FACT SHEET: Navigation

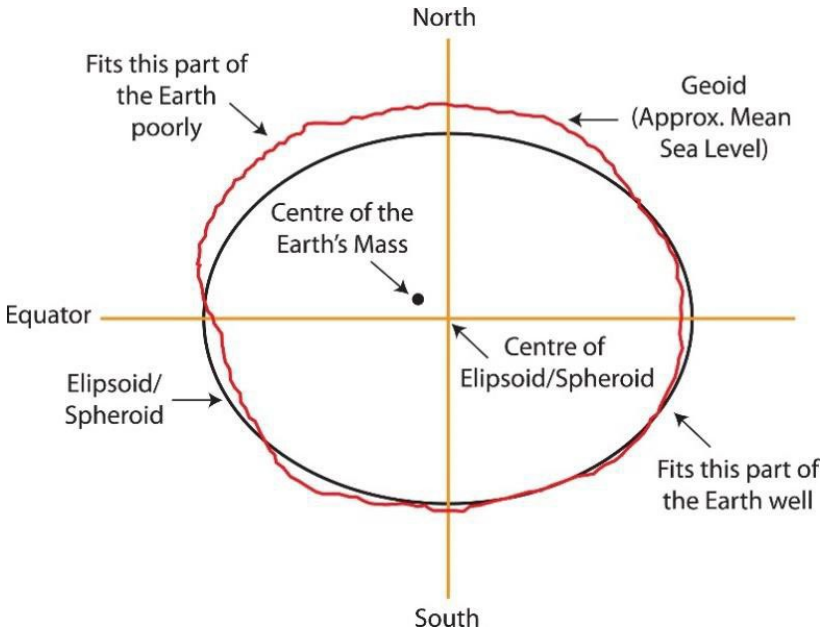
GPS Receivers and Chart Datums

Importance of Datum Alignment

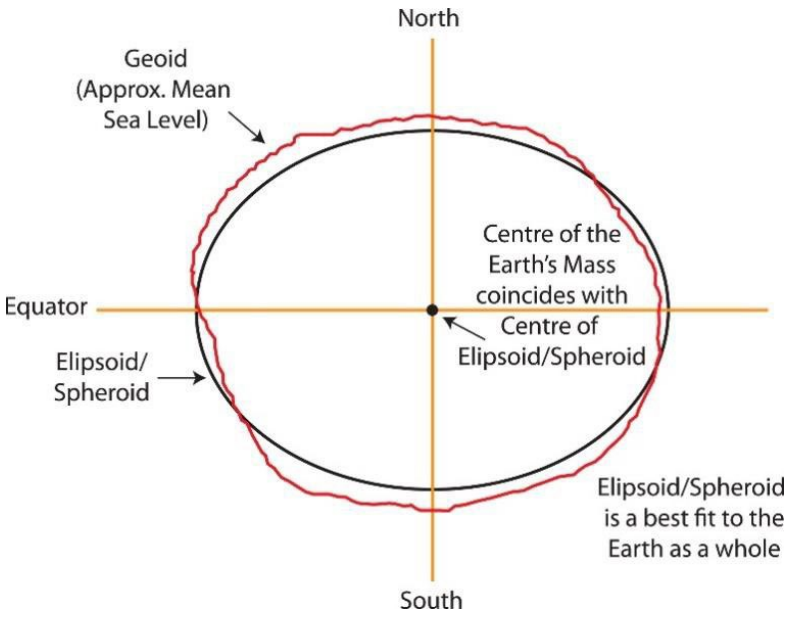
Positioning systems and the charts or maps used for navigation must operate using the same datum. Misalignment can result in significant positional errors. Hazards expected to be well clear may be directly ahead, or intended channels may be offset from the vessel's track. Ensuring consistency between the satellite positioning system (for example, GPS) and the chart datum, or understanding and correcting any differences, is critical for safe navigation.

Concept of Datums

Latitude and longitude coordinates on charts and maps depend on the mathematical model used to represent the Earth. The Earth is an irregular, three-dimensional shape, while charts are flat and two-dimensional. To reconcile this, charts are based on mathematical models (datums) that approximate the Earth's surface.



Different datums may provide a better fit for particular regions. However, because the Earth is not a perfect sphere, no single model perfectly represents all locations. The World Geodetic System 1984 (WGS84) is a globally optimised model used by Global Navigation Satellite Systems (GNSS), including GPS, to provide practical and consistent positioning worldwide.



Use of WGS84 in Marine Navigation

Nautical charts, including Electronic Navigational Charts (ENC), are primarily used for international navigation. International standards therefore require these charts to be referenced to WGS84. Most satellite positioning receivers also use WGS84 as their default datum. This alignment enables vessels to navigate consistently across international waters without changing datum settings.

Australian Nautical Charts

All ENC and Paper Nautical Charts (PNC) published by the Australian Hydrographic Office are compiled using WGS84, in accordance with international requirements. When using official Australian charts, satellite positioning systems should be configured to WGS84 to ensure positional accuracy.

Variations in Non-Standard Charts

While ENC are standardised to WGS84, some paper charts produced by other countries have not been updated to this datum. In certain cases, older local datums may persist, including in some electronic products derived from legacy data. These differences can result in positional discrepancies of several hundred metres. Where uncertainty exists, positions should be verified using traditional navigation methods such as range and bearing to charted features.

Datum Settings for Marine Use

All positional data used for navigation must reference the same datum. If different datums are used, corrections must be applied or the positioning system must be reconfigured to match the chart datum.

Satellite positioning receivers are commonly set to WGS84 by default. This datum is suitable for most marine navigation purposes. Users should confirm the datum setting of their device before use.

Datum Considerations for Land Use

When a satellite positioning receiver is used for both marine and land navigation in Australia, it is important to account for differences between datums. The Geocentric Datum of Australia 1994 (GDA94) has been the national standard for land mapping. While similar to WGS84, small differences may be significant where sub-metre accuracy is required.

The Geocentric Datum of Australia 2020 (GDA2020) has been introduced as the updated national datum. It aligns more closely with WGS84 and the International Terrestrial Reference Frame, with differences generally less than 0.5 metres. GDA2020 is being implemented alongside GDA94, with adoption dependent on jurisdictional and organisational requirements.

Further Information

Additional guidance on datums is available through the Intergovernmental Committee on Surveying and Mapping (ICSM)