

# Western Australian Cruising Guide 5<sup>th</sup> Edition

## How it was created and why it has certain features

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During the preparation of this (5<sup>th</sup>) edition and previous editions, many readers have asked questions about the way the guide has been prepared. The purpose of this document is to explain to the reader of the guide how we keep track of new information added to the guide, and why we have presented some of the information in the way you see it.

### **1. Guide currency**

The only date relevant to the currency of information in the published guide is the date in the Document Control box. This is fully explained in the notes that follow. Document Control follows a simplified version of the quality management principles found in ISO 9001.

### **2. AUS chart correction numbers**

Under each anchorage heading of the guide (e.g. 'Port Gregory'), a list of relevant charts is given. This practice was established in the 1<sup>st</sup> edition and has been maintained. The 3<sup>rd</sup> and 4<sup>th</sup> editions of the guide also included an AHO Notice to Mariners reference number against each AUS chart listed under the geographical section header (e.g. 'Shark Bay to Geraldton'). This reference number was "the latest AHO correction applied to the source material" (4<sup>th</sup> Ed p20 col 1 para 5. There was no information on which other sources were used to generate a chartlet or paragraph, let alone their provenance. (e.g. DoT chart numbers were included in the same list as the AUS charts, but only the edition number of the chart was included, not the date of latest correction).

This situation led to unanswerable questions about the perceived currency of the chartlets and the information in the guide. Therefore, in order to avoid misleading the reader about currency, the practice of listing AUS chart correction numbers has been discontinued for the 5<sup>th</sup> Edition. AHO have confirmed this to be sound practice.

It is concluded from the content of this document that the only date relevant to the currency of information in the published guide is the date in the Document Control box.

### **3. Waypoint accuracy**

#### *Summary*

For locations of large features such as bays, harbours etc., no figures are given after the decimal point. The lat/lon is going to vary across these types of feature by a mile or two. It is therefore fruitless giving a position accurate to less than a mile. (Which part of 80 Mile Beach would you choose to pinpoint?!).

The more controversial decision made by the editors (current and previous) is to restrict anchorage waypoints and the like to just one decimal point (i.e. +-100m accuracy), despite us being given reports containing waypoints with up to 3 decimal points (i.e. +-1m). Why has this been done? The short answer is that positions are often not accurate to more than one decimal place. This may surprise some people, so a fuller explanation is given below.

## *Accuracy or precision?*

To understand the rationale for publishing all positions to only one decimal place, we must first appreciate the difference between accuracy and precision. Accuracy is how close a reading is to the truth, whereas precision is how repeatable a reading is. For example, your boat pen might be located at latitude  $32^{\circ} 04.222'S$ . Your GPS might give its latitude as  $32^{\circ} 04.200'S$ , which is wrong by 44m (0.022'). That 44m is an estimate of its accuracy. Every time you return to your pen you might check its GPS latitude; perhaps it always gives the same reading to within just 0.002'. That is a precision of 4m, not an accuracy of 4m; the position is still wrong by at least 40m. Many people assume that if a GPS gives them the same reading each time, then that reading is accurate; it is not. Well it might be, but you just don't know. All you can say is that it is precise.

## *Error sources*

Once the distinction between accuracy and precision is understood, it is possible to start examining the errors and uncertainties in establishing your position on the globe using a GPS. This is a very big topic, the subject of entire books, so the following is a very simplified summary of the chain of errors that make up positional accuracy.

- a) The GPS itself has high accuracy, perhaps 5m or less most of the time. However, it does suffer occasional jumps of position by 20m or so. There are lots of reason for those jumps, we just have to be aware that they exist. The jumps might occur for a few minutes or hours and give a deceptive impression of accuracy. In fact the GPS is giving precise readings between jumps, but the jumping means it is not as accurate as you might assume from the readout. Some of the errors causing jumps and other positional inaccuracies are incorporated in a number called DOP (Dilution of Precision). This number can be shown on the GPS screen if you dig through a few menu options. If the number is high, the GPS position is inaccurate. When was the last time you looked at the DOP? Of the hundreds of reports we receive of anchorage waypoints, not one has quoted the DOP of the GPS waypoint submitted. They could be tens of metres out, or just one metre out; we don't know. Nevertheless, this is probably the least of our worries when it comes to finding our position on the globe....
- b) The next link in the chain is the chart datum used for the chart you are using to plot the GPS position. This can be either a paper chart or an electronic chart, it doesn't matter which. The datum used for the chart has to be the same as that used in the GPS. The most commonly used datum is WGS84, which is within 1m of the GDA94 used for DoT charts. If the wrong datum is used (or not corrected for), errors of a few hundred metres are usually created; the difference between positions for WGS84 and AGD84 is 200m and some chart datums used by other countries have differences from WGS84 of up to 9 miles! Fortunately most sailors using GPS and charts are aware of this problem and take care to ensure the datums correspond. However, as with GPS DOP information, we rarely receive waypoints with a chart datum quoted, let alone a confirmation that that the chart datum corresponds with the GPS datum. Again we can relax a little because even this is not the biggest source of concern....
- c) The third error source is specific to electronic charts. If you run your electronic charts on a dedicated chart plotter, this particular error will not concern you. However if you use a PC, iPad, or other computer to do your plotting, and that device has the capacity to run other software in the background, there is the possibility of the

background software interfering with the plotting software. This might seem obscure, and it is quite rare, but it can have dire consequences. A well-known example is the grounding of the commercial vessel True North in the St. George Basin entrance (Kimberley) in 2004. The resulting inquiry concluded that a likely cause of the grounding was a background program interfering with the plotting software, changing the waypoints. ( [True North grounding report](#) )

- d) The fourth source of error is probably the greatest concern to users of the WA Cruising Guide; ***the charts are not always accurate***. This is the case regardless of whether you use charts from the Australian Hydrographic Office, the British Admiralty, Navionics, C-Map or any other supplier. The error varies from place to place and from chart to chart. In the early years of GPS, these discrepancies were often ascribed to the GPS system or the plotter software (not the chart). However, as more and more people started using OpenCPN and Google Earth, it became evident that many geographical features on charts did not have the same shape, or position relative to other features, as the satellite photographs showed. This is probably the biggest source of error for the guide user. Discrepancies of tens of metres are the norm, and errors of 100m are sometimes discovered.
- e) Even if a chart were perfectly accurate, there is still an inherent limitation to its accuracy. This is best explained by considering a paper chart (which are also the source of many electronic charts). A draughtsperson has drawn the features on the chart with an ink pen. Even if they have outstanding draughting skills, the accuracy is still limited by the thickness of the pen nib. For a typical 0.2mm drafting pen the resulting ink line is 30m thick when scaled up on a typical coastal chart of 1:150,000 (the scale used for the AUS 7-series). Even on the vary large scale DoT chart of Rottneest Island (1:25,000), the line is still 5m thick.

### *Conclusion*

The conclusion from this very brief analysis is that you are fooling yourself if you think your GSP plot on a chart is consistently accurate to within less than 50m. The reason for this self-deception is that your GPS is probably repeatable (i.e. precise) to within 5m most of the time, and it may even be accurate to within 15m quite a lot of the time, but it is probably much less accurate at other times. When we receive waypoints for the guide, they are never accompanied by enough information on errors and uncertainties; therefore we have to assume a reasonable worst-case accuracy. We take that to be +/-100m i.e. 0.1°. Some people argue that the accuracy must be better than that, because they often go back to the same anchorage and their GPS displays the same position to within 5m. They are mistaking precision for accuracy.

### *Application*

Is this all just theoretical claptrap? The real world evidence is found in the many times we receive reports along the lines of “the waypoint in the guide is wrong, you go aground there; it should be 100m to the east where there is good depth”, followed by a conflicting report from another source: “we anchored at the waypoint given in the guide, in 7m water LAT”. In those circumstances it would be unwise of us to quote waypoints to a precision of 10m. One part of the guide where this becomes difficult is when providing a list of waypoints for safe transit through a channel or passage. If the waypoints are close together, the rounding to one decimal point can create a peculiar track if they are plotted as precise points. They should be plotted as circles of radius 100m.

Having explained the reason for one-decimal-point accuracy, it is worth noting that all waypoints given to us at 3 decimal places are kept in the archive. As charting accuracy improves in future, we can perhaps revisit the source material and update the guide accordingly. But we still do not know the two datums, the DOP at measurement, and the type of chart used; without them, the uncertainty of positions given in the guide will always be greater than the uncertainties in your own plotting system.

#### **4. Direction naming**

There is no definitive way of writing the points of the compass. A standard often seen in government publications is for the direction to be written in full, with hyphens between each sub-direction e.g. south-south-west. Another frequently used system is to eliminate the first hyphen e.g. southwest, but keep it for the next level down e.g. south-southwest. This is the system used in previous editions of the guide, and has been continued in this edition for geographical locations and directions. However, it looks very 'clunky' when used for wind and current directions – perhaps because we are so used to seeing wind directions abbreviated to initials e.g. SSW, SW. In an early draft of this edition I changed all directions to initials, but this made the guide very jagged to read. In the end I chose a hybrid approach:

- directions are fully spelled out e.g. southeast, northeast, etc. no hyphen, but west-southwest, north-northwest etc. with hyphen. I do not use capitals unless part of a proper noun e.g. North West Cape.
- wind and current directions are abbreviated to e.g. SSW, NE.

This will not be to everybody's liking but I felt it struck a balance. To help decide what is best, please let me know what you would prefer.

#### **5. Number format**

Numbers greater than 999 use a comma, not a space to separate e.g. 4,567,789 not 4 567 789. This is contrary to international style standards, but the international standard looks disjointed to my eye. We have very few continental European readers (who use commas in numbers where we use decimal points), so it is unlikely to cause confusion.

#### **6. Keeping track of content**

The 5<sup>th</sup> edition of the guide (2017) is, unsurprisingly, developed from the 4<sup>th</sup> edition (2014). Modifications are made as new information comes to light. A critical responsibility of the editor is to document the sources of information and how they have been dealt with. A spreadsheet of provenance was created by the editor of the 2<sup>nd</sup> edition (Steve Laws), but there is very little information on provenance for the 4<sup>th</sup> edition. Therefore its content had to be taken at face value unless new information came to light. This was clearly an unsatisfactory situation. For example, if a new report is received about an anchorage being unsuitable, but the 4<sup>th</sup> edition states it is suitable, there is no objective method for resolving the conflict between the two sources of information (short of the editor sailing there and anchoring).

The situation has been addressed for the 5<sup>th</sup> edition by adopting the following procedure:

- Every new item of information arriving (typically from cruisers sailing the coast) is allocated a sequential number.

- The source document is stored in the guide’s electronic (Sparkleshare) repository with a descriptive filename starting with the allocated sequential number.
- A metadata spreadsheet of new information has been established “000-WACG ed5 metadata\_v1.xls”. It records the filename and number of each new item, the geographical locations it refers to, actions required and date actioned. This metadata spreadsheet is also held in the repository.
- Whenever the computer file for the guide is modified as a result of information in one of these new items, a tag is placed in the file at that point, which is given the reference number of the new item. There may be several tags for a single sentence in the guide if there is more than one source of new information for it. The tag is visible in the publishing software (Jutoh) but not in the released version of the guide.

The end result is that it is possible to trace the source of changes made in the guide. This is especially valuable where conflicting reports are received – the source data can be retrieved and compared. There have been 128 metadata items recorded to date, generating over 300 modifications to the guide. Some sources of new information that result in changes to the guide do not warrant an entry into the metadata spreadsheet. Examples include:

- Changes to government department structures e.g. handover of marine safety from DoT(WA) to AMSA.
- New scientific information e.g. detailed explanation of the sea breeze.
- New regulatory requirements e.g. Unguu Vistor Pass for parts of the Kimberley.
- Changes to services e.g. closure of Fremantle Hospital Emergency Department.

*Example of a metadata spreadsheet entry:*

23/06/2017	Alain Belen	Broome	101-Belen-Broome mooring.txt
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*Corresponding tag in the publishing software:*

The screenshot shows a text editor window with a 'Comment' dialog box open. The dialog box has a title bar 'Comment' and contains the following fields: 'Initials: KK' and 'Tags: ref 76 and 101'. Below these fields are buttons for 'Delete', '?', 'Cancel', and 'OK'. The background text in the editor is partially visible, showing sections for 'Dampier Creek' and 'Gantheaume Point'. The 'Dampier Creek' section includes an anchor icon and text about vessel moorings. The 'Gantheaume Point' section includes an anchor icon and text about anchorage facilities. A warning icon is visible at the bottom of the editor window.

## **7. Photographs**

Most photos used in the 4<sup>th</sup> edition were handed over as electronic files. Many of them had no identifier that linked the image file name to a corresponding photo in the guide. Most of them were matched by the slow manual process of comparing each electronic image file with the photos in the guide hardcopy. However, several images remained unmatched and were therefore unusable, and some photos in the guide could not be matched to any of the image files handed over.

In order to avoid this problem for the 5<sup>th</sup> edition, photographs are now handled as follows:

- Originals are renamed to include the author and the intended caption, sometimes also retaining the original filename e.g. a photo of Geordie Bay received from Paul Gebhard as file “20170305\_22.jpg” would be renamed “Gebhard Geordie Bay 20170305\_22.jpg”
- They are then stored in the repository.
- If they are modified (e.g. cropped or the resolution reduced), a new file is usually created and the file name is usually extended to reflect the change e.g. “Gebhard Geordie Bay 20170305\_22-lowres.jpg”. The new file is also stored in the repository.

Thus all new photos received are instantly identifiable with both the author and the location. There are more than 300 photos in the repository at present.

### *Rock art*

There were several images of rock art in the 4<sup>th</sup> edition. The acknowledgments in that edition state that the Department of Aboriginal Affairs gave permission ‘to reproduce their art work’. The current situation is that the Department does not have the authority to give such permission; it must be obtained through the coastal corporation responsible for each piece of rock art. There are many such corporations and their application processes are different. Most of the rock art images in the 4<sup>th</sup> edition did not give a location, so it was not even possible to identify the correct corporation, let alone obtain permission to reproduce the image. Consequently it was decided to leave out all images of rock art in the 5<sup>th</sup> edition.

## **8. Chartlets**

The 5<sup>th</sup> edition of the guide contains over 200 sketches of anchorages; we call them “chartlets”. Each chartlet exists in several electronic formats (svg, png, jpg), each format being used in different stages of the publishing process. The chartlets are embedded in the guide file. If a change in a chartlet is required as a result of a new item of information being received, this is entered in a separate worksheet of the metadata spreadsheet.

When a chart is embedded into the publishing software, its properties contain Drawing Notes written by the creator. These notes detail changes made. In many instances the reference source will be one of the itemized submissions recorded in the metadata spreadsheet. This information is visible in the publishing software but not in the released version of the guide.

### *Example of Drawing Notes in the publishing software:*

Lyne river chartlet: ‘Completed (Edition 5): - Added Myrmidon Ledge Anchor symbol ( to match text)’

### Corresponding metadata worksheet entry:

content reference	action reqd	metadata Ref no	Date Completed	Comments
Lyne River	Myrmidon Ledge anchorage in text is not on chartlet	KK ed4 hand annotation	6 Nov 2016	Added Anchor symbol, moved Myrmidon ledge text eastwards a little to accommodate.

The chartlets are not georeferenced (i.e. no lat/lon). This is a practice that was adopted in the 1<sup>st</sup> edition and continued ever since. It reduces the temptation to use the chartlet for navigational purposes.

The chartlets are usually created from more than one source of information. This is good working practice for any navigational or pilotage procedure. Sources of information include:

- *Navionics charts*: These are updated daily, in a manner that can be automated.
- *AUS charts* from the Australian Hydrographic Office (AHO): Incremental updates are issued every two weeks, electronic Base Updates are issued every 6 months.
- *DoT(WA) charts*: These are updated irregularly.
- *DoT(WA) boating guides*: These are updated irregularly.
- *Google Earth*: Image dates vary with location, but are typically less than 2 years old.
- *Chartlets in the 4<sup>th</sup> Edition*: There is no date for their currency; clearly it must be pre-publication (Dec 2014).
- *Specific information* from sailors cruising the coast: This information is usually at least one month old.

The date of a chart update from AHO or DoT(WA) can be deceptive, as it is not the date of the observed change to navigation. For example, when the FSC Cruising Section and the then FSC Harbourmaster reported the uncharted 1.8m shallows west of Fish Rock, it took a year for a corresponding update notice to be issued by DoT(WA) and AHO (AUS charts). By comparison, the shallows appeared on Navionics charts within one week.

It follows that the information in a chartlet can be out of date even before it is modified, let alone before it is published. It also follows that there is no single point in time that a chartlet is correct. Therefore it would be dangerously misleading to state a date of currency for a chartlet. The only reliable guidance is that there will have been no changes made after the date of the guide's publication shown in the Document Control box at the beginning of the guide.

It would be a very, very foolish or desperate mariner who relied solely on a chartlet, or indeed any other part of the guide, for navigation. Nevertheless a disclaimer is issued just before the first section in the guide:

#### Disclaimer

This book is intended as a guide only. Every effort has been made to be accurate in compiling the guide, but it may contain errors or omissions. Accordingly:

- (a) No warranty is given that it is free from error or omission;
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Since the Western Australian coast covers a vast distance with many anchorages, not all the anchorages have been visited in all conditions. Thus readers should be aware of inherent inaccuracies and omissions.