

Western Australian Cruising Guide Edition 5.4

How it was created and why it has certain features

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During the preparation of this (5th) 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 at the beginning of the guide. 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 1st edition and has been maintained. The 3rd and 4th 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" (4th 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 5th 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 30µm 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 $\pm 100\text{m}$ 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. Note: there is one position with two decimal points; can you find it?

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*

Modifications are made as new information comes to light. Tracking the source of these modifications is a crucial, especially if new information conflicts with an existing entry in the guide.

Tracking by the reader

For the reader, we have introduced a simple way of keeping track of changes between editions. Any section which has been changed between versions 5.3 and 5.4 will have a tag "5.4" next to its header. This is particularly useful for readers who have printed out version 5.3, and want to know which sections need printing out to convert the hardcopy 5.3 version to a 5.4 version. Having said that, there are an awful lot of changes since 5.3, so it is probably easier to just print out the entire new version 5.4.

Tracking by the editor

The editor needs a very different and more detailed way to keep track of changes. A critical responsibility of the editor is to document the sources of information and how they have been dealt with. The 5th edition of the guide (2017) was, unsurprisingly, developed from the 4th edition (2014). A spreadsheet of provenance was created by the editor of the 2nd edition (Steve Laws), but there is very little information on provenance for the 3rd and 4th editions. Therefore the content of the 4th edition – the starting point for the 5th edition – 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 4th 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 5th editions 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 then stored in the guide's electronic repository with a descriptive filename starting with the allocated sequential number.
- A free cloud-based, on-line system called "Trac" is used to record each source by giving it a 'ticket' with a number corresponding to the allocated sequential number. The source document is attached to the ticket i.e. there are two separate records of the source data. The ticket also stores other information such as what action is required, by whom, and what has been done to date.
- 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 328 metadata items recorded to date, generating over 900 modifications to the guide. Some sources of new information that result in changes to the guide do not warrant an entry into the Trac software . 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. Uunguu Vistor Pass for parts of the Kimberley.
- Changes to services e.g. closure of Fremantle Hospital Emergency Department.

Example of Trac software ticket summaries:

| Ticket | Summary | Component | Version | Milestone | Type | Owner | Status | Created |
|---------------|---|---|----------------|---------------------|-------------|--------------|---------------|----------------|
| #95 | Mandurah Entrance Changes | 14 GERALDTON TO CAPE LEEUWIN | | Release Edition 5.2 | task | Rob Hills | assigned | 9 Aug 2018 |
| #7 | Dawesville Bridge Clearance needs noting | 14 GERALDTON TO CAPE LEEUWIN | Edition 5 | Release Edition 5.3 | metadata | Kim Klaka | assigned | 18 Dec 2017 |
| #233 | south coast anchorages and passage planning | 15 CAPE LEEUWIN TO EUCLA and PORT LINCOLN | Edition 5 | Release Edition 5.3 | metadata | Kim | new | 14 Dec 2018 |
| #93 | New Chartlet for Cockatoo Island | 11 DARWIN TO CAPE LEVEQUE | Edition 5 | Release Edition 5.3 | task | Rob Hills | assigned | 19 Dec 2017 |
| #183 | New Chartlet for Meade Island / Homestead Bay | 13 NORTH WEST CAPE TO GERALDTON | Edition 5 | Release Edition 5.2 | task | Rob Hills | assigned | 19 Dec 2017 |
| #222 | Glycosmis Bay | 11 DARWIN TO CAPE LEVEQUE | Edition 5 | Release Edition 5.2 | task | Rob Hills | assigned | 27 Nov 2018 |

Corresponding tags in the publishing software:

the fuel from the depot 1 km from the base of the jetty, or from suppliers in town.

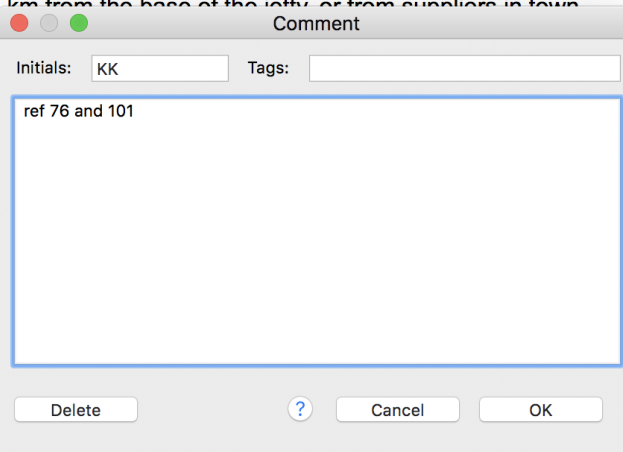
Dampier Creek

⚓ Vessels sometimes come in at least 7 m it is possible should be on a bearing of 120°. *Facilities:* Take your dingy

Gantheaume Point

⚓ Anchorage north of Gantheaume facilities. It is better than the Anchorage is over sand almost continuous north most states of the tide. A strong wind. LW exposes a large area especially if wheels are fitted.

▶ There are several moorings in Gantheaume Bay. contact Antony Burton of Broome Mooring Hire Ph: 0406 938 540 info@broomemoorings.com.au



positioning. With a spring tide of 2' 15'E). The approach is difficult but strong tides.

the E but is remote from the Easterlies usually ease. and over rock. The reef is a protection from swell at low tide is very rocky in SW to W. Dingy good dinghy access,

7. Photographs

Most photos used in the 4th 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 5th 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 500 photos in the repository at present.

Rock art

There were several images of rock art in the 4th 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 sole 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 4th 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 5th edition.

8. Chartlets

The 5th edition of the guide contains more than 230 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 were originally embedded in the guide Jutoh file but they are now stored separately, with a link to them from the Jutoh file. This makes the Jutoh file smaller and results in quicker loading, saving and transferring. If a change in a chartlet is required as a result of a new item of information being received, this is dealt with using the Trac ticket system described earlier.

When a chart is linked into the publishing software, its properties contain Drawing Notes written by the creator. These notes detail changes made. In most instances the reference source will be one of the itemized submissions recorded in the Trac software described earlier. 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)’

The chartlets are not georeferenced (i.e. no lat/lon). This is a practice that was adopted in the 1st 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 4th 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;
- (b) The authors, editors, the Fremantle Sailing Club and its servants expressly disclaim liability for any act or omission done in reliance on the book or for any consequences of any such act or omission.

The Fremantle Sailing Club does not accept liability for errors in third party information. 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.

That disclaimer is issued not only to protect the publisher. It is also a warning to the reader not to rely on it as the only source of information; follow good navigational practice by cross-checking across several sources.

Appendix 1: Software used

We use both PCs and Macs, so we have to ensure that any software we use is compatible with boat types of computer.

Writing software

The guide is written using Jutoh v3 <https://www.jutoh.com/> It is intended mainly for writing novels so we are stretching it to its limits writing a technical book with hundreds of diagrams. However, its author Dr Julian Smart provides astonishingly rapid and helpful support. For example, when we were deciding whether to purchase a licence for Jutoh we wrote to Julian saying there were a few features not present that would be helpful to us, and asked if they were planned for any future versions. Within 12 hours we received a modified version of Jutoh incorporating our requests, with a message saying “try this”!

Some readers might question why we don't use Word (or similar). There are two reasons (three if you include cost):

- Word is what I think of as “legacy” software. It was developed so that people could change from writing on an A4 page to typing on a computer. It retains the familiar idea of pages, margins etc so that it looks just like a paper document when you view it on the screen. Jutoh, on the other hand, starts from scratch and asks the bold question: “why do we need pages and margins when we are writing? We can put all that stuff in at the end of the publishing process”. Once you get your head around this concept, it makes formatting the guide very much easier. It's a bit like extending the idea of writing on individual pages to writing on a continuous sheet of paper (as the ancient scrolls did), or like writing on a roll of kitchen towel. Take this endless-length concept and add an endless width concept, and you now have how Jutoh lays things out – you are writing on a piece of paper that is endlessly long and endlessly wide. Once you have written everything, you can then decide your page size, margins etc.
- Word can be horrible to use with very large documents. The older versions of Word that were around when we first developed version 5 of the guide would not handle documents larger than about 40MB - the guide is about 250MB as a Word doc. Word has improved and will now load the guide but it will not save changes.

Provenance tracking software

In order to keep track of all the new info we receive and all the changes we make, we use open-source (i.e. free) software appropriately called “trac” <https://trac.edgewall.org/>

It is design for managing large software development projects but it does just what we want for our small project.

Multiple author software

The Editor (Kim Klaka) and Assistant Editor (Rob Hills) need to work on the guide at their own computers. It is essential that the changes made by one editor are saved in a file that will be up to date on both our computers. We also both need access to the same photos, images, support documents such as this one etc. We could possibly do this by relying on the Cloud, but I think that would be very slow given the file sizes, and clunky (there are probably other reasons I am not aware of). Instead we use a program called Syncthing <https://syncthing.net/> It is open-source (i.e. free). It synchronises files we use in real-time, almost removing the risk of one of us working on an outdated version of the document. It is a bit tricky to set up, but works well once it is running.

Software for creating the pdf version

Whilst Jutoh can create an ePub books (or many other formats) quickly at the push of a button, it does not have a button that creates a pdf file. We have to export the document from Jutoh to to another program, which can then convert it to a pdf. As noted earlier, we cannot use Word for this process because of the huge file size; instead we use Libre Office <https://www.libreoffice.org/> It is open-source (i.e. free) and it is very similar to Word, with the advantage that in can handle our huge files easily. We export the guide from Jutoh as a file that can be read by LibreOffice (.odt format), apply a few tweaks to it in LibreOffice then export it as a pdf.

Images, diagrams and chartlets

We use standard image processing software (such as Preview and Photos on a Mac) to crop and straighten photos we want to include. Chartlets, diagrams and maps are created by the ever-helpful Rob Hills and Cameron Berg, using more advanced graphic design software - Inkscape for chartlets <https://inkscape.org/> (open-source i.e. free) and mainly CorelDRAW for maps and diagrams <https://www.coreldraw.com/en/>