

Completion of Permanent Survey Mark Plans

Specification

SIG/2013/427

Version 1.06

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Version History

Version	Date	Description/Comments
1.00	11/7/2012	Replacing former NRW policy RPS/2004/1891
1.01	16/08/2013	Rebranding due to departmental name change and updated references
1.02	23/09/2014	Adding Appendix A about dealing with Uncertainty versus Class and Order and adding appropriate references to the new Appendix within the body of the document.
1.03	11/12/2015	Integrating former Appendix A into the body of the specification and adding a new appendix with examples of GNSS booking sheets.
1.04	19/06/2017	Change to AUSPOS lodgement whereby only 6 hour or more GNSS datasets will now be considered for inclusion in the Department's Datum adjustment and therefore are the only times Rinex data and field records need to be lodged.
1.05	28/08/2018	Rebranding due to departmental name change and updated references. Clarification of suitability for imaging and reproduction. Change to Section 8 removing information on the lodgement of GNSS data to the newly created Submitting GNSS data for Inclusion into the state-wide datum adjustment network guideline, information on the submission of AHD Derived heights when using AUSPOS 2.3, removal of GNSS booking sheets in Appendix A to the Submitting GNSS data for Inclusion into the state-wide datum adjustment network guideline.
1.06	06/10/2021	Rebranding due to department name change. Updates accounting for new GDA2020 datum and revised Form 6 and mark maintenance form.

Approval

Position	Name	Date
Director of Surveys	Ken Sherwood	10/11/2021

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1. Purpose

This specification provides for the preparing and lodging of permanent survey mark plans with the Department.

2. Scope

Placement of permanent survey marks

Section 14(2) of the *Survey and Mapping Infrastructure Regulation 2014* provides that a surveyor or a person supervised by a surveyor may place or reinstate a permanent survey mark.

Recording of permanent survey marks

Section 15 of the Act provides for a permanent survey mark plan to be prepared on the current approved form (Form 6) for each permanent survey mark placed in the course of conducting a survey, and for the plan to be submitted within 40 business days of the mark being placed. This specification sets out the requirements for completion of version 6 of the permanent survey mark plan. This version of the approved form is an Excel™ Spreadsheet that includes automation and validation rules that have been developed to assist in the completion of the form as well as improving data integrity and consistency of submitted data. Lodging information in a format other than the approved form may be approved by the department in special circumstances. This should be discussed with the department and may be assessed on a case-by-case basis.

The purpose of the permanent survey mark plan is to positively identify the permanent survey mark and facilitate its recovery in the field. The information from the permanent survey mark plan forms part of the State's survey and mapping infrastructure and is maintained by the department within the survey control register.

Section 45 of the Act requires registered persons to notify the chief executive of the disrepair, destruction or removal of a permanent mark, or apparent irregularities in information about the mark in the survey control register. This can be provided through submission of a permanent survey mark maintenance form, which is incorporated into the new approved Excel™ form as an additional worksheet.

3. Specification

The information shown on a permanent survey mark plan is to be compiled in a clear style, which is suitable for imaging and reproduction. Pictorial images (e.g. photographs, aerial imagery) are not acceptable. Images of linework and text are acceptable. The Permanent Survey Mark Plan face is the first worksheet in the new approved Excel™ form.

3.1. Face of permanent survey mark plan

The highlighted fields must be completed (choosing options from the drop-down lists in the green highlighted fields provided and manual data entry in the blue highlighted fields). Conditional formatting

in the approved form is intended to guide the user by highlighting the mandatory fields that are applicable, based on the data being input.

- a) The following information is to be supplied on the face of the plan:
 - Registered number – as stamped on plaque or tag
 - Meridian used on the plan
 - Mark type
 - Suited to GNSS
 - Prepared by (the registered person, entity, or public authority who takes responsibility for the plan and the installation of the mark) and the date the plan was completed.
 - Location sketch of the mark.
- b) Where the permanent mark lies within a road, the location sketch must clearly depict identifiable features in their correct relationship to each other and show the following information:
 - Approved road name(s) and a distance to the closest named intersecting or joining road, feature (creek crossing etc) or town where appropriate. (See also Item 4 below for the use of a speedo traverse.)
 - Real property description of adjoining properties (with property address where available).
 - Offsets to nearby fence lines and road edges or centreline.
 - Suitable radiations to locate the mark – to any of the following identifiable features listed in order of priority:
 - buildings – where applicable
 - power poles or towers, electric light poles, telecom terminal posts, water valves, manholes, culverts etc, recording any identifying numbers appearing on such structures
 - street name signs, distinctive trees or rocks, and other ornamental or unusual features
 - fence posts, gate posts – note types of fences
 - cadastral marks – pegs, alignment spikes, screws, drill holes and existing subsurface marks (eg pins).
 - Bearings and lengths of each radiation.
 - distances measured to identifiable features should be of sufficient accuracy to enable the mark to be found
 - bearings are to be either magnetic or on MGA. In NO circumstances should an assumed meridian be adopted.
 - If the permanent survey mark forms part of a survey control network, there may be radiations to recovery marks and/or witness post(s). The connections to these marks should be shown. The distances measured to recovery marks should be of sufficient accuracy to re-establish the permanent mark.

- A north point.
 - Bearings along all fences, road centre lines, power lines etc. to establish local meridian.
 - Alternate names for the mark (eg MR34.5K) may be shown on the face of the plan.
- c) Where the mark lies within freehold or state-owned land, the plan must clearly depict identifiable features in their correct relationship to each other and show the following information:
- All the information required in Item b above – where these requirements are applicable.
 - If that information does not clearly locate the mark, an additional location sketch should be provided on the face of the plan.
- d) Where a clear, unambiguous description of the location of the mark is difficult, a speedometer traverse from the nearest clearly identified feature should be supplied and the details of the traverse shown on the plan.

3.2. Permanent Survey Mark Data Sheet (Sheet 2 of permanent survey mark plan)

This data sheet which forms the second page of the form must be completed as set out below. The highlighted fields must be completed (choosing options from the drop-down lists in the green highlighted fields provided and manual data entry in the blue highlighted fields). Conditional formatting in the approved form is intended to guide the user by highlighting the mandatory fields that are applicable, based on the data being input.

- Administrative Data
 - Installed by (the registered person or entity, or public authority that placed the mark)
 - Date installed (when mark was physically placed).
 - Note: The other fields should be completed where appropriate.
 - Note: The Local Government field must be completed before the Locality field as Locality is dependent on the selection from the Local Government field. When changing any of these fields, the independent field (Local Government) must be changed first.
- AHD Derived Height
 - “Fixed by” methods of GNSS will not be accepted in this section. GNSS derived heights are ellipsoidal and should be entered into the GDA Position section.
 - Note: The heading of this section AHD Height does not imply that the submitted information will be attributed with a lineage of Datum in the survey control register. All survey control information submitted to the department will initially be given a lineage of Derived. The lineage can only progress to Datum by submitting measurements to the department. If the measurements fit well in the relevant state-wide datum adjustment, the Department will then upgrade the lineage to Datum.
 - A height value is not mandatory for a new Form6
- GDA Derived Position

- The mark must have a GDA position (coordinates). If the coordinates are determined by connection to an existing mark, i.e. not Network RTK, Single Point Position or AUSPOS, the GDA origin fields must also be completed.
- Coordinates should be supplied in one format only, either Latitude/Longitude or Easting/Northing/Zone.
- Note: In the case of AUSPOS, surveyors should take care to state the relevant values in the GDA2020 section of the AUSPOS Report, not the GDA94 values nor the ITRF values that are also shown in the AUSPOS Report
- Note: Coordinates must be supplied in the current accepted datum (GDA2020).
- Note: All GNSS positions are 3D, requiring the ellipsoidal height to be entered in the GDA position section along with its vertical PU. If the mark also has a separately measured AHD height (not fixed by GNSS) that can also be submitted on the form. Positions fixed by Traverse are acceptable as 2D only or as 3D with an AHD derived height.
- Note: The heading of this section GDA Position does not imply that the submitted information will be attributed with a lineage of Datum in the survey control register. All survey control information submitted to the department will be given a lineage of Derived unless raw measurements are submitted to the department for inclusion into the relevant state-wide datum adjustment.
- Note: The acceptable value ranges for horizontal and vertical PU are set in the approved forms and as follows:

Expected PU ranges				
GDA Fixed By	Hz Min (m)	Hz Max (m)	Vt Min (m)	Vt Max (m)
Traverse	0.008	1.000	0.012	1.500
GNSS AUSPOS	0.008	0.150	0.012	0.225
GNSS Static	0.008	0.150	0.012	0.225
GNSS Network RTK	0.020	0.100	0.030	0.150
GNSS RTK	0.030	0.150	0.045	0.225
DGNSS	0.500	5.000	0.750	7.500
GNSS Single Point Position	5.000	30.000	7.500	45.000

- Cadastral Connection Data
 - Show the plan number of the survey plan which contains the cadastral connection.

3.3. Updates/amendments to permanent survey mark plan

When the information on an existing permanent survey mark plan is to be updated the following action is recommended:

- Where the information on the front (eg the location sketch) of the permanent survey mark plan is to be updated you may:

- prepare a new permanent survey mark plan completing the front and marking it as “REDRAWN” in the top right hand corner of the location sketch area; or
- annotate a copy of the current permanent survey mark plan, provided the new information can be shown with clarity.
- Where the permanent survey mark data sheet information on the back of the permanent survey mark plan is to be updated you may:
 - prepare a permanent mark maintenance form, completing the relevant sections (see item 3.4 below); or
 - prepare a new permanent survey mark data sheet for the mark, completing the relevant sections.

3.4. Permanent Survey Mark Maintenance Form

A mark maintenance worksheet is incorporated into the approved form. The highlighted fields must be completed (choosing options from the drop-down lists in the green highlighted fields provided and manual data entry in the blue highlighted fields). Conditional formatting in the approved form is intended to guide the user by highlighting the mandatory fields that are applicable, based on the data being input.

The maintenance form has been modified to more closely resemble the PSM Data Sheet (Sheet 2 or the reverse side of the PSM Plan) and utilises the same lookup tables for drop down.

Most fields on the maintenance form are common to sheet 2 (reverse side) of the PSM Plan form, however some fields which are not relevant to mark maintenance have been removed. The following fields have been added to the maintenance form and are not found on sheet 2 (reverse side) of the PSM Plan.

- Administrative Data
 - Numbering (confirmation of any physical numbering stamped on the mark)
 - Date visited
- Location
 - Sketch – Confirmation that the current sketch in the survey control register is adequate. If not, an updated sketch is required (see item 3.3 above).
 - PSM in danger of being disturbed
 - PSM in suitable location for GNSS occupation

3.5. Lodgement of permanent survey mark information

Completed permanent survey mark plans, maintenance forms or updates prepared as per Item 3.3 above, should be sent to the Cadastral and Administrative Data team

CadastralAdminDataHelp@resources.qld.gov.au for processing.

4. Definitions

the Act	the <i>Survey and Mapping Infrastructure Act 2003</i>
department	the department administering the Act
Form 6	permanent survey mark plan approved under the Act
GNSS	Global Navigation Satellite System
MGA	Map Grid of Australia
PU	Positional Uncertainty
RTK	Real Time Kinematic
Survey control register	Register for recording information about survey marks maintained under the Act

Permanent Survey Mark Data Sheet Definitions

Administrative

Alternate Name	Alternative name for registered number. May be a control/geographical name, or a government department/local authority name. For example, MANLY WT, QGS 1246, BCC203/14.
Installed by	Name of the registered person or entity, or public authority that installed the mark.
Installed date	Date mark installation was completed.
Date last visited	Latest date of inspection of mark.
Mark Type	Description of the mark type.
Mark Condition	Physical condition of the mark.
Locality	Official name of locality the mark is within.
City or Town	Name of city or town the mark is within.
Local Government	Name of local government the mark is within.
Location Description	Brief description of the location of the mark to assist in future location and identification.

AHD Derived Data

Height	Height of the mark relevant to the Australian Height Datum.
Order	Order of the height. For example, 1 st order, 2 nd order, 5 th order. For a guide to the application of order and class, refer to later sections on interpretation of uncertainty as defined in ICSM Publication SP1 – Standards of Accuracy.
Class	Class of the height. For example, Class A, Class B, Class E. For a guide to the application of order and class, refer to later sections on interpretation of uncertainty as defined in ICSM Publication SP1 – Standards of Accuracy.

AHD Derived Data

Fixed by	Method of heighting used for the mark.
Date	Date height was determined.
AHD Origin – Registered No.	Registered number of the origin mark used to determine height.
AHD Origin – Height	Adopted height of the origin mark.

GDA Derived Position Data

Latitude	Geographical latitude (Positive South in Degrees Minutes Seconds format).
Longitude	Geographical longitude (Positive East in Degrees Minutes Seconds format).
Datum	Datum of the geographical coordinates. For example, GDA2020.
Easting	Easting value on MGA projection of datum. For example, MGA2020.
Northing	Northing value on MGA projection of datum. For example, MGA2020.
Zone	MGA zone within which coordinates have been calculated.
Date	Date GDA position was determined.
Horizontal PU	Horizontal Positional Uncertainty as defined in ICSM SP1 – Standard for Australian Survey Control Network.
Ellipsoidal Ht PU	Ellipsoidal Height Positional Uncertainty as defined in ICSM SP1 – Standard for Australian Survey Control Network.
GDA – Fixed By	Method by which the horizontal position was established.
GDA Origin Registered No.	Registered number of the origin mark used to determine coordinate values.
GDA Origin – Latitude	Adopted geographical latitude of the origin mark (Positive South in Degrees Minutes Seconds format).
GDA Origin – Longitude	Adopted geographical longitude of the origin mark (Positive East in Degrees Minutes Seconds format).
GDA Origin - Datum	Datum of coordinates for the origin mark.
GDA Origin Ellipsoidal Ht	Adopted ellipsoidal height of the origin mark.

Cadastral Connection Data

Connected on Cadastral Plan No	Plan number of plan(s) which show a survey connection to the mark.
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5. Legislation

Survey and Mapping Infrastructure Act 2003

Survey and Mapping Infrastructure Regulation 2014

6. Interpretation of Guidelines based on Uncertainty when Lodging Class and Order for the Survey Control Database

Estimating Class for AHD Heights

Where a survey technique has achieved a particular Class in the past, surveyors should continue to state that as the Class for any new surveys using that technique.

In the case of General Purpose Control Surveys using levelling, SP1 has guidelines for achieving various vertical Survey Uncertainties and they are expressed in the traditional way as a value (in millimetres) multiplied by the square root of the levelled distance (in kilometres). SP1 covers levelling techniques to achieve a vertical SU of $2\text{mm}\cdot\sqrt{K}$, $6\text{mm}\cdot\sqrt{K}$ and $12\text{mm}\cdot\sqrt{K}$, which is in line with previous versions of SP1 and Class for those techniques should continue to be stated as A, B and C, respectively. Levelling with an SU of $18\text{mm}\cdot\sqrt{K}$ is no longer covered in SP1 but Class for such levelling should continue to be stated as D.

Estimating Order for AHD Heights

For General Purpose Control Surveys, an initial estimate of the Order assigned to a mark should follow the same convention as has always been applied, namely:

- Not higher than equivalent to the Class assigned to that survey, and;
- Not higher than the Order of origin marks to which the survey is connected.

However, to distinguish from the Datum Control Survey, values from a General Purpose Control survey ***should never be assigned better than 2nd Order***.

Examples

The following examples illustrate how to apply the above to General Purpose Control Surveys:

- If a levelling technique achieves a vertical SU of $12\text{mm}\cdot\sqrt{K}$, Class C can be assigned. If the survey connects to 4th Order AHD marks, the new AHD marks cannot be assigned better than 4th Order ~ so Class C, 4th Order;
- If the levelling technique achieves a vertical SU of $2\text{mm}\cdot\sqrt{K}$, Class A can be assigned. If the survey connects to 1st Order AHD marks, in the past 1st Order would be assigned but unless the Department is supplied the observations and incorporates them in the state wide datum adjustment, the new marks cannot be assigned better than 2nd Order ~ so Class A, 2nd Order;

7. GNSS Control Surveys

Where permanent survey marks are fixed by GNSS, the Department may be interested in including suitable GNSS measurements in the geodetic adjustment of the State Control Survey. This will allow the GDA values to be rigorously maintained over time as we modernise GDA and/or upgrade

AUSGeoid models. Inclusion in the geodetic adjustment also allows rigorous assessment of uncertainties and strong levels of legal traceability. Surveyors should refer to the separate detailed Guideline for Submitting GNSS Data for Inclusion into the State-wide Datum Adjustment Network.

8. Links and References

Guideline for Submitting GNSS Data for Inclusion into the State-wide Datum Adjustment Network
<<https://www.business.qld.gov.au/industries/building-property-development/titles-property-surveying/surveying/permanent-marks>>

Further general information about AUSPOS is available from Geoscience Australia's web site
<<https://www.ga.gov.au/scientific-topics/positioning-navigation/geodesy/auspos>>

Background information on antenna types and antenna reference points is available from the AUSPOS FAQ, <<http://www.ga.gov.au/scientific-topics/positioning-navigation/geodesy/auspos/faq5>>

For specific information about particular models of antennas and their corresponding antenna reference points, see the US National Geodetic Survey's Antenna Calibration Program, <<https://www.ngs.noaa.gov/ANTCAL/>>.

Bentley, R.E. (2005). Uncertainty in Measurement: The ISO Guide - Monograph 1: NMI Technology Transfers Series, 11th Edition. Australian Government, National Measurement Institute.

Cadastral Survey Requirements

<<https://www.business.qld.gov.au/industries/building-property-development/titles-property-surveying/surveying/standards-forms>>

Permanent Survey Mark Plan Form

<<https://www.business.qld.gov.au/industries/building-property-development/titles-property-surveying/surveying/permanent-marks>>

Permanent Mark Maintenance Form

<<https://www.business.qld.gov.au/industries/building-property-development/titles-property-surveying/surveying/permanent-marks>>

Standard for the Australian Survey Control Network, ICSM Special Publication 1 (SP1)

<<https://www.icsm.gov.au/publications>>