Analysis of the accuracy of the location coordinates of some Historic Sites and Monuments

In support of WP 52: Proposal for Modifications to the Location Coordinates of Nine Historic Sites and Monuments

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**Information Paper submitted by Argentina**

***Summary***

During a review of the information on HSMs, inaccuracies were detected in the location of some HSMs using Geographic Information System (GIS), which did not provide a correct location for them. For this reason, the objective was to carry out a review of the location coordinates of the HSMs in the management of which Argentina participates and to evaluate the need to propose a review of all the coordinates to achieve a precise location in the mapping.

This IP complements WP 52 “Proposal for Modifications to the Location Coordinates of Nine Historic Sites and Monuments”.

***Revision of coordinates***

In accordance with the Guidelines for the designation and protection of Historic Sites and Monuments (Annex to Resolution 3 (2009)), paragraph 4: “*The Party or Parties that nominated and/or are undertaking management of a Historic Site or Monument should keep the site or monument under review to assess whether:*

1. *the site or monument still exists in whole or in part;*
2. *the site or monument continues to meet the guidelines outlined in the previous paragraph;*
3. *the description of the site or monument should be amended and updated when necessary;*
4. *the location and if possible the limits of the site or monument are on its topographic maps, hydrographic charts and in other relevant publications.*

Based on what is established in point “d)”, Argentina detected that in some of the most widely used Geographic Information Systems for Antarctica (SCAR Antarctic Digital Database/ADD, Quantarctica, etc.) the location of some of the HSMs in the management of which Argentina participates presented inaccuracies.

One case analysed was that of HSM 42: Laurie Island Observatories, which includes the area of Scotia Bay, Laurie Island, South Orkney Island, in which are found: stone hut built in 1903 by the Scottish Antarctic Expedition led by William S. Bruce; the Argentine meteorological hut and magnetic observatory, built in 1905 and known as Moneta House, and a graveyard with twelve graves, the earliest of which dates from 1903. For example, in the viewer of the Digital Topographic Database “SCAR ADD map viewer(ADD)”, the coordinate indicated is some way out to sea instead of being the location point of the HSM on the island. For this reason, a process of reviewing the information of each of the HSMs in which Argentina is one of the parties in charge of their management began.

In the specific case of the coordinates, a detailed review has led to the conclusion that a more precise position could be established with respect to that currently appearing in the list of HSMs (Measure 3 - 2021). The general problem that has been detected is that expressing coordinates to the nearest minute in effect means taking discrete staggered jumps spaced almost 2 kilometres (1 852 metres = 1 nautical mile) apart in latitude, with no intermediate alternatives (and in longitude multiplying by the cosine of the latitude).

In this way, even if we have reliable coordinates (for example with about 5 metres of error or even less) corresponding to the intermediate range between two values per minute (read XX.5 minutes), a few centimetres of error are enough to possibly tilt the rounding incorrectly towards the inappropriate lower or upper value. That deviation can reach almost half a minute (almost 926 metres in latitude; almost 926\*COS(Lat) in Lon), even if the rounding is correct.

The quality and resolving power of current Antarctic maps and images (SCAR Antarctic Digital Database / ADD, Quantarctica, Google Earth, etc.), offer the possibility of using coordinates with a format with greater resolving power than a whole minute. The format with decimal degrees and minutes is widely used in air and maritime navigation. A hundredth fraction of a minute represents, in latitude, approximately 20 metres of ground resolution.

It should be noted that when sites were surveyed on the ground (often with a simple handheld GPS receiver properly used), the resulting coordinates could be displayed to the hundredth of a minute or to the second, the latter reflecting some 30+ metres in distance on the ground in latitude), an option that we have chosen in this first revision. In all cases, the coordinates recently surveyed with handheld GPS navigators refer, by default, to the World Geodetic System WGS 84, which is widely used.

It is also important to highlight that, in the Database of the Antarctic Treaty Secretariat for Historic Sites and Monuments, information can be provided in any of these formats, and the system is prepared to receive them with up to four decimal places in seconds, or up to six decimal places in decimal degrees. Therefore, if the coordinates given for an HSM are greatly simplified by rounding, for example by using only whole degrees and minutes, then it is likely that in most cases the end result of the HSM location on the map may not be accurate. This same situation could be occurring with ASPAs and ASMAs (although this situation has not been evaluated in this review).

***Conclusion***

Considering that the objective of the databases that use geographic information is to locate the sites in a consistent way, and that finally the HSMs can be represented in a cartographic interface accessible to the general public and in a precise way, considering a revision of the location coordinates of the HSMs and preparing a proposal of common criteria for the use of geographic coordinates, would be a great contribution to the system.