

# EstuaryWatch

## Data confidence plan

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# Overview

## 1. Introduction

### EstuaryWatch

EstuaryWatch has been operating in the Corangamite region since 2006. This program, which is coordinated from the Geelong office of the Corangamite Catchment Management Authority (CCMA), is currently monitoring twelve estuaries. The estuaries monitored within this program have the potential to affect ten different coastal communities. Each community and its surrounding natural environment are susceptible to the effects of flooding and to the problems associated with estuarine changes. The estuaries in this area open naturally on a cyclical basis, however anoxic conditions or floods can occur between openings. Anoxic conditions and floods have traditionally been relieved by artificial estuary openings. Estuaries in the region function as wildlife refuges, wetlands and as breeding grounds for fish, birds and insects. Frequent estuary openings can change the many functions of an estuary.

Most of the estuaries observed through EstuaryWatch are classed as modified or largely unmodified, with only the St George Estuary classed as pristine (*Australian Catchment, River and Estuary Assessment 2002*, National Land and Water Resources Audit). The EstuaryWatch program was developed to encourage participation and awareness of estuary health within the Corangamite Catchment region, and to provide information to decision makers on the impact of natural and artificial estuary openings on the health of estuaries.

The estuaries which are monitored are:

- Anglesea River Estuary
- Barham River Estuary
- Barwon River Estuary
- Erskine River Estuary
- Gellibrand River Estuary
- Kennett River Estuary
- Painkalac Creek Estuary
- Skenes Creek Estuary
- Spring Creek Estuary
- St George River Estuary
- Thompson Creek Estuary
- Wild Dog Creek Estuary

[For locations, see the map on p.9]

The EstuaryWatch program is linked to the Estuary Entrance Management Support System (EEMSS). EEMSS is a gateway system run by the CCMA to make decisions on estuary openings.

The EstuaryWatch program provides data to EEMSS and is used by EEMSS to update the public on estuary management and decision making.

Over the longer term, the EstuaryWatch program will provide information on responses of the natural environment to changes in population, climate and sea level. Annual monitoring of flora, fauna and parameters not included in the regular monitoring program will provide additional data on long term changes.

**The purposes of EstuaryWatch are:**

- To raise awareness and provide educational opportunities to the community in estuarine environments.
- To enable communities and stakeholders to inform decision making on estuarine health.
- To provide support for the Estuary Entrance Management Support System (EEMSS) program.
- To monitor estuaries in the long term with regard to flora and fauna and water levels.

**2. Summary**

The Data Confidence Plan (DCP) has been developed as part of the EstuaryWatch program, to help our network to produce data of known quality. We aim to use this plan to increase EstuaryWatchers' confidence in the field and to demonstrate data confidence to stakeholders, including monitors and regulatory authorities.

**Monitoring estuaries**

Each estuary has between 1 and 10 EstuaryWatchers, and most monitoring is done monthly. Members of the community measure a number of water quality parameters, along with basic physical parameters such as water level and inflow.

There are between one and nine sites on each estuary which are monitored by EstuaryWatch volunteers. All are trained to an acceptable standard of competency. One full-time staff member of the Corangamite Catchment Management Authority co-ordinates the program.

**Information gathered**

Information on a number of parameters is collected within the EstuaryWatch program. These are primarily to assess the health and water quality profile of the estuary.

There are two monitoring sheets used.

**Mouth condition monitoring – sheet 1**

Mouth conditions are monitored and photographed at a predetermined point close to the estuary mouth. The condition of the estuary is assessed – the flow, berm height, water levels, tidal influences, and the frequency of opening and closing of the estuary mouth.

**Physico-chemical monitoring - sheet 2**

Profiles of physical and chemical conditions are taken at different locations upstream of the estuary mouth. At each location the maximum depth is measured, as well as dissolved oxygen, temperature and salinity. These parameters are measured from the water surface to the

bottom of the water body at intervals to achieve a consistent depth profile. Top/bottom sampling is also used at each location to measure the turbidity.

### QA/QC

Data quality is achieved by training EstuaryWatchers, both at the start of their involvement with the program and on an ongoing basis, and by completing regular data assessments. There is a biannual QA/QC program run with EstuaryWatchers to ensure the consistency of practice between groups and individuals. Regular independent data reviews are planned for the future to assess data quality.

### Database management

The database is largely updated by online data entry from the volunteers. The data is then visible to the general public on the EstuaryWatch website, and is available for checking by the EstuaryWatch co-ordinator.

<b>Section of the EstuaryWatch program</b>	<b>Data confidence procedures used</b>
EstuaryWatchers	All EstuaryWatch data is collected by competent adults. School groups and families are involved with EstuaryWatch in other ways.
Training	All EstuaryWatchers are trained to collect data consistently and accurately.
QA/QC	Data collection practices are validated by a regular QA/QC programme, in which data collection is checked against other EstuaryWatchers and the EstuaryWatch co-ordinator.
Equipment	All equipment is regularly calibrated and serviced.
Database	The database is checked by EstuaryWatchers, team leaders and the EstuaryWatch co-ordinator.
Analysis	Regular independent data reviews are planned.

### 3. Links with the EEMSS Program

#### Objectives of EEMSS

The EEMSS program is an estuary management database and decision making tool. The database is populated with information on the assets which may be affected by an estuary opening. Decisions on whether or not to open an estuary are made by weighing up the threats to all these predetermined assets.

**Estuarine assets included in EEMSS are:**

SOCIO-ECONOMIC ASSETS	ENVIRONMENTAL ASSETS
Roads & bridges Agricultural land Fishing Jetties Walking tracks Boat ramps Recreational land Camping Swimming Stormwater Septics Human health Watercraft Built infrastructure	Fish Birds Plant communities (EVCs)
	CULTURAL ASSETS
	Cultural heritage Indigenous culture

*From <http://www.glenelg-hopkins.vic.gov.au/?id=estuarymanagementpla>*

**Roles of EstuaryWatch and EEMSS:**

EstuaryWatch data is designed to integrate with the EEMSS program. Data can be loaded into the EEMSS database as current monitoring data. Upon receiving an opening request, data is collected by representatives from the EEMSS program and loaded in the system.

Some of the EEMSS sites monitored are the same as or similar to EstuaryWatch sites. Permanent monitoring stations also provide data to EEMSS, and may coincide with EstuaryWatch monitoring programs. In this way, EEMSS monitoring can be used to validate EstuaryWatch monitoring, and vice versa. EEMSS will also serve to reduce the legislative exposure of the EstuaryWatch program and individuals and groups within it, by validating critical data which informs contentious decision making with impacts on land, stock, infrastructure and property.

Information from EEMSS which is not sensitive may be provided to the general public and EstuaryWatch volunteers via the EstuaryWatch website. This information may include the reasons why a decision was made on an estuary opening, information on sensitive plant and

animal species in the region, and information on environmental monitoring conducted by EEMSS.

#### **4. Minimising risks and improving data quality**

Although EstuaryWatch is not a professional data collection body, we aim to produce a reliable dataset through consistent, accurate data collection. The EstuaryWatch program minimises the risks inherent in data collection by training EstuaryWatchers to take consistent, accurate readings, providing backup, help files, a manual, regular refresher sessions and a QA/QC program to ensure that standard operating procedures are being followed. EstuaryWatchers are encouraged to participate in the program as fully as possible, and flexibility within the program ensures that if an EstuaryWatcher is unable to take accurate readings, they will be able to participate in other ways. The risk of local community bias is more difficult to address, however additional readings by other services, for example the EEMSS program are valuable opportunities to verify the data collected by the EstuaryWatch program. Local volunteers have a high level of commitment to responsible environmental management.

#### **5. Objectives of the data confidence plan**

The Data Confidence Plan will be used by EstuaryWatch volunteers and co-ordinators and will be implemented in 2009. The overall aim is to provide data of known quality to manage natural systems.

The aims of the Data Confidence Plan are:

- To ensure effective data collection and management, so that data can be reviewed and used by natural resource managers and the general public.
- To demonstrate data quality to stakeholders, so that data may be used in decision making.
- To provide transparency to natural resource managers, EEMSS and the community, so that they have access to the procedures and standards under which data is collected.

**The EstuaryWatch data confidence plan affects all aspects of data collection, namely:**

- Sampling
- Analysis
- Data management
- Use

The DCP will be used to highlight risks to reliable data collection. Poor data quality is due to inadequate practices and procedures, contamination of samples, and equipment failure. The aim in establishing the DCP is to reduce or eliminate these risks by establishing and maintaining standards and by consistently reviewing data.

# Natural and other resources

## 6. Estuaries

These are shown in Fig 1, below. All estuaries except for the Barwon Estuary are intermittent, that is, they have sandbars that periodically close their connection with the ocean. The estuaries monitored have a range of sizes and shapes and some have intermittent freshwater flows.

### Choice of estuaries

In February 2005, a survey titled, 'Awareness and perceptions of estuaries' was conducted across 650 Surf Coast Shire homeowners, gauging their likelihood of becoming involved with their local estuary. As a result of the survey, estuaries were chosen in sites which were more likely to have a sustainable community of monitors. Other reasons for choosing estuaries were the size of the river and the depth of the estuaries. Depth profiling was impossible in a number of sites because the water was too shallow.

### Sites

Twelve estuaries are monitored across the EstuaryWatch program. There are other sites which are seen as having potential for monitoring in the future if conditions change, or if there is an increase in community interest.

### Why were these sites chosen?

Teams of monitors chose the sites to be monitored for access and safety, while maximising channel depth. One site was generally chosen at the upstream limit of tidal influence in the estuary, and one site was chosen at the estuary mouth. One photopoint was generally established close to the estuary mouth. Apart from these, other sites were chosen by teams for access and safety.

Photopoint monitoring at the estuary mouths was chosen because most of the estuaries have sandbars which strongly influence them. Sites were chosen which had a good view of the detail of channels and sandbars.

Site locations were recorded by GPS, with descriptions of the sites kept by monitors.

### Site codes

A numbering system was developed to establish consistency across monitoring groups and for ease of accessing data. All photos are labelled by estuary, type of photo and date. Different codes are used for photos of events and from monitoring photopoints. All photos are then filed by date in the format YYMMDD, for ease of digital retrieval, so that, for example, all the 2008 results are together on file. Events are filed by the estuary initial, followed by an E. There is a list of codes for different events. Monitoring results are stored online and numbered chronologically and by estuary.

## Monitoring site description

A site description sheet is completed by each volunteer for all sites they will monitor. This sheet records the location, description and a basic checklist of adjoining land use. This encourages EstuaryWatchers to have a good theoretical overview of their monitoring sites.

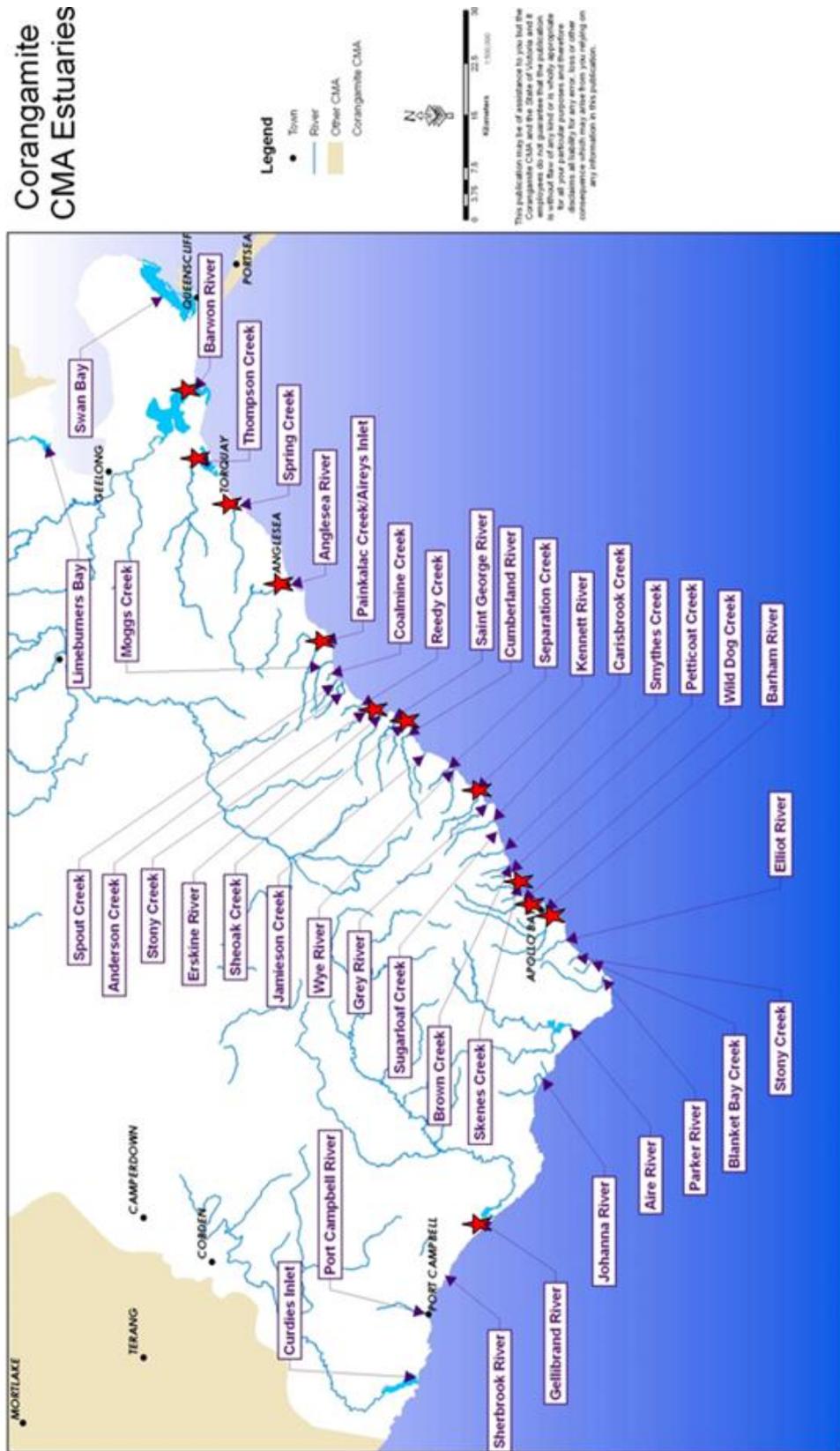


Fig. 1 Estuaries in the Corangamite catchment, with red stars showing estuaries monitored under the EstuaryWatch program.

## **7. Parameters**

Parameters were chosen for ease of measurement, reliability, economy and the value of the data over the short and long term. Mouth condition reporting will track the development and erosion of intermittent sand bars at estuary mouths and changing channel conditions, with information on tides and weather. Depth profiling will give an indication of estuary health at different depths and show the extent of mixing between fresh and salty layers, which may then be related to environmental factors such as berm height and rainfall.

### **Mouth**

#### **Qualitative**

- State: open, closed, perched
- Flow
- Tidal influence

#### **Quantitative**

- Berm heights
- Water level
- Tidal range
- Wind direction and Beaufort No.
- Sea state

### **Physico-chemical**

#### **Quantitative**

- Max depth
- Turbidity and Ule scale colour, top and bottom

#### **Profile of:**

- Temp °C
- Salinity mg/L
- DO: mg/L and %sat

#### **Qualitative**

- Freshwater inflow

### **Event**

- Fish kills
- Weather event (storm, swell, flood)
- Estuary opening (permitted, illegal or natural)
- Large seaweed deposits
- Sudden changes, for example in colour, clarity, depth, smell etc.

### **Special interest monitoring**

- Pollution
- Photographs
- Colour change

### **Are there any other parameters that could be recorded usefully?**

Additional Monitoring is part of the original EstuaryWatch program. This covers monitoring which falls outside the current program, but which could be valuable to collect. Parameters include pH, phosphorous, nitrogen, fish, bird and macroinvertebrate monitoring, oral histories and human use surveys.

The effects of climate change on estuaries could be assessed from EstuaryWatch and EEMSS data. Water height data and temperature could be included.

Rapid health assessments are currently conducted by EstuaryWatch and could be professionally monitored in the future.

Some parameters which could be recorded by the EstuaryWatch program are currently monitored by the EEMSS program. There is potential for the data from this monitoring to be released to the public through the EstuaryWatch website. Some of these are:

#### **Biological indicators**

- Nutrient load
- Chlorophyll A sampling for algal blooms
- Ground nesting birds

#### **Seasonal sampling – contract**

- Flora and fauna surveys
- EVCs on rivers

### **Are there any obsolete parameters?**

Some parameters may become unnecessary over time. Field sheets should regularly change to reflect this, to avoid in-field decisions on what is and isn't necessary to record. One example is Ule scale measurement, which is usually not recorded except in the Barwon Estuary, and is currently under review. Other parameters which may cease to be measured in the future are two-week estimates of physical conditions such as wind direction and sea state. Usually, this section is not filled in because the conditions have varied considerably and an average wind direction reading does not reflect actual conditions.

#### **Monitoring broader change**

Several descriptive sheets are used to monitor the conditions surrounding the estuary. These can be used to monitor changes over the longer term in land use and environmental conditions in the area. This type of monitoring is included in the data confidence plan as it may be used in the future to track long-term change and its implications in land use and vegetation. It allows for broader-scale engagement with the area surrounding the estuaries.

#### **Monitoring estuary condition**

An assessment of each estuary is done by EstuaryWatch monitors. The estuary is assessed for its current state, for example land use, vegetation, streambed shape and fish habitat. Over time with continuing assessment, major improvement or degradation can be tracked, for example by charting bush regeneration or increasing diversity in fish habitats.

## **Monitoring plans**

Monitoring plans are developed by the monitoring group for each estuary. The monitoring plan is an agreement between EstuaryWatchers about why the estuary is being monitored and how the monitoring program will meet these aims. This ensures that the goals of each team are agreed on and formalised, and that convenient, repeatable testing methods are adopted to meet these goals. Responsibilities are outlined, e.g. team leadership, communication, equipment management and monitoring frequency. A contact list for the team is drawn up, and the exact location of all monitoring sites is decided, with photographs or diagrams.

## **8. Equipment and infrastructure**

### **Equipment**

Monitoring kits are stored by team leaders. Team leaders are responsible for reporting any faults or problems to the EstuaryWatch co-ordinator.

Reagent ordering and storage is done by the EstuaryWatch co-ordinator, however team leaders or monitors who use a lot of the reagents may be given bulk amounts to store and advice on safe and practical storage methods.

### **Management of physical equipment**

Monitoring kits are fixed as needed and serviced annually.

Equipment calibration is done at the time of monitoring. The calibration record sheet is stored with the kit. Calibration data will be uploaded with monitoring data, and will be monitored by the EstuaryWatch co-ordinator.

### **Infrastructure**

Signage increases community involvement and awareness of estuary health and the EstuaryWatch program, and refers to the EstuaryWatch website so that the public can access data for their local estuary.

Estuary height gauges used by the EstuaryWatch program are maintained by the EEMSS program.

## **People**

### **9. EstuaryWatchers**

EstuaryWatchers are adult members of local communities who volunteer their services in caring for their local estuarine environment. School groups and families are involved in EstuaryWatch through community engagement activities such as the Festival of the Sea and Connecting to Coast programs.

#### **Who can be an EstuaryWatcher?**

Any adult can become an EstuaryWatcher, regardless of prior knowledge of estuaries or monitoring experience. EstuaryWatchers come from many walks of life, with different age groups and occupations represented

### **Levels of competence required.**

No prior experience or knowledge is necessary; however EstuaryWatchers must complete the training course before they can monitor estuaries on their own. EstuaryWatchers are assessed on their first monitoring outing. If their competence is found to be below minimum standards, they may be placed in a group of competent EstuaryWatchers.

### **Frequency of monitoring**

Most monitoring is done monthly. Some sites are monitored more regularly, and as such are dealt with on a case-by-case basis.

### **EstuaryWatchers with different skills**

If an EstuaryWatcher becomes unable to monitor estuary conditions, they may be able to help in other ways, such as mentoring, educating others and office support. When the database was established, volunteers travelled into the Geelong office to test the external links to the database. Other programs along these lines may be developed to retain knowledge and skills within the EstuaryWatch program.

### **Recognition**

There is a reward and recognition program for long serving EstuaryWatchers. Within this program, EstuaryWatchers are provided with access to training and external seminars, as well as with useful equipment such as hats and warm weather gear.

## **10. Training**

EstuaryWatch training is a one day course covering theory, assessment and practical skills. The EstuaryWatch methods manual is used and given to EstuaryWatchers. This contains information on sampling procedures, equipment maintenance, safety considerations and quality control practices. Detailed operating procedures are outlined for photopoint monitoring, physico-chemical monitoring and data reporting. EstuaryWatchers are introduced to the website and shown the procedure for uploading data into the database. Instructions for uploading information are included in the database as help files, which are accessible from any page.

The monitoring manual is provided for participants to take home and can then be referred to in the field. When the EstuaryWatcher goes out in the field for the first time, the EstuaryWatch co-ordinator goes with them for training purposes.

### **Site Risk Assessment Sheet**

A risk assessment sheet is filled out by all EstuaryWatchers, covering emergency reference points, hazards pertaining to the sites, risks to third parties and management strategies for these. The risk assessment sheets are signed off by the EstuaryWatchers who will be monitoring the site and the EstuaryWatch co-ordinator.

### **Ongoing training**

All EstuaryWatchers are provided with opportunities to increase their knowledge and understanding of estuary processes. Twice a year, they can attend the EstuaryWatch night seminars which involve more advanced concepts, for example, taking a more detailed look at some of the flora and fauna in the area. Using the coastal network of natural resource

managers, other training or information seminars are offered to EstuaryWatchers as the opportunities arise.

EstuaryWatchers may decide to study natural resource management. Some EstuaryWatchers have volunteered to work with the EstuaryWatch co-ordinator, either informally or as formal work experience within their course. This creates deeper community engagement in estuary management.

### **11. Personnel Safety**

Volunteer registration is done at the training session and includes pre-existing medical conditions, drugs and alcohol, clothing, medications and emergency contact numbers.

A waiver for pre-existing illness is signed by each EstuaryWatcher, both for legal reasons and to ensure that current risks are fully understood, and that the risk of further injury is minimised or eliminated.

Job safety analysis and risk analysis is undertaken in the training session. EstuaryWatchers consider the safety aspects of monitoring and conduct risk assessments of the sampling sites. Ongoing methods of safety management are considered.

Report forms for safety hazards are kept in the EstuaryWatchers' folders and updated as conditions change. The EstuaryWatch co-ordinator is responsible for managing these risks.

Accident and incident report forms are also kept in monitors' folders. These are filled in and sent to the EstuaryWatch co-ordinator. Hazards or risks leading to these are removed or minimised.

### **12. Staff**

One full time co-ordinator runs the EstuaryWatch program, reporting to the CCMA, and advised by the EstuaryWatch Steering Committee. The EstuaryWatch co-ordinator manages the monitoring teams by conducting the following;

- Registration
- Training
- Assessment
- QA/QC testing
- Kit servicing and maintenance,
- Recognition and rewards program
- Providing advice, direction and resources to EstuaryWatchers

The EstuaryWatch co-ordinator is also responsible for raising public awareness about the importance of estuaries and the EstuaryWatch program, website co-ordination with Geomatic, database management, co-ordinating with the EEMSS program and providing strategic direction for EstuaryWatch.

## **Data**

### **13. Website**

The website has been running since February 2008. It is located at

[www.ccma.geomatic.com](http://www.ccma.geomatic.com) and is accessible to the public. It can be used to enter, edit and view data (Figure 1, below).

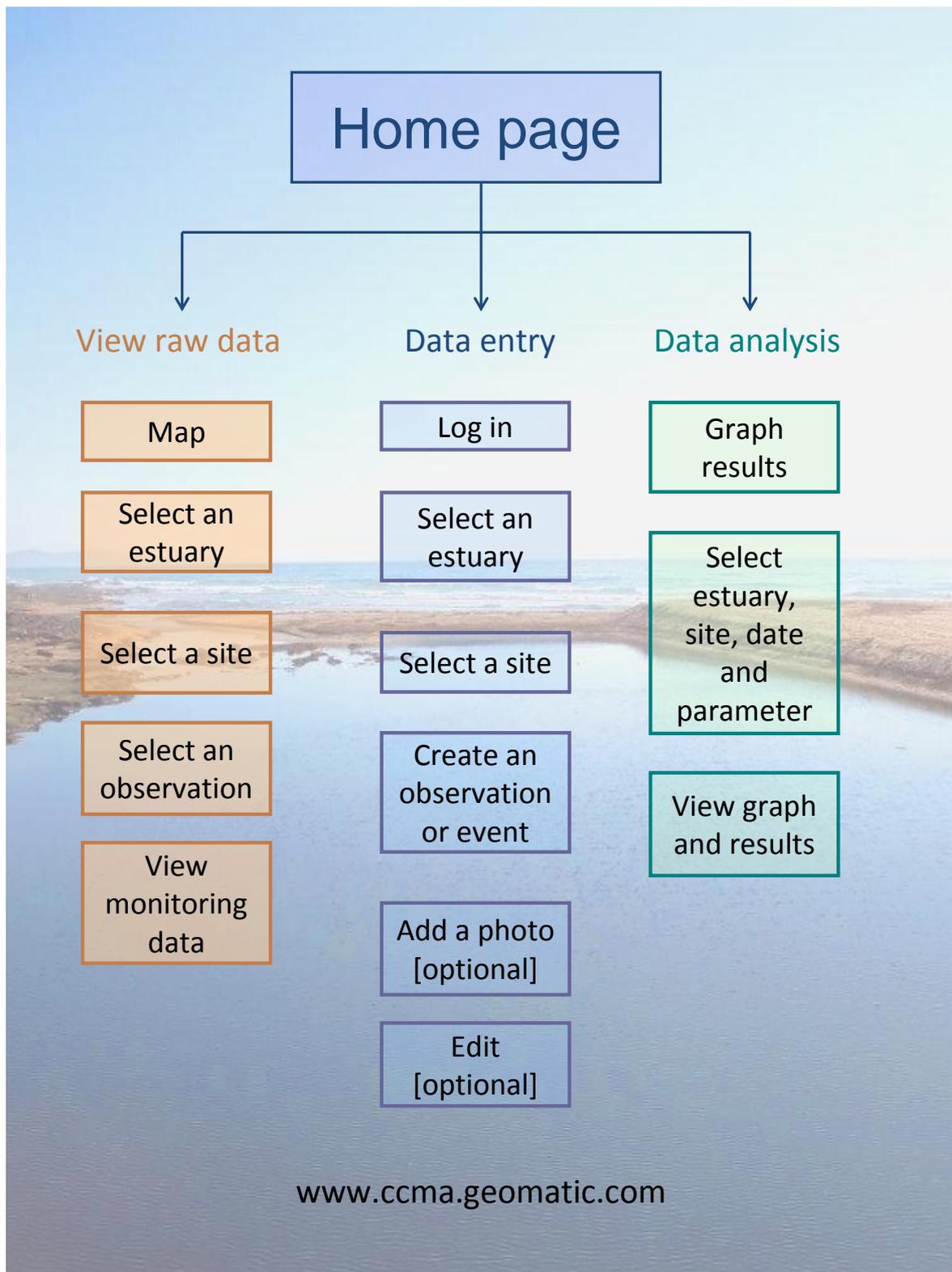


Fig. 2 Some uses of the EstuaryWatch website.

## **Data management**

The website can be used to analyse and report on estuaries, to access contact data for EstuaryWatchers and to assist in educating the general public on issues relating to estuary health. It is a vital part of the Data Confidence Plan because information entered is immediately visible to the EstuaryWatch co-ordinator and the other volunteers, and events, sudden changes or problems within the estuary can be highlighted and discussed immediately, increasing the flexibility and responsiveness of the program.

## **EstuaryWatch co-ordinator**

The details of the estuaries monitored can be changed on the website, and new estuaries can be added if the program expands. The EstuaryWatch co-ordinator can use the website to manage monitors by updating contact data and entering data from monitors who don't have an internet connection. The EstuaryWatch co-ordinator (or an independent reviewer) will also be able to scrutinise the data by graph analysis and by viewing raw data.

## **14. Database**

Geomatic created an online application in 2007-2008. The website was tested by volunteers in late 2007 and launched in February 2008. Geomatic now host the database and website, and add functions to the website as needed. Current projects include adding the graphing facility and online QA/QC updates.

The database is web-based and linked to the CCMA website. Monitors can use it to upload their data online, and members of the public can look at data and photographs taken as part of the EstuaryWatch program.

The data will be able to be graphed online by volunteers, members of the public and the EstuaryWatch co-ordinators. This will show the evolution and seasonal cycles of the estuary. It may also highlight the effects of storm events.

## **Database quality monitoring**

The data that is entered onto the database by the EstuaryWatchers is checked for accuracy. This is a two step process – data sheets are sent to team leaders and then to the EstuaryWatch co-ordinator for checking. There are boxes on the database for the team leader and EstuaryWatch co-ordinator to indicate the data has been checked against the hard copy. Hard copies of monitoring sheets are retained in the Geelong office for further validation if necessary.

## **15. Quality assurance and quality control**

### **Testing**

EstuaryWatchers are required to participate in biannual testing. The QA/QC program includes three tests: knowledge, skill and accuracy. The date of the last QA/QC test done by each monitor will be stored online, and will be visible to the public. The results of the testing will be stored in the Geelong office.

### **Knowledge**

The knowledge test is designed to assist EstuaryWatchers to develop an understanding of how estuaries work. Examples of the knowledge component of the test are: understanding the water

depth and quality parameters which are tested, and understanding the impacts of a permitted opening on the fish community. For the knowledge test, grades given range from low to very high.

### **Skill**

The skill test has been developed to assess whether the EstuaryWatchers understand how to use their equipment and why these procedures are necessary. It uses questions such as 'how is the membrane changed on your oxygen meter?' and 'what is the calibration procedure for the salinity meter?' The result given for the theoretical monitoring test is either competent or not competent.

### **Accuracy**

The practical accuracy test is designed to assess field monitoring techniques, for example measuring for turbidity and depth profiling, and to see whether there is variation across the group. Monitors' samples are compared with a known sample, which has been tested by the EstuaryWatch co-ordinator. In the practical test, each EstuaryWatcher is given a reliability rating out of 100.

### **Duplicate testing**

Between annual servicing, kits will be tested against each other in a biannual refresher training event. This will be a duplicate sample test to ensure that kits are producing comparable results. It will also provide an opportunity for monitors to compare meters and talk about problems or techniques that they have developed to use with their meters, and will take place prior to the biannual monitors' barbecue. This procedure will be a good opportunity for solutions, membrane caps and data sheets to be topped up by the EstuaryWatch co-ordinator.

## **16. Analysis**

### **Data analysis**

EstuaryWatchers are trained to look out for unusual or suspect results, and to retest in the field at the time of measurement. If the results are still suspect, e.g. if a healthy estuary has unusually low oxygen readings, even after repeated calibration, the probe may be sent for servicing and recalibrating by the manufacturer.

### **Data review**

An external consultant will be commissioned on an as-needed basis to review the data. This will involve checking the database generated by EstuaryWatchers, and scanning the data for outlying results. This data validation technique may encompass the entire EstuaryWatch program, or may be limited to estuaries of interest.

The data collected so far is not sufficient for a meaningful review. Statisticians are currently being consulted about how much data will be required for a review, following which an estimate of the timing of the review will be given to EstuaryWatchers.

This independent review may also involve tracking longer term changes in the estuaries using the data, and generating small reports to be posted on the website to keep EstuaryWatchers and the public informed about the knowledge gained from the data.

## **17. Reporting**

The EstuaryWatch program meets investor requirements via quarterly reports through the Great Ocean Road Estuary Restoration Project. Progress and information regarding the EstuaryWatch program is distributed via a monthly email update. The website acts as a reporting tool, providing available updates to EstuaryWatchers and the general public. Local media have reported on the EstuaryWatch program.

### **What is reported**

Monthly updates to EstuaryWatchers and stakeholders are used to report information about the program, including any changes. The monthly update also reports up and coming events, comments on past events and notifies of any artificial estuary openings that are due. Biannual QA/QC testing is reported on, without individual results being published.

### **Reporting to the public**

The website is a reporting tool, with the ability to report to the public and EstuaryWatchers. Information provided will be changes to the program, recognition of monitors, EEMSS data, and any relevant studies that have been undertaken in the area.

Local media have been useful in disseminating information to the public. The point of liaison is the EstuaryWatch co-ordinator, who organises interviews and photographs of EstuaryWatchers, and issues press releases. Many issues of interest to the local community can be reported on, such as algal blooms, water quality for swimming and seasonal fauna numbers. Summer litter found by EstuaryWatchers has been a recent focus. Media coverage so far has been via ABC radio and local newspapers.

## **18. Documentation**

The EstuaryWatch co-ordinator and monitors maintain a series of logs to make sure that procedures are being correctly followed.

### **Training**

A copy of the training manual, risk assessment sheets, volunteer details training logs and proficiency data are stored in the Geelong office.

### **Equipment**

Calibration logs are kept by monitors for the purposes of monitoring their calibration process, and may be stored online in the future.

A log is kept by staff of supervised calibrations done in the field.

Equipment servicing and reagent logs are kept by staff in the Geelong office.

### **Data**

Mouth condition and physico-chemical monitoring sheets are posted or faxed to the EstuaryWatch co-ordinator and stored chronologically in the Geelong office. This ensures efficient retrieval and checking of data sheets.

## **Review**

The EstuaryWatch program will be reviewed on an annual basis. The purpose of the review will be to gauge whether the objectives are being met and to look at any improvements that can be made. The EstuaryWatch co-ordinator and selected stakeholders will be part of the review. The review will address the following concerns, and others that have been raised:

### **EstuaryWatch Objectives**

- Does the data meet the objectives?
- Have adequate time and resources been made available?
- Can any improvements be made to meet the program's objectives?

### **Program review**

- Is the equipment used the most appropriate for the monitoring task?
- Are volunteers being retained by the program?
- What feedback is coming from volunteers, the website and the independent review?
- Can improvements be made to the objectives themselves?

### **Future improvements**

Some features which may be implemented in the future are:

- Placing cameras at the monitoring sites to allow for regular and highly precise photo monitoring. Monitoring could be timed to exactly coincide with high or low tides.
- Using live camera feeds online to allow the public to monitor estuaries visually, and see the cycles of estuaries through a 'rewind' function.
- Automated monitoring, for example of salinity. This is already done within the EEMSS program, at two locations in the region. One is already an EstuaryWatch site. This function could be expanded to other estuaries.
- More advanced techniques for graphing and analysis as the database grows.
- Climate change implications: analysing data for long-term change, sea level rise or fall, changes in species or habitat.
- These need to be assessed for benefit, practicality and cost. Benefits can be outlined and further monitoring can determine whether these are being achieved.

### **Review of the data confidence plan**

The data confidence plan will be reviewed annually during the general EstuaryWatch review. The main objective is to see whether data generated meets minimum QA/QC requirements through implementation of the data confidence plan.

Monitors will be invited to take part in the reviewing process. The purpose of the review will be to determine whether the minimum standards are being met to produce high quality data, to flag any issues which may be affecting data quality, and to raise any ideas, comments or problems pertaining to data collection and quality.

## References

### EstuaryWatch documents

For EstuaryWatch documents, contact the EstuaryWatch co-ordinator. EstuaryWatch documents available include:

- Job safety analysis sheet
- Training checklist
- Instrumentation checklist
- Monitoring checklist and sheets
- Calibration log
- Site checklist

### Reference documents

Corangamite Catchment Management Authority (2003). *Corangamite Regional Catchment Strategy 2003-2008*, Colac, Victoria.

Department of Sustainability and Environment (2006). *Estuary Entrance Management Support System*, DSE, Victoria.

Glenelg Hopkins Catchment Management Authority website page:  
<http://www.glenelg-hopkins.vic.gov.au/?id=estuarymanagementpla>

National Land and Water Resources Audit (2002). *Australian Catchment, River and Estuary Assessment 2002*. Vol 2. National Land and Water Resources Audit, Canberra.

Pope, Dr. Adam, and Wynn, Kate (2007). *Estuary Monitoring Methods Manual*, Corangamite Catchment Management Authority, Victoria.