Developments in Specifications for Survey Datums

The requirements for hydrographic surveys influence the specifications adopted. Requirements, however, are not static. For example, emerging requirements now include collecting hydrographic data for the potential impacts of tsunami modelling, inundation mapping and climate change (TMIMaCC). These relatively new requirements are resulting in modified specifications. One such change is the requirement to provide data relative to multiple height datums.<P>

Traditionally, the vertical datum of hydrographic survey data was directly related to the tide. Depending on whether the nature of the tide was predominantly diurnal or semi-diurnal, surveys referred to mean lower low water (MLLW) or mean low water spring (MLWS) tides. In more modern surveys, lowest astronomical tide (LAT) was generally adopted, being the level below which the tide would not be predicted to fall due to any combination of astronomical conditions and average meteorological conditions. These low tide datums were generally adopted for the primary purpose of surveys for nautical charting to support safe navigation. The charted depth would be the minimum depth that a mariner could expect in that area.

Surveys for other purposes have adopted different datums. For example, surveys for coastal zone management (CZM) have often referred to mean sea level (MSL) because it is also the datum generally used for topographic mapping surveys. For CZM surveys, it is important to define bathymetry relative to existing land mapping data, for example, the depth of the near-shore bathymetry relative to a beach profile for erosion monitoring or for sand renourishment.
Technology has also influenced the choice of the most appropriate datum. For example, terrestrial Lidar systems have been used to provide data for high-density digital elevation models (DEMs) over large areas. These have been particularly useful for modelling surface run-off in catchments and for inundation mapping in flood-prone areas. These systems typically capture data relative to an ellipsoid due to the use of high-accuracy GPS positioning techniques. However, for the height data to be practically useful, it must generally be transformed to an MSL datum using some form of geoid model. In many areas, and commonly along coastlines, the surface of the geoid relative to the ellipsoid is not accurately known due to a lack of shallow water and coastal gravity data. In such cases, common reference points may be used to locally transform the ellipsoidal height data.

Hydrographic surveys with potential applications for TMIMaCC are generally required to be integrated with terrestrial DEM data from the coast and hinterland. Two recent examples are a survey specified by the Geological Survey of Ireland, as part of the INtegrated mapping FOr the sustainable development of Ireland's MArine Resource (INFOMAR) programme, and the Victorian Department of Sustainability and Environment (DSE), for the Future Coasts Bathymetric Lidar Survey programme. These surveys require hydrographic data relative to MSL, LAT and an ellipsoidal datum.
Both share a similar requirement to relate hydrographic and land data to the same datum and the common problem of dealing with weaknesses in modelling the geoid-ellipsoid separation along the coast.

Historically, datums for hydrographic surveys have been referenced to a geoidal datum referenced to a low tide or mean tide level. A number of recent survey specifications have required data to be provided to both geoidal and spheroidal datums due to limitations in geoid-ellipsoid separation models. Future improvements in geoid models in coastal areas may alleviate this problem.