Site B**	**Site C**
A	15°C	14°C	14.5°C
B	11.9°C	11°C	12.4°C
C	14.2°C	13.2°C	13.6°C
D	15°C	14°C	15°C
E	12.5°C	13.4°C	12.6°C
F	14°C	13.6°C	14.2°C
G	12°C	11.8°C	13°C

Riffle sites			
Student	**Site D**	**Site E**	**Site F**
A	5°C	6°C	4.5°C
B	4.9°C	5.1°C	4.4°C
C	4.2°C	4.2°C	3.6°C
D	5°C	4°C	5°C
E	3.5°C	3.4°C	4.2°C
F	4°C	3.6°C	4.2°C
G	5.2°C	4.8°C	5.1°C

a. **<u>What is the mean temperature for each site?</u>**

Show how you worked it out –

Pool Sites	Show working out	Mean temperature
A		
B		
C		
	Average/ mean for pools →	

Conclusions:

a. What can you say about the difference between the mean in the riffles and the pools?

_____

_____

_____

_____

b. **What is the Median temperature for each site?**

Pool Sites	Show working out	Median temperature
A		
B		
C		
	Average/ mean for pools →	

Riffle Sites	Show working	Median temperature
D		
E		
F		
	Average/ mean for riffles →	

Conclusions:

a. What can you say about the difference between the median in the riffles and the pools?

_____

_____

_____

Name: _____Date:_____

Temperature of Stream Water

The temperature of the water of a natural stream can tell a scientist if it the water is 'healthy' for stream bugs to live in. Fresh water streams need to have riffles in them with temperatures between 3° C and 6. 5℃ and pools that are warmer but below 15.5°C, to get it balanced for lots of different types of bugs to live in. If the water is too warm then all sorts of bad bugs and bacteria can live there and is a sign the stream is unhealthy.

Table A		
Matapuna Training Centre Stream Temperature Data		
	Pool	**Riffle**
Median	13.6℃	4.4℃
Mode	15℃	4.2℃
Mean	14.6℃	4.9℃
Range	11℃ – 15℃	3.4℃ – 6℃

You are a 'scientist' testing the water temperature of our stream and are advising the council on whether the stream is healthy or not. Using this table above, what can you tell them about the temperature of this stream and the health of this stream?

2. Water Clarity

- At **2** different sites take a **water clarity** measurement- one in the pool and one in the riffle
- Try not disturb the water by walking in it to get your sample.
- **Record** your readings in the table below.

Site	Reading in cm or m	Scale score
Riffle		
Pool		

a. Individually decide which scale score your readings were using the scale below

Reading	100cm	70cm to 99cm	55cm to 69ccm	35cm to 54cm	Under 35cm
Scale score	10	8	5	3	1

HEALTHY ← → NOT HEALTHY

b. Individually answer the following questions in class,:

1. Is there any difference in the clarity readings between the riffle and pool?
   _____

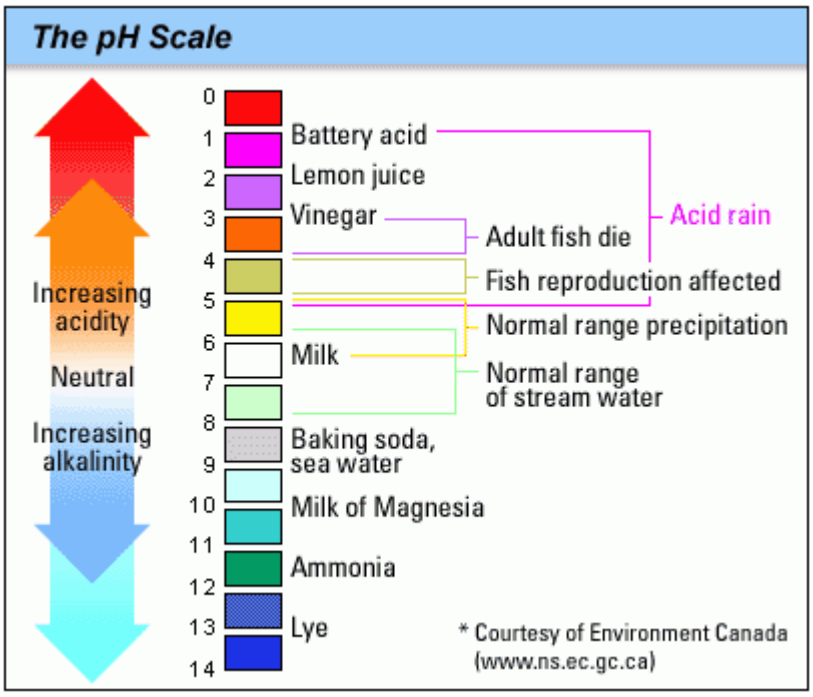
2. The water clarity is another way that scientists measure the health of the stream. What do the readings tell us about the health of this stream?
   _____
   _____
   _____

3. Conductivity and pH

- Take a reading of the conductivity of the stream at any site and record the results in the table below.
- Take a reading of the pH of the stream at any site and record the results in the table below.

Site	**Conductivity in S/m**	**pH**

Use your answers to complete Worksheet B (NZ Stream Health Monitoring and Assessment Kit)



Conclusion:

Using the scale above –

What does your reading of the stream tell us about the acidity of the water and how does this affect the fish life?

4. Speed of River/ Flow velocity

- As a team work out how you would measure the speed of the river using the formula for speed. Speed=distance/time
- Once you have worked this out carry it out five times
- Record the results below.

Individually work out the speed and average speed back at Matapuna Training Centre.

Trials	**Time**	**Distance**
1		
2		
3		
4		
5		
Matapuna Median		
Matapuna Mean		
Speed **= metres per second**		

Use your average to complete Worksheet B (NZ Stream Health Monitoring and Assessment Kit)

5. Flow rate

- Using a bucket and a timer work out how you could measure the flow of the river, remembering that flow rate formula is Flow rate = volume / time
- Choose a suitable area for this activity.
- Record the time.

a. Work out the volume of the bucket **in class**
b. Enter the volume in the table below
c. **Individually work out the flow rate back at Matapuna Training Centre**

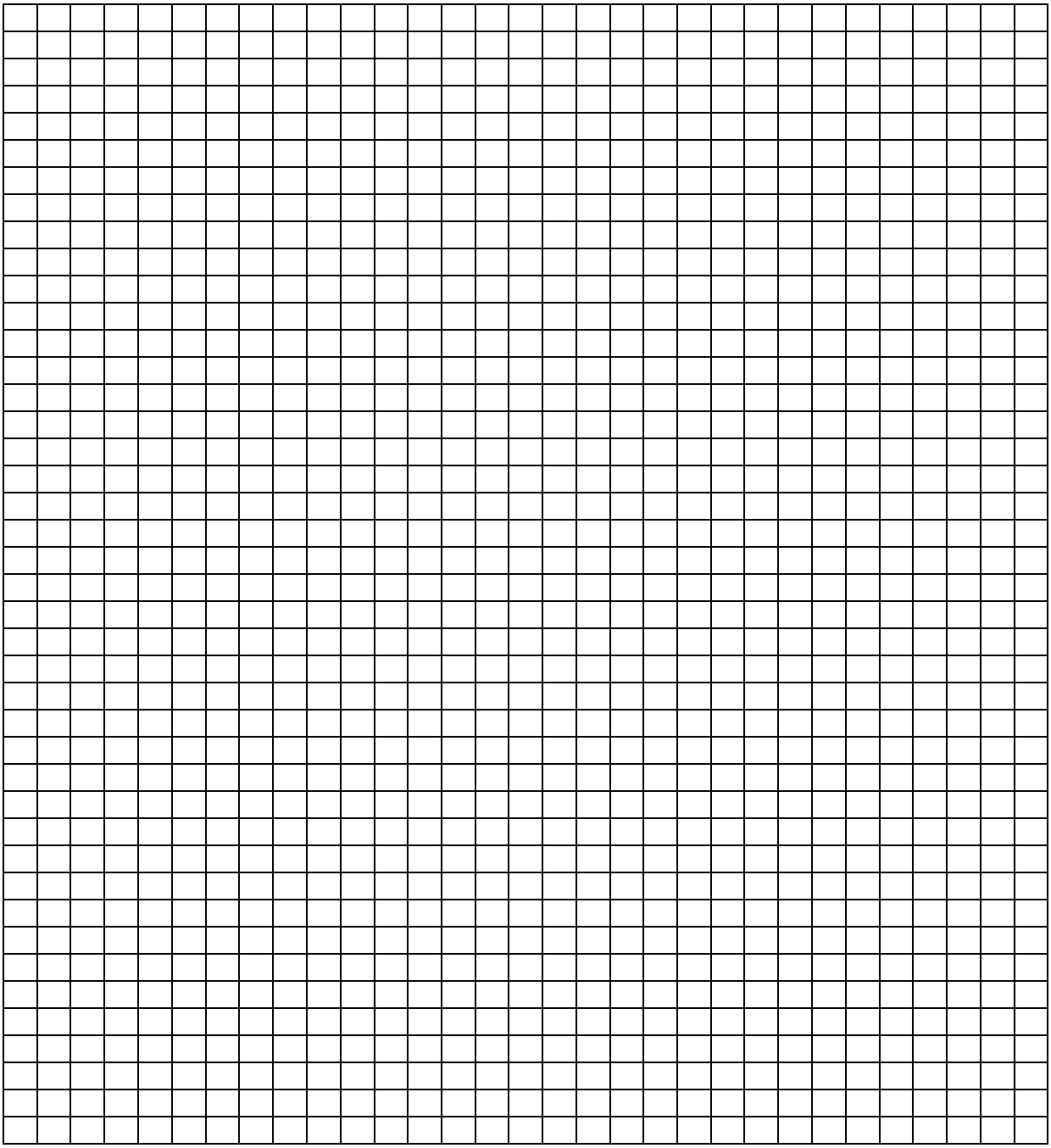
Volume of one bucket =

Trials	**Time in minutes**	**Number of buckets**	**Volume of bucket**
1			
Flow rate = litres per minute			

6. Bug data

1. Use the bug data recording sheet – D1 Stream Bed Life - to make a bar graph using the paper provided.

This graph shows _____
_____
_____
_____



Conclusion:

What percentage of the total are ‘good bugs’? These are bugs that score above 6 on the invertebrate scale (see below).
Show your workings.

_____
_____
_____
_____
_____

If there are not enough of the ‘good bugs’ in a stream then the water quality is low and unhealthy for people to swim in. If the quality is low, we only find a few different types of bugs and they are mostly bugs that can live in yucky water and score below 5 on the scale.

You are an insect specialist and using your graph of insect numbers, would like to know if the water in this stream is of a good quality. What would you say to the people living alongside this river or stream?

_____
_____
_____
_____

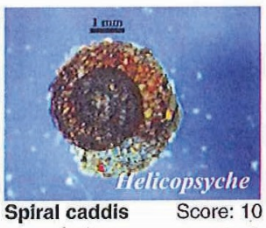
New Zealand Stream Health Monitoring and Assessment Kit: Version 2

Indicator invertebrates, identification guide: Part 2

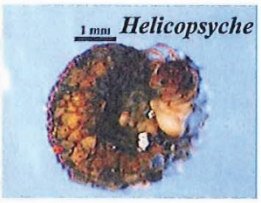
(for more information on each invertebrate type, see pages 9.14 to 9.18 in the Stream Monitoring Manual)

Olinga

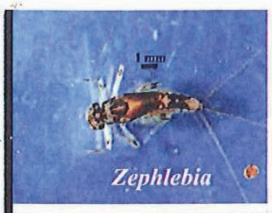
Caddisfly larvae (smooth cases) Score: 9

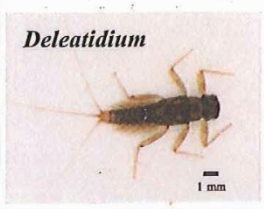


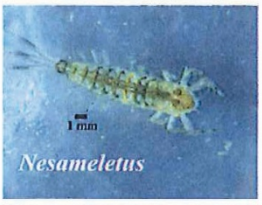
Spiral caddis Score: 10

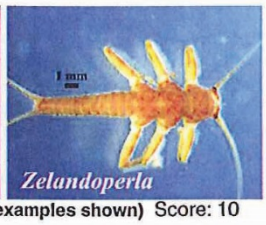


Mayfly larvae (six examples) Score: 9



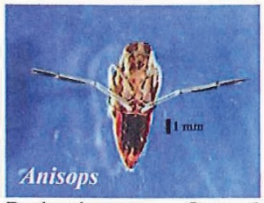






Large stonefly larvae (four examples shown) Score: 10

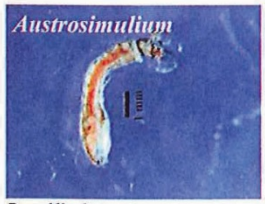
Some other invertebrates not included in the SHMAK indicator set



Backswimmer Score: 3

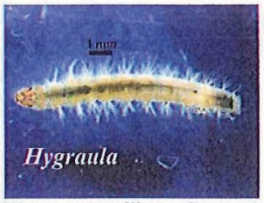
Water boatman Score: 3

Dobsonfly larva (toebiter) Score: 7



Sandfly larvae Don't score these

Mosquito larvae Score: 3

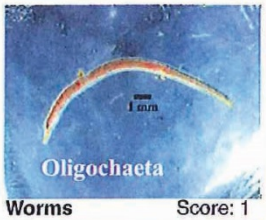


Water caterpillar Score: 4

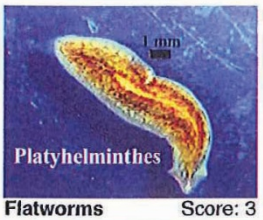
New Zealand Stream Health Monitoring and Assessment Kit: Version 2

Indicator invertebrates, identification guide: Part 1

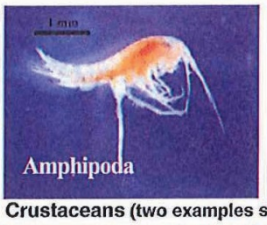
(for more information on each invertebrate type, see pages 9.14 to 9.18 in the Stream Monitoring Manual)

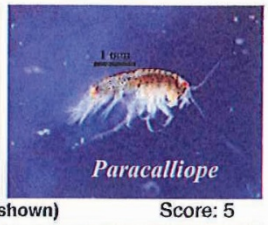


Worms Score: 1

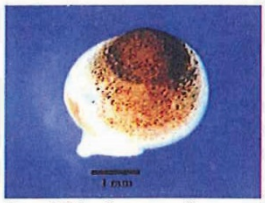


Flatworms Score: 3

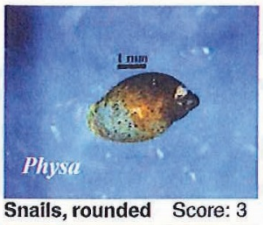




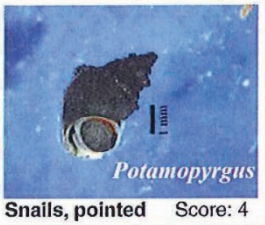
Crustaceans (two examples shown) Score: 5



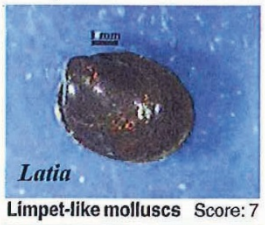
Small bivalves Score:3



Snails, rounded Score: 3



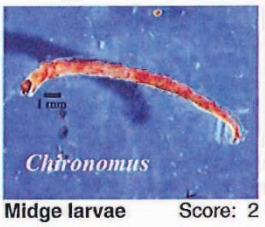
Snails, pointed Score: 4



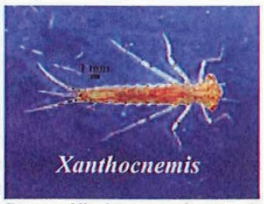
Limpet-like molluscs Score: 7

Oxyethira

'Axehead' caddis
Score: 3

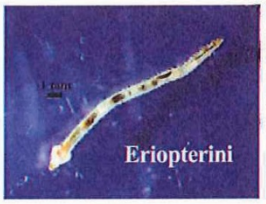


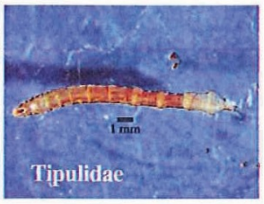
Midge larvae Score: 2



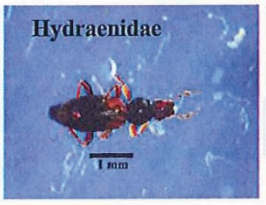
Damselfly larvae Score: 4

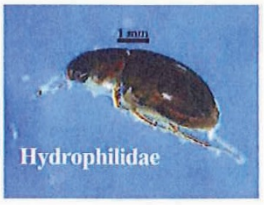
Cranefly larvae
(three examples)
Score: 5



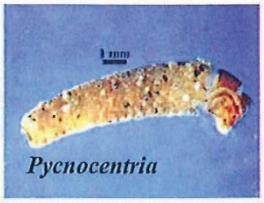


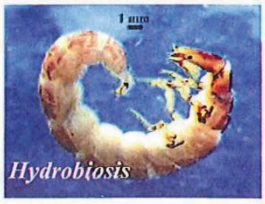
Beetle larvae and adults
(three examples)
Score: 6

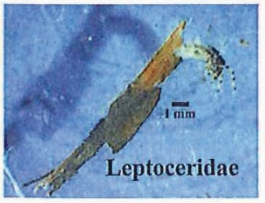




Caddisfly larvae (rough, stony cases and free living, eight examples)
Score: 6







N.B. Complete ***either*** D1 ***or*** D2.

D1 Stream-bed life: Level 1

For each of 10 stone, sediment or water plant samples record in the tables below the presence (tick) or absence (blank) of "indicator" invertebrates and then periphyton (algae). (See over for calculating biological scores for this site.)

Invertebrates		Sample number:									
	Invert score	Transect 1 (if applicable) 1	2	3	4	5	Transect 2 (if applicable) 6	7	8	9	10
Enter type of sample (stone, gravel, silt, plant, etc.):											
Worms (e.g. thin brown/red)	1										
Flatworms, leeches	3										
Freshwater crustaceans (amphipods, water fleas)	5										
Small bivalves (up to 4 mm across)	3										
Snails (4–6 mm across, rounded)	3										
Snails (1–3 mm across, pointed end)	4										
Limpet-like molluscs (*Latia*, up to 8 mm wide)	7										
"Axehead" caddis (*Oxyethira*, 2–3 mm long)	3										
Midge larvae (3–7 mm long, white - red)	2										
Damselfly larvae	4										
Cranefly larvae	5										
Beetle larvae and adults	6										
Caddisfly larvae (rough stony cases, or cases of sticks, etc. and free-living)	6										
Smooth-cased caddisfly larvae (*Olinga*, up to 10 mm long, chestnut-brown colour)	9										
Spiral caddis (*Helicopsyche*, up to 3 mm wide)	10										
Mayfly larvae (2–15 mm long)	9										
Stonefly larvae (large species, up to 20 mm)	10										

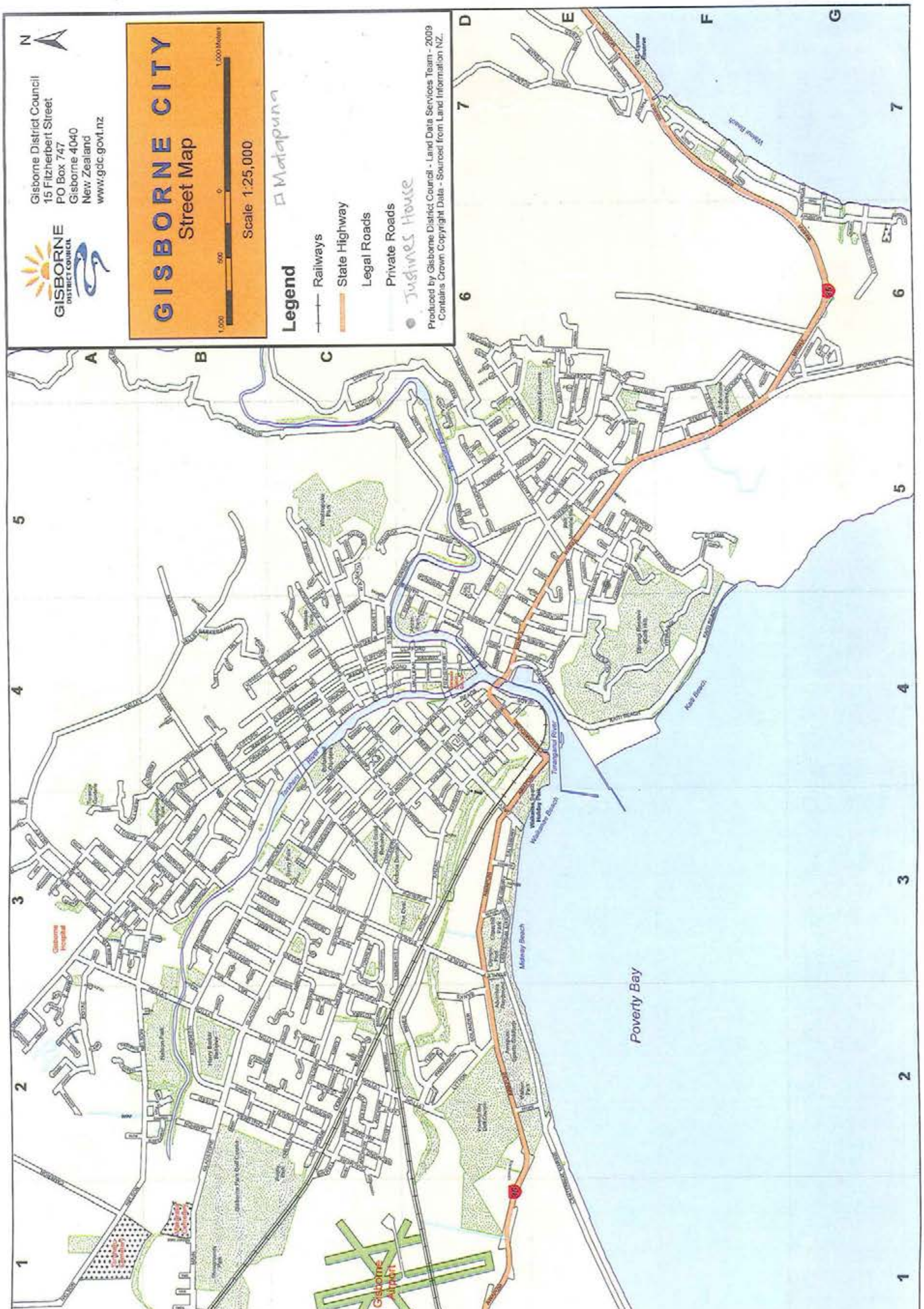
Periphyton (on exposed surfaces)			Stone number:									
		Peri. score	Transect 1 (if applicable) 1	2	3	4	5	Transect 2 (if applicable) 6	7	8	9	10
Thin mat/film:	green	7										
(under 0.5 mm thick)	light brown	10										
	black/dark brown	10										
Medium mat:	green	5										
(0.5-3 mm thick)	light brown	7										
	black/dark brown	9										
Thick mat:	green/ light brown	4										
(over 3 mm thick)	black/dark brown	7										
Filaments, short	green	5										
(under 2 cm long)	brown/reddish	5										
Filaments, long	green	1										
(over 2 cm long)	brown/reddish	4										

7. Mapwork

Using the map provided pretend you are Google Maps and you are writing the directions of how to get to Rere Falls from Matapuna Training Centre in Gisborne. Use distances and the scale, as well as compass directions.

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

How far is it in a straight line for Gisborne to Waihora Stream, Te Karaka?
Show workings
_____


GISBORNE DISTRICT COUNCIL
Gisborne District Council
15 Fitzherbert Street
PO Box 747
Gisborne 4040
New Zealand
www.gdc.govt.nz
GISBORNE CITY
Street Map
Scale 1:25,000
Matapuna
Legend
Railways
State Highway
Legal Roads
Private Roads
Justines House
Produced by Gisborne District Council - Land Data Services Team - 2009
Contains Crown Copyright Data - Sourced from Land Information NZ.
Gisborne Hospital
Gisborne Airport
Poverty Bay
Midway Beach
Waikanae Beach
Turanganui River
Kaiti Beach
Wainui Beach

7. Maps

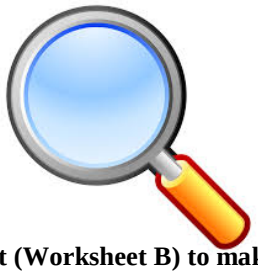
At the field study site complete the legend and map provided to give an overview of the location. Include:
GPS Reading
Compass Reading
Relevant natural and man-made features.

‘

Matapuna Training Centre
NIWA Worksheets (B)

Unit standard: 26627, 26623, 26626

Name:



Purpose

You are now going to use the NZ Stream Health Monitoring and Assessment Kit (Worksheet B) to make an overall decision about the health of the stream or river you have just monitored.
Using graphs provided by NIWA (National Institute of Water and Atmospheric Research) you are going to let the 'Council" know what you have decided.

C. Habitat quality

Flow velocity / Speed

Measure the speed of the water flow by timing an object floating down the length of the site (or a part of the length) in the centre of the stream. Take the average of three measurements.

Distance travelled:		Time:	1	2	3	Average time:	

Average water velocity = Distance travelled/average time = _____ metres/sec

	Under 0.1 m/s	0.1 to 0.29	0.3 to 0.69	0.7 to 0.99	1.0 or more
score:	1	8	10	5	3

enter score:

Water pH

Use pH indicator strips to measure the pH of a sample of stream water from the main flow.

Measured pH: _____

	5 or less	5.5 to 6	6.5 to 7.5	8 to 9	9.5 or more
score:	-5	5	10	5	-5

enter score:

Water temperature

Measure water temperature in the main flow, in an undisturbed area.

Measured temperature: _____ °C Time of day: _____

	Under 5 °C	5 to 9.9	10 to 14.9	15 to 19.9	20 to 24.9	25 to 29.9	30 or more
score:	5	8	10	8	5	1	-5

enter score:

Water conductivity

Measure the conductivity of a water sample, from the main flow, using the meter provided.

Measured conductivity: _____ µSiemens/cm

	Under 50	50 to 149	150 to 249	250 to 399	400 or more
score:	20	16	10	6	1

enter score:

Water clarity

Measure the clarity of a water sample using the clarity tube (average of three readings).

Measured clarity:	1	2	3	cm (from viewing end to disk surface)	Average clarity:	

	Clear to bottom (=100)	70 to 99	55 to 69	35 to 54	Under 35 cm
score:	10	8	5	3	1

enter score:

C. Habitat quality *(continued)*

Composition of the stream bed

Estimate by eye the percentages (to the nearest 10%) of cover of different types of material making up the stream bottom (see scale on ruler). (See page 6.15 for a more precise method.)

	Bedrock	Boulders (>25cm)	Large cobbles (12-25cm)	Small cobbles (6-12cm)	Gravels (0.2-6 cm)	Sand	Mud or silt	Man-made (eg. concrete)	Woody debris	Water plants (rooted in the stream bed)	
score	10	10	20	10	0	-10	-20	-20	0	0	Total:
enter %		10	70	20							100
score x %		100	1400	200							

enter total of (score x %)	overall score = total (score x %) / 100 (maximum score = 20)	enter score:

Deposits

Note whether any loose deposited material is on the stream bed.

	None noticed	Fine (less than 1 mm thick), mainly in edge areas	Moderate (up to 3 mm) edge areas and elsewhere	Moderate to thick (3 mm or more) patchy, most of bed	Thick (over about 5 mm) on most horizontal surfaces	enter score:
score	10	5	0	-5	-10	

Bank vegetation

For each bank along the 10 metre length of the site estimate the percentage (to the nearest 10%) covered by the listed vegetation types in a strip 5 metres wide parallel to the water's edge.

Note: the true left and true right are the left and right sides looking downstream.

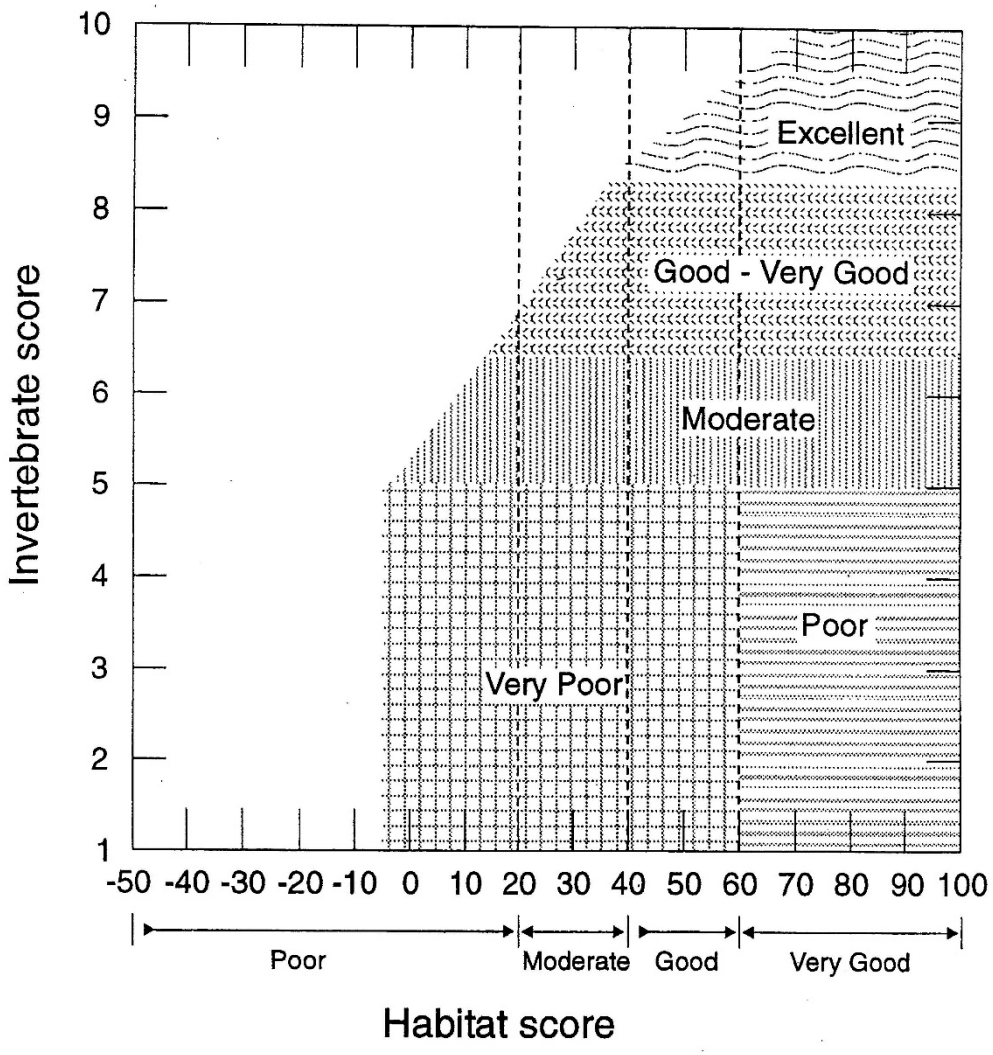
	Native trees	Wetland vegetation	Tall tussock grassland, not improved	Introduced trees (willow, poplar)	Other introduced trees (conifers)	Scrub	Rock, gravels	Short tussock grassland, improved	Pasture grasses and weeds	Bare ground, roads, buildings	Total
score	10	10	8	8	5	5	5	3	-10	-10	
% true left	15				80			5			100
% true right	15				80			5			100
total % (L+R)											200
total % x score											

enter total of all (score x %)	overall score = total (score x %) / 100 (ie average L and R bank scores added) (maximum possible score = 20)	enter score:

Now add the scores for all questions and transfer to the *Monitoring record*. Also note any scores which are at the very low end of their range.

Total score:

1. Graph of overall stream health for **stony** streams



As a Council scientist, using the NIWA graph above and your invertebrate score and your habitat score, give feedback to the Farmer's Meeting about the health of the Stream/ river.

_____
_____
_____
_____
_____
_____
_____
_____

Name: _____ Date: _____

Field day recording sheets

Temperature:

- At **3** different sites, pool, riffle, run, take a **temperature** reading,
- **Record** your readings in Celsius (C°) in the table below.

Site	**Temperature - C°**	**Temperature - F°**
Riffle		
Run		
Pool		

Water Clarity

- At **2** different sites take a **water clarity** measurement- one in the pool and one in the riffle
- Try not disturb the water by walking in it to get your sample.
- **Record** your readings in the table below.

Site	**Reading in cm or m**	**Scale score**
Riffle		
Pool		

Conductivity and pH

- Take a reading of the conductivity of the stream at any site and record the results in the table below.
- Take a reading of the pH of the stream at any site and record the results in the table below.

Site	**Conductivity in S/m**	**pH**

Speed of River/ Flow velocity

- As a team work out how you would measure the speed of the river using the formula for speed. Speed=distance/time
- Once you have worked this out carry it out five times
- Record the results below.

Individually work out the speed and average speed back at Matapuna Training Centre.

Trials	**Time**	**Distance**
1		
2		
3		
4		
5		
Matapuna Median		
Matapuna Mean		
Speed **= metres per second**		

Flow rate

- Using a bucket and a timer work out how you could measure the flow of the river, remembering that flow rate formula is Flow rate = volume / time
- Choose a suitable area for this activity.
- Record the time.

d. Work out the volume of the bucket **in class**
e. Enter the volume in the table below
f. **Individually work out the flow rate back at Matapuna Training Centre**

Volume of one bucket =

Trials	**Time in minutes**	**Number of buckets**	**Volume of bucket**
1			
Flow rate = litres per minute			

6. Bug data

Use the bug data recording sheet D1 and the ID sheets to identify the bugs and fill in the number of bugs/ invertebrates you found.