

Mouth Condition Monitoring

2. Methods

Every time you undertake mouth condition monitoring you must record what estuary you are monitoring at and the following details:

Mouth State

The mouth state refers to the condition of the estuary entrance to the sea.

- If there is water exchange or flow occurring between the sea and the estuary itself the mouth state is defined as "Open". This may be a wide open mouth with lots of exchange or a smaller opening in the berm with a small amount of exchange. The 'berm' is the sand that closes the estuary entrance.
- If there is a berm at the mouth of the estuary which is blocking water exchange between the estuary and the sea, the mouth state is defined as "Closed".

Date and time

This is where you record the date and the time when you started monitoring.

Sampled by

This is where you record the names of all the people undertaking the monitoring.

Notes

This is where you record anything general which may be of interest in relation to estuarine health. General observations should be recorded in the Notes section of the datasheet as part of each estuary mouth condition assessment and during each physico-chemical monitoring session. These general observations are recorded to provide clues about how an estuary is functioning and can assist managers in better understanding local estuary processes.

General observations are indeed, just that - generally anything relevant to estuary monitoring. Some examples of the types of information you may record in the notes section is listed in Table 1, but anything you believe is relevant can be recorded.

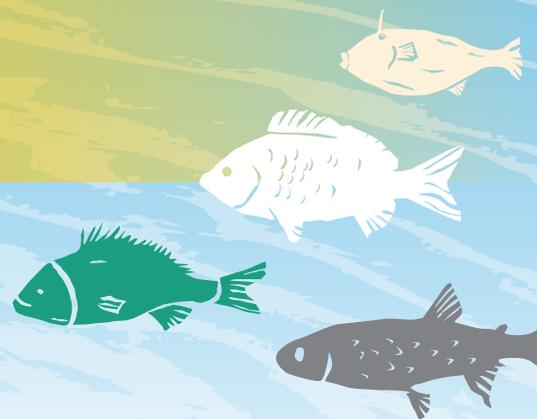
If you have nothing of interest to record you may leave the notes section blank.

Table 1. Examples of information that may be included in the Notes Section.

Fauna & Flora	Dead fish/birdlife, whale sightings, unusually high mosquito count, presence and colour of algae
Equipment	Unusual equipment behaviour, damage or testing equipment in short supply
Vegetation	Changes to vegetation type or extent
Stratification	Visible stratification of salt/fresh water layers
Odour	Unusual odour presence or possible sources
Litter	Presence, quantity and type
Safety	Observe any new OH&S risks, incidents, near misses.

Mouth Condition Monitoring

Photopoint Monitoring



The concept of Photopoint Monitoring is very simple – it is about taking a photograph of the same location at specific time intervals. It gives a good general overview or inventory of a situation, landscape or environment and gauges temporal and spatial trends in a more objective way than memory or written notes.

It is important that photopoint monitoring is easily replicated by a number of people and over time, hence consistent data collection is crucial. Photopoint monitoring aims to show the estuary mouth and its relationship to the surrounding area. It is important to document changes on or around the estuary entrance over time, whether long term or short-term over the course of an ‘opening’ or storm event. The photopoint monitoring will help interpret other data collected.

1. Methods

Location and timing

- at set points at the estuary mouth as determined by your EstuaryWatch monitoring plan
- if possible, take photos and record water levels near high tide.

Equipment

- estuary mouth condition data sheet
- photopoint guide/s for your estuary of study
- photopoint instruction sheet
- compass, string and clip attachment
- digital camera
 - understanding the features and functions of your camera is always a good starting point! Check if a tripod will add clarity to your photos. A tripod (or something to lean your camera on) may be especially helpful if you take any photos in low light conditions. If you have one, a polarizing lense may be especially helpful for removing reflection (from the water) from your photos. However, be wary of vignetting (darkening of corners due to occlusion of the image by the polarizer ring).

Procedure

- a. Record which photopoint you are taking pictures from, the number of pictures and the time pictures were taken.
- b. Take photo(s) according to technique outlined below. Ensure the photos are as high quality as possible. Minimum image file size should be 500kb.

Mouth Condition Monitoring

Photopoint Monitoring

Techniques used

The photo point: establishing position of photographer

The EstuaryWatch Coordinator will work with each EstuaryWatch group to establish a photo point. This is a set place where the photographer will always stand to take the photo. A *Photopoint Guide* will also be developed and placed in your monitoring kit.

Photopoint monitoring: taking the shots

- always take each photo from the same position (photo point), and at the same compass bearing and photo angle, i.e. stand at the same level when taking photo. Refer to *Photopoint Instruction Sheet* and relevant *Photopoint Guide* when arriving at the photo point
- use the full width of your viewfinder, don't zoom in or use different lenses
- follow the 4 steps outlined in the *Photopoint Instruction Sheet*. Take the set amount of photos as outlined in the *Photopoint Guide*. Try to maintain a level (horizontal) camera view
- when taking each photo, try not to have the clip board used in the frame
- ensure the photos saved to the camera are in a place where they can easily be found and uploaded onto the EstuaryWatch online database.



Photopoint Instruction Sheet



4) Use the lines & photos to position your camera for the shot.

2) Turn the dial of the compass so that the bearing matches the number printed just above the compass.

1) Line the centre of the compass up with the crosshairs in the printed circle and clamp it to the clipboard.

3) Turn the clipboard until the compass needle lines up with North on the compass ring.

Figure 1. EstuaryWatch Photopoint Instruction Sheet

Mouth Condition Monitoring

Photopoint Monitoring

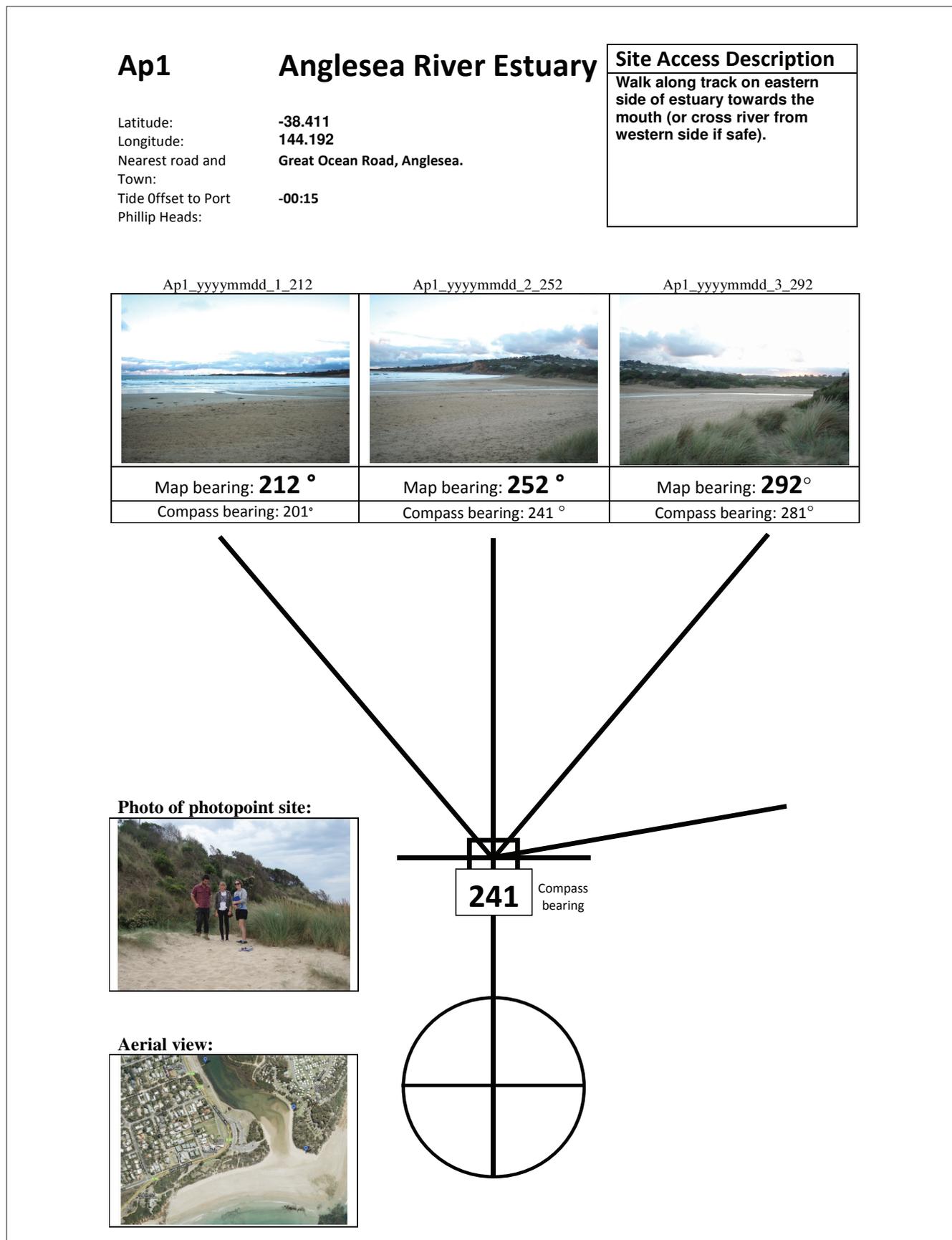
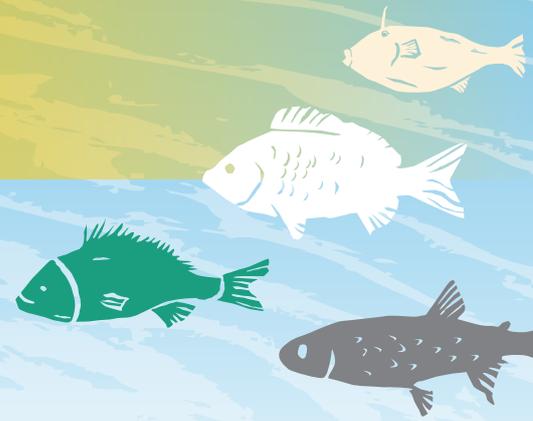


Figure 2. Example Photopoint Guide for the Anglesea River Estuary

Mouth Condition Monitoring

Flow, Water Levels & Tides



1. Why do we monitor flow, water levels and tidal changes?

The depth of water within an estuary changes over time. These changes can be due to changes in flows coming from upstream, changes in flows through the entrance channel (including the amount of tidal influence) and loss of water from the estuary to the ocean through estuary mouth openings.

Linked with other parameters, water level data can provide an important link in the information about processes in an estuary, such as the length of time that water is resident in the estuary and relative amounts of fresh and salt water entering and leaving the estuary. These processes in turn affect other parameters such as dissolved oxygen and salinity as well as determining how long different habitats are inundated.

Daily changes in estuary water level can vary from zero, when a mouth is fully closed, to around 1.4m, with near-full tidal influence.

2. Methods

Location and timing

- Monitoring for flow occurs at the estuary mouth.
- Monitoring for water levels and tidal changes will take place at Australian Height Datum (AHD) referenced gauges or at sites set in your EstuaryWatch monitoring plan for water level measurement. AHD referenced gauges are installed at many estuaries. The gauges are surveyed and calibrated to the AHD which is the standard altitude measurement used throughout Australia. AHD referenced gauges give an accurate water level reading for the estuary at that site in metres above sea level. For example, a reading of 0.5m means that the height of the estuary is 0.5metres above the mean sea level.



Figure 1. AHD referenced gauge on the Thompson River Estuary

- Water levels should be measured at the same time that estuary mouth state is monitored. Depending on what monitoring you are undertaking at the one time, the best way to achieve the most useful water depth measurements is to check the AHD referenced gauge, undertake mouth condition monitoring, undertake phys-chem monitoring and then check the AHD referenced gauge again;

Equipment

- tide chart or use www.willyweather.com.au and select your location (or the closest point)
- stick or other biodegradable object (optional).

Mouth Condition Monitoring

Flow, Water Levels & Tides

Procedures

Flow

1. Stand near the mouth of the estuary (the photopoint site is often ideal).
2. If you have recorded the estuary mouth as closed there is no flow. Enter 'N' on the data sheet.
3. If the estuary is open there may be flow. Look at the water to determine if it is moving. You also need to determine what direction it is going – in or out. It may help to throw a small stick or other biodegradable object into the water to determine the flow's presence and it's direction. Record 'Y' or 'N' on the data sheet and whether the flow is going 'in' or 'out'.

Water Level

1. Record the water level on a AHD referenced gauge (see Figure 2) at the time you start monitoring and at the time you finish monitoring.
2. To read water level from an AHD referenced gauge is not always easy. Water can splash and rise up and down against the gauge. One easy technique is to take a picture of the gauge when the water is at its steadiest and take the reading off this.

Tidal Range

1. Record the nearest high tide and low tide heights and times from a tide chart or www.willyweather.com.au website to the time you are monitoring. Remember to allow for time differences for your estuary's location from the tide measurement points and make adjustments for daylight savings.

Tidal Influence

1. There is a tidal influence if water levels have changed consistent with tidal changes over the period you have been monitoring.
2. You will need to refer to your mouth state, water level and tidal range recordings to determine whether there has been any tidal influence.
3. If the water levels you have recorded appear to have been influenced by the tide, record 'Y' in the Tidal Influence section of the data sheet.

An example of tidal influence:

The estuary mouth is open. You start monitoring just after high tide and finish 1 hour before low tide. The depth gauge board reads 1.2 metres when you start and 0.8 metres when you finish. This indicates that there is a tidal influence in the estuary as the water level has dropped parallel with the tide dropping.

An example of no tidal influence:

You start monitoring just after high tide and finish 1 hour before low tide. The estuary mouth is perched and water levels do not drop with the tide dropping.

Rainfall, inflow from tributaries and groundwater can all be confounding factors influencing your measurement of tidal influence. If a tidal influence is not obvious or you are not sure, leave this section of the data sheet blank.

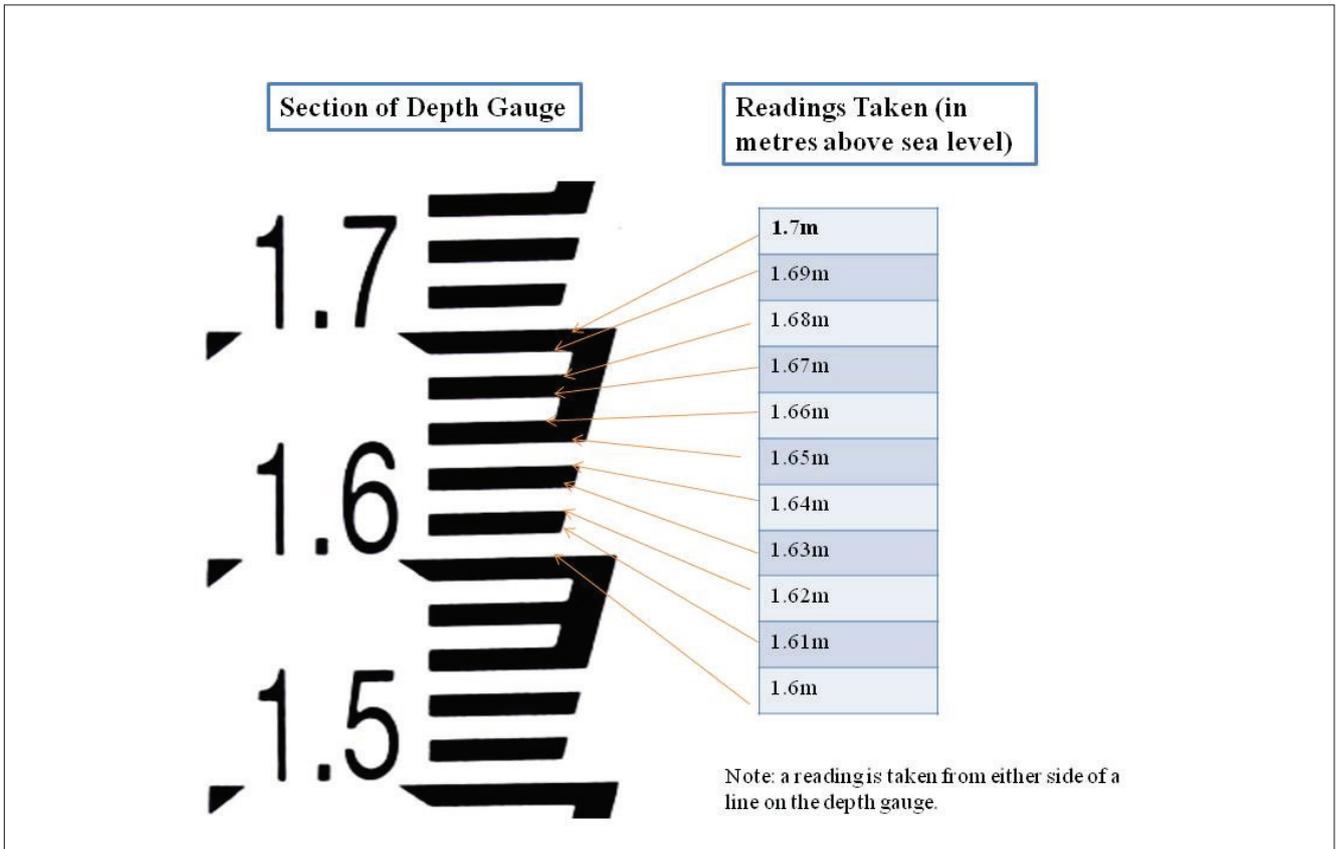
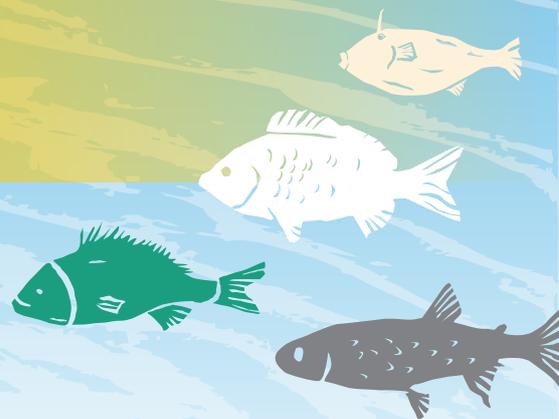


Figure 2. A common type of AHD referenced gauge with technique for taking readings explained.

Mouth Condition Monitoring

Physical Conditions



1. Why do we monitor physical conditions?

Weather patterns and other changeable conditions such as sea state provide valuable information about an estuary. These conditions have great influence over the state of an estuary and provide valuable data for interpretation of other parameters monitored through EstuaryWatch.

2. Methods

Location and timing

- All physical conditions are to be recorded as close as possible to the time all other elements of the mouth condition data sheet are recorded.
- Monitoring will take place at the monitoring site closest to the mouth of the estuary for wind direction and wind strength observations.
- Sea state is to be monitored at a point where a good view of the ocean can be achieved.

- If you know what the conditions have generally been like for the last 2 weeks enter them also (assuming your EstuaryWatch group has not monitored in the last 2 weeks). If you do not know what conditions have been like, DO NOT guess, leave this section blank.

Equipment

- Beaufort Wind Strength Scale (located on the back of Mouth Condition Data Sheets)
- Sea State Table (located on the back of Mouth Condition Data Sheets)
- compass

Procedure

1. Record the wind direction, i.e. N, NE, E, SE, S, SW, W or NW. (Your compass may assist with this observation).
2. Observe the wind strength and record according to the Beaufort Wind Strength Scale
3. Observe the sea and record the sea state according to the Sea State Table.

Table 1. Beaufort Wind Strength Scale

B. No	Approx Speed	Classification and Description	
0	< 2 km/h	Calm	Still, smoke will rise vertically.
1	2 to 5 km/h	Light Air	Rising smoke drifts, weather vane is inactive.
2	5 to 12 km/h	Light Breeze	Leaves rustle, can feel wind on your face, weather vane is active.
3	12 to 20 km/h	Gentle Breeze	Leaves and twigs move around. Light weight flags extend.
4	20 to 30 km/h	Moderate Breeze	Thin branches move around, raises dust and paper.
5	30 to 40 km/h	Fresh Breeze	Trees move and sway.



Wind Strength

This Beaufort Wind Strength scale gauges wind speed through the use of observations of the effect wind has on trees and other objects (see Table 1). It is often used in monitoring projects because it is simple to understand and does not require specialized equipment.

Example: A “light breeze” is recorded as 2 on the Beaufort Scale.

Sea State

The ‘sea state’ (see Table 2) is the general condition of the free surface on a large body of water—with respect to wind, waves and swell—at a certain location and moment. A sea state is characterized by statistics, including the wave height and power. The sea state varies with time, as the wind or swell conditions change and can be assessed by an observer using the Sea State Scale. This simple scale, devised originally for mariners and in modern times used by the Australian Bureau of Meteorology, is a standard method of observation and recording of sea waves.

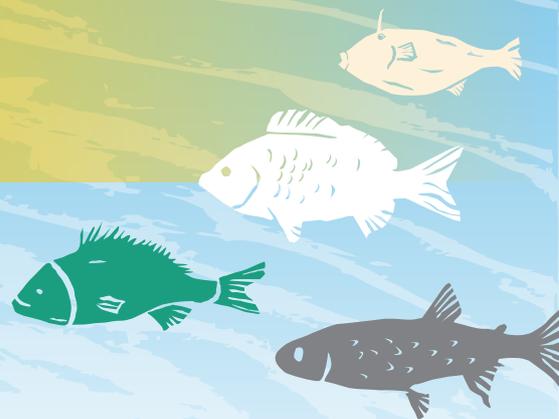
Table 2: Sea State Table

Sea Description	Height (metres)	Effect
Calm (glassy)	0	No waves breaking on beach
Calm (rippled)	0 - 0.1	No waves breaking on beach
Smooth	0.1 - 0.5	Slight waves breaking on beach
Slight	0.5 – 1.25	Waves rock buoys and small craft
Moderate	1.25 – 2.5	Sea becoming furrowed
Rough	2.5 – 4	Sea deeply furrowed
Very rough	4 – 6	Sea much disturbed with rollers having steep fronts
High	6 – 9	Sea much disturbed with rollers having steep fronts (damage to foreshore)
Very high	9 – 14	Towering seas
Phenomenal	Over 14	Precipitous seas (experiences only in cyclones)

Note: The definition of “furrowed” is: having long narrow shallow depressions (as grooves, wrinkles or ripples) in the surface of the ocean.

Mouth Condition Monitoring

Berm Measurement



1. Why do we monitor the berm?

The berm is the sand that closes the estuary entrance. By collecting data on berm heights, the physical/chemical data collected can be placed into the context of the estuary at that point in time. When a sand berm develops across the seaward entrance to an estuary, saltwater is prevented from entering the estuary.

We need to measure the vertical height of the berm at the estuary and seaward edge and the horizontal distance between the estuary and the sea.

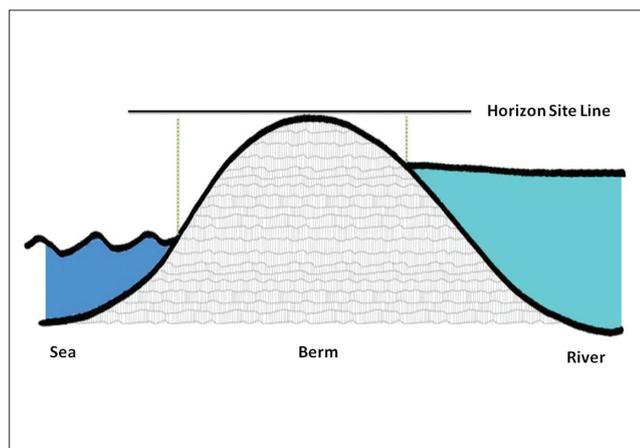


Figure 1. Measuring Berm Dimensions (closed mouth only)

2. Methods

Location and timing

- berm measurements are to be taken as close as possible to the time all other elements of the mouth condition data sheet are recorded
- berm measurements are only to be taken when the estuary mouth is closed
- berm measurements are best taken at high tide
- berm height measurements need to be taken from the estuary/river side of the berm and the seaward side. At the river side of the berm you need to stand adjacent to the most seaward extent of the river waterline (Figure 2);



Figure 2. Standing at the most seaward extent of the river waterline to take a berm measurement.



Figure 3. The upper swash limit.



Figure 4. Person 2 standing at the upper swash limit at the seaward side of the berm.

- At the seaward side of the berm you need to stand at the upper 'swash limit' of the water. The 'swash' is the turbulent layer of water that washes up on the beach after an incoming wave has broken'. The swash limit therefore is the upper extent of this and is often delineated by the wet markings on the sand that waves leave behind. Figure 3 further displays the 'swash limit' and the location where you should stand to take berm measurements.

Equipment

- berm measurement pole/s.

Procedure

1. Stand at the estuary water's edge as outlined in Figure 2. Place the pole in the sand as straight as possible. Dig the pole into the sand until the lowest black line is level with the sand. Crouch or lean down as necessary until your sightline brings the top of the berm in line with the horizon. Noting the increments and colour of the tape on the pole, record the height measurement on the berm pole which is at the level of your sightline at this point.
2. One person in the monitoring team (Person 1) stays standing in the same spot at the estuary water's edge. The other person/s (Person 2) removes the berm pole and walks from this point straight over the berm towards the sea, measuring the distance as you walk (one long stride on average equals one metre in distance). Person 2 should walk until they reach the upper swash limit of the sea (see Figures 3 and 4) and record the horizontal distance across the berm.
3. Person 2 must then place the berm pole in the sand at the upper swash limit location. Dig the pole into the sand until the lowest black line is level with the sand. Person 1 should then crouch or lean down as necessary until their sightline brings the top of berm in line with the horizon. Person 1 communicates with Person 2 (as they are closest to the pole) using an agreed upon sign language to pin point the height where the top of the berm lines up with the horizon (see Figure 6). It may help if Person 2 raises or lowers an extended arm up and down the pole to advice from Person 1 (see Figure 7).

Mouth Condition Monitoring

Berm Measurement



Figure 5. Person 1 at the estuary edge of the berm and Person 2 standing at the seaward edge of the berm

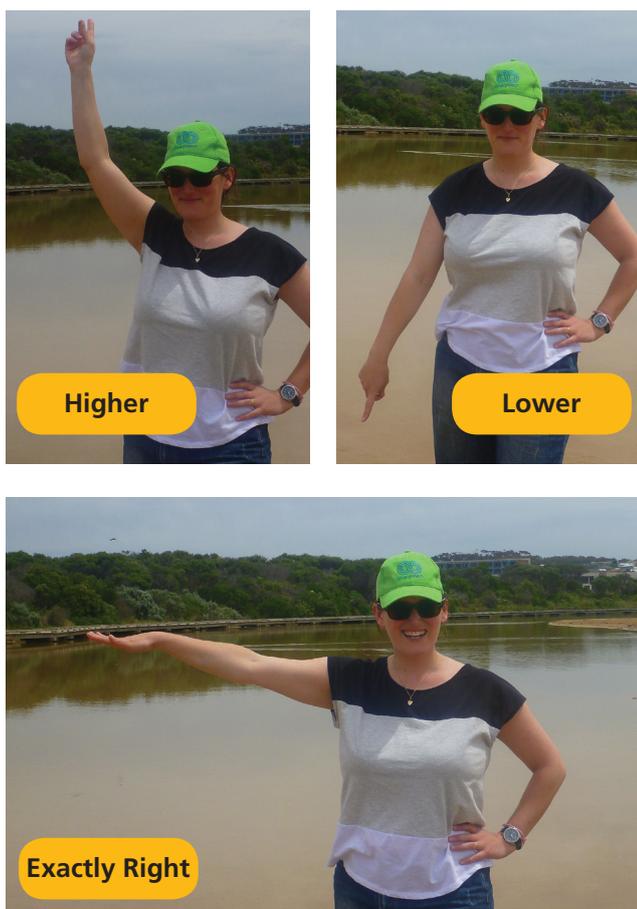


Figure 6. Some suggested arm movements used by Person 1 at the estuary water's edge to communicate with Person 2 at the upper swash limit at the seaward edge of the berm.



Figure 7. Person 2 is using their arm to communicate with Person 1 standing at the estuary edge of the berm.