Ground-truthing your baseline estuary habitat map

Objective

To check the accuracy of your baseline habitat map, constructed using existing information. This field check, or ground-truthing, involves taking your habitat map into the estuary and checking that the habitat boundaries and other information recorded on the map are correct. Use this field information to update and improve your baseline habitat map.

Background

Ground-truthing is an important step in developing your final baseline habitat map and involves taking your habitat map into the estuary and checking that the information recorded is correct. The quality of the existing information is often limited. For example, some types of habitat, such as sandflats, mudflats, and shellfish beds, may not be identified from aerial photographs. Some habitats may change substantially in the course of only a few years (e.g., size and location of a shellfish bed) so a field survey to ground-truth the habitat map is essential. Remember that the baseline habitat map will be the 'yardstick' which you will use to detect habitat changes in the future. It's important that this habitat map is an accurate record of the estuary at the time that the map was created. Building this baseline habitat map is the most time-consuming step; accuracy at this stage will make future updates easier. Furthermore, you may only need to update the habitat map at five- or ten-year intervals depending on what your monitoring information is telling you.

The field work that underpins the ground-truthing involves making observations along **transects**. Transects are lines or strips of ground along which environmental measurements and observations are made. The field information collected along the transects will be used to update and improve your baseline habitat map. You will also have to locate habitat boundaries along each transect using a GPS.

Designing your field survey requires careful thought. For example, you must determine:

- how many people you will have to do the survey
- how many days you have available for the survey
- can the entire estuary be surveyed?

The size of your estuary is an important consideration in planning the ground-truthing field work. Small estuaries (less than 3 km from their upper reaches to mouth) can be sampled by 4–6 people over 1–2 low tides. For much larger estuaries (e.g., 5 km+) you must carefully define your objectives. If you do not have enough people to adequately sample the entire estuary in 2–3 days then an

alternative approach will be required. For example, divide your large estuary into separate geographical areas and survey one area at a time. If the estuary has three main arms or inlets divide the estuary up in this way and survey each arm in turn. You may choose to first survey the arm/inlet that is most important to your hapū because, for example, this is where most kaimoana is collected, or it is where your marae is, or it is of particular spiritual importance.

It is important that you also think about the fitness levels of the people in your sampling group(s). The fittest people should survey the most difficult transects e.g., those that require more walking and/or more challenging habitats such as mudflats or mangrove forests. If you have two or more groups give the longer transects to the most experienced group as they will be able to sample the transect faster.

Because the baseline habitat map is intended to be a snapshot in time, you should complete the surveys of the remaining estuary arms/inlets within a single year. Summer days are longer and the weather is usually better, so try to complete the field survey in summer if you can.

To get the most out of the field survey, preparation and planning are important. The information contained in the "*Some practical matters before starting field work*" section of the **Getting started module** provides some guidance, including basic safety information for estuaries.

Links to other modules and methods

- Shellfish module
- Plants module
- Water Quality module
- Fish module
- Sediment module

Summary of method

This method outlines how to ground-truth your baseline estuary habitat map by:

1. selecting and establishing your survey sites
2. making observations at fixed monitoring sites
3. recording the location of habitat boundaries along transects.

Equipment

- Laminated baseline habitat map(s).
- GPS
- Compass.
- Digital camera (to take photos of monitoring sites, habitat types, landmarks that line up transects and sites of interest).
- Clipboard and pencils
- "Habitat Mapping" field datasheets (printed on waterproof paper if possible)
- Laminated habitat identification field guide
- 50 m measuring tape
- Sieves or buckets for sorting shellfish and other animals from the sediment. A plastic garden sieve or kitchen sieve is suitable to use. The holes in the sieve mesh should be less than 1 cm.

Data collection and management

The data collected should be entered into a “Habitat Mapping” datasheet.

Use a new field datasheet for each transect. Each datasheet allows you to record up to five quadrats. More datasheets will be needed if you want to do more than 5 quadrats. Pay special attention to keeping all the datasheets together, i.e., staple and store together.

How to: Select and establish your survey sites

Selecting your transect sites

The first step in ground-truthing your baseline habitat map is to select your transect sites. Even in small estuaries you cannot hope to cover every square inch of every habitat. Transects partly overcome this limitation by providing a systematic approach to making your ground-truth observations. Below are some general considerations when selecting your transect sites.

- you want to locate your transect sites in areas that have easy access
- locate transects so that they cross the key habitat types that you want to know about
- if you want to have particular shellfish beds that you want to monitor, make sure that at least one transect crosses each shellfish bed.
- transects shouldn't be spaced more than 200m apart
- in a small estuary or single arm of a larger estuary 6 –10 transects should be sufficient
- if enough people are available and/or the estuary is small enough, increase the number of transects so that they are only 100 m apart.
- stay clear of any wahi tapu and sensitive habitatsonce you have selected your transect sites draw them on your baseline habitat map.

Installing benchmark/marker pegs

You will need to establish some transect benchmarks/ markers pegs before you can conduct your ground truthing survey. We recommend that you install your benchmark/marker pegs well before the baseline habitat survey

Below are some steps on how best to install your benchmark/marker pegs

- obtain permission from the landowner or local authority before installing the marker pegs on private or public land.
- you will need to find a suitable location for the marker peg on dry land immediately above the high tide mark.
- find a site where the marker peg is not too obvious but still easy for you to find, where it is not likely to be damaged or disturbed, or injure people or animals that may step on it.
- good sites for marker pegs include along fence lines or near other fixed objects.
- avoid areas with vehicle access where the peg could be pushed into the ground or broken off. Remember, it may need to last ten years or more.

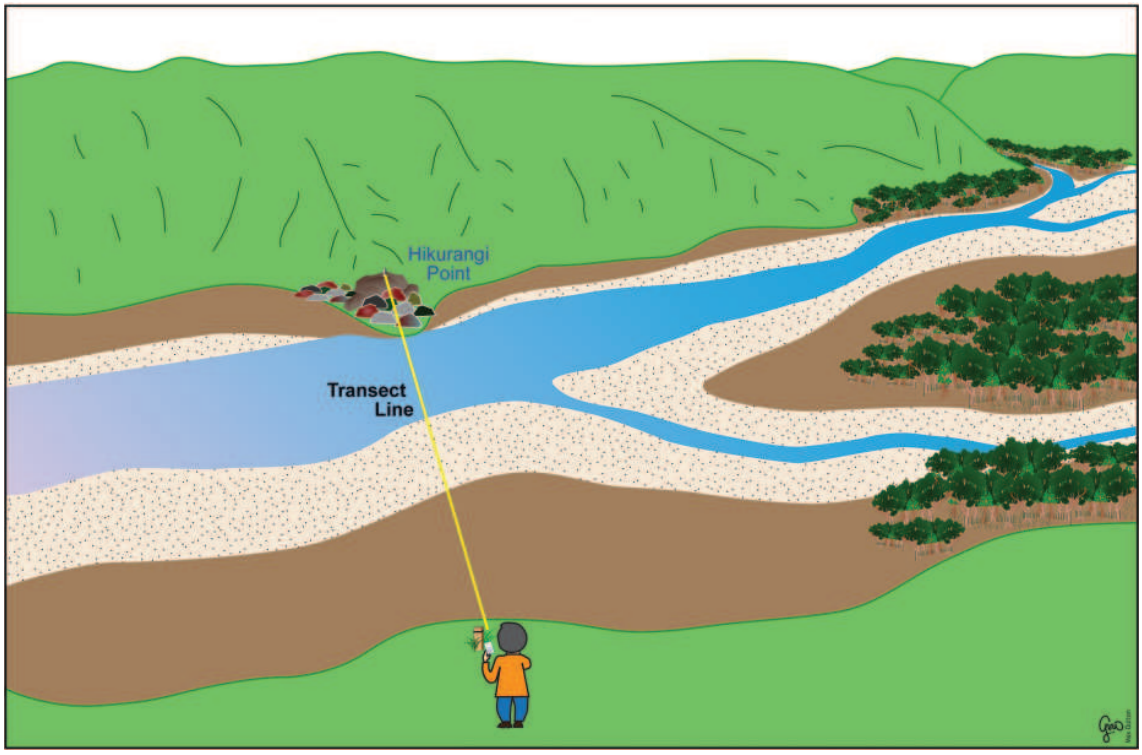
- use the most appropriate material for your marker peg. At some sites a wooden peg will be fine. At other sites a galvanised or stainless steel bolt or nail set into a concrete surface may be a better option.
- if your using wooden pegs hammer the peg into the ground until the top of it is just above ground level. In 'high risk' sites you might bury it 5–10 cm below the ground.
- a piece of galvanised pipe of about 50 mm diameter driven into the ground and set into concrete also provides a long-lasting marker peg.
- make an accurate description of the marker peg location. This should include a written description and diagram, map coordinates, and photograph.
- installing a second marker peg a few metres away from the first marker peg as a back-up is also a good idea. Make accurate notes of its location in relation to the main marker peg. If the main BM goes missing (for whatever reason) and you have not installed a second marker peg, then you will not be able to compare information from old surveys with new surveys.
- remember that someone else from your hapū might have to find the benchmark in 5, 10, or 20 years.

Establishing transect lines

It is important to establish transect lines so that each time you repeat your monitoring you are following the same line. This is important because it means you can accurately identify changes over time. To do this you will first need to decide on, and fix, the direction of the transect.

- stand next to the benchmark and look in the general direction that you want to measure.
- usually transects are established at right angles to the shoreline, and run the shortest distance between high and low tide.
- a simple method is to find an easily recognisable – and permanent – feature or landmark that you can use as a reference point to keep you on line. Good examples include hilltops, headlands, large trees, buildings, and power poles.
- take a compass bearing to the landmark and record this direction on the "Hydrostatic elevation survey" datasheet. Also describe the landmark on your datasheet.

In the example below, a headland on the opposite shore of the estuary provides a good landmark to fix the direction of the transect.



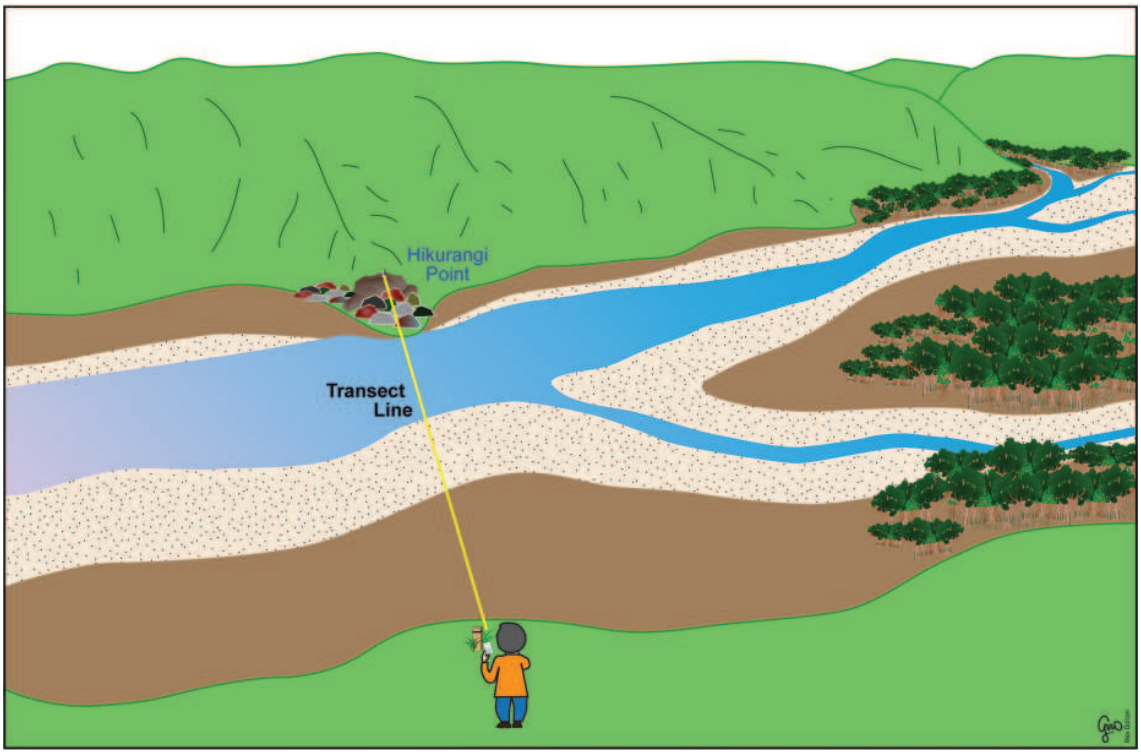
The transect (yellow line) starts at the benchmark and is lined up with Hikurangi Point on the north side of the harbour. The compass bearing along the transect is 338° magnetic.

How to: Identify and map the different habitats in your estuary

Here we describe how to ground-truth your baseline habitat map using the transect method. We assume that you have already selected and established your survey sites, and are now ready for the field survey of your estuary. As well as describing habitat types along a transect you will also record the locations of boundaries between different habitat types using this method.

1 Locate the landward marker peg using your estuary habitat map, landmarks, site description notes or GPS co-ordinates.

2 Once you have found your landward marker peg, check the direction of your transect (line) down the shore using your compass bearing and/or landmark.



This example transect (yellow line) starts at the landward mark peg and is lined up with Hikurangi Point on the north side of the harbour. The compass bearing along the transect is 338° magnetic.

3 Its extremely important that you complete your field datasheet fully, so before you start collecting survey information, fill out the first section of your datasheet "site information.

4 Now you are ready to start surveying your transect. Beginning at your landward marker peg, run your measuring tapes out from your marker peg along your transect.

5 You want to select survey sites at 6–15 locations along your transect, so that you have a good representation of all the habitats along your transect. These sites will either be within a habitat or at the boundary of a habitat. Use your habitat identification field guide to help identify your habitats.

Measure the distance from the landward marker peg to the different habitat boundaries or changes in the plant community.

6 Now walk along the transect until you locate the first habitat or habitat boundary of interest

7 Record the following information on your field datasheet:

- Distance of your survey site from the marker peg
- GPS location of your survey site (easting and northing including waypoint number).
- Is your survey site within a habitat or at a habitat boundary

8 Then Identify the sediment type (e.g.,mud, sand, mixed mud/sand, gravel/cobbles, rock platform, oyster/mussel reef and shellfish bed) using your habitat identification field guide and the below descriptions.

- **Gravel:** feels gritty and particles are greater than the size of rock salt crystals. Gravel can be composed of shell or rock fragments, be sure to note whether your gravel is made up of shell or rock fragments on the field datasheet.
- **Sand:** feels gritty and particles are the size of rock salt crystals or smaller. If you try and roll sand into a ball it will fall apart.
- **Mud:** feels smooth and silky. Estuarine muds are usually composed mostly of silt particles and a small amount of clay, the size of flour. When you roll mud into a ball, if its extremely smooth and silky, the sediment is mainly silt. If the ball is very sticky, looks and feels like plasticine, and can be made into an unbroken ring, the sediment is mainly clay.

9 Once you have identified the sediment type, then identify the vegetation type (e.g., saltmarsh seagrass, mangrove, macroalgal bed) using your habitat identification field guide.

10 Lastly record any other general comments of interest, such as sediment colour, presence of crab holes, worm tubes, Macomona (wedge shell) feeding tracks, snails grazing on the surface, shellfish present (live or dead) or other things you see.

11 Go to the next monitoring site along the transect until you locate the next habitat or habitat boundary of interest and repeat steps 7 to 11 until you reach the waters edge.

Ground-truthing the Whangateau estuary habitat map

We can use the Whangateau estuary case study as an example of how to plan and carry out the ground-truthing of the baseline estuary habitat map. This includes selecting sites for transects. The information that we have already collected tells us that the estuary is probably too large to sample in 2–3 days so we decided to divide the estuary into three smaller areas:

1 Omaha River

2 Whangateau estuary north of the causeway

3 Whangateau estuary south of the causeway (Waikokopu Creek).

In this example, we chose to first ground-truth Waikokopu Creek, as this is one of the areas where the 1995/96 and 2010 aerial photos indicate that noticeable habitat changes have occurred. The diagram over the page shows the baseline habitat map for this area.

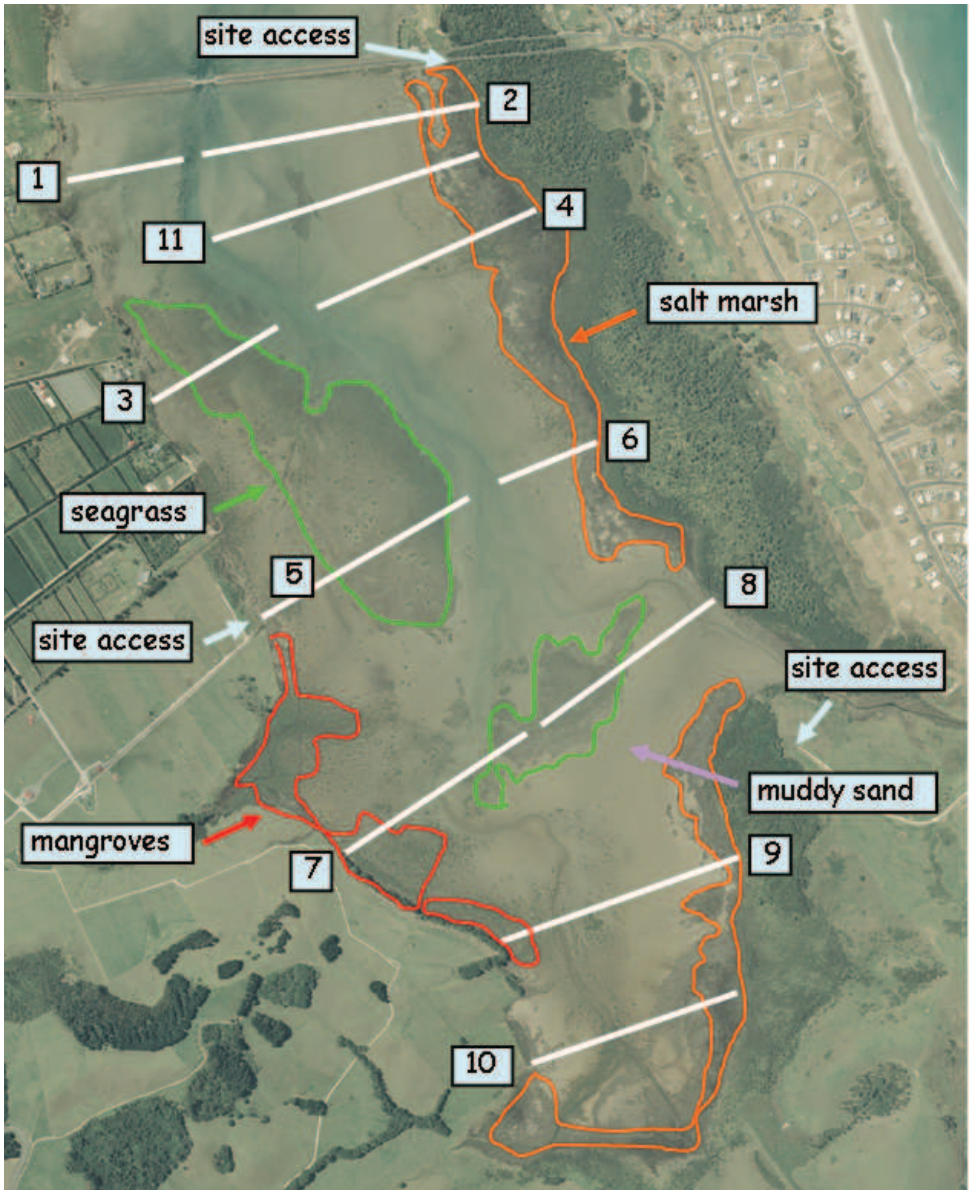
Waikokopu Creek is approximately 2.5 km north to south and 800 m east to west at its widest point. We have a 3-person team to sample 11 transects over 2–3 days, with 6 to 10 sampling sites per transect. The transects are spaced at about 200 m intervals along Waikokopu Creek.

To make the most of the limited period available at low tide to survey the lower intertidal and shallow subtidal habitats you need to plan your field survey carefully. This includes working out how to access the transects. In this example we have selected transects on both shores of the Waikokopu Creek. Ideally, this means you will need to find access points on both sides of the estuary as well. This may save you time instead of walking between each transect. Alternatively, the beds of tidal channels are usually composed of firm sand and/or shell. These sediments are easier to walk on than soft mud and muddy sandflats. Thus, you can use shallow channels at low tide as natural walkways to move quickly between transects. Larger channels will be deeper so that you may not be able to cross the channel close to the causeway.

Here are some tips for surveying the transects.

- Locate transects so that they cross the key habitat types that you want to know about. In the Waikokupu Creek, transects cross seagrass patches and tidal flat areas that presently have sparse mangroves. These are likely to fill in over time and become dense mangrove habitat. If you are worried about land-based effects, such as discharges from potential pollution sources at Ti Point or Point Wells, you can begin a transect near discharge points. You may collect water samples that are analysed using methods described in the **Water Quality module.**

- It is important that you also think about the fitness levels of the people in your sampling group(s). The fittest people should survey the most difficult transects e.g., those that require more walking and/or more challenging habitats such as mudflats or mangrove forests.
- The transects in Waikokopu Creek vary between about 250 and 600 m in length. If you have two or more groups give the longer transects to the most experienced group as they will be able to sample the transect faster.
- Locate sites at habitat boundaries and/or within habitats.



Baseline estuary habitat map of the Whangateau estuary. This map is based on existing information including aerial photographs, a topographic map, a hydrographic chart, local knowledge, and council reports. More realistic outlines of vegetation and shellfish banks are outlined. Source of photo: Auckland Council.