GOVERNMENT OF WESTERN AUSTRALIA

Landgate

Landgate Specification for Drafting Geodetic Survey Mark Station Summaries

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Locate Value Secure

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Document control

Landgate Specifications for Drafting Geodetic Survey Mark Station Summaries

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Document version history

Date	Author	Version	Revision Notes
Sept 2025	Khandu	5.0	Minor revision
Aug 2025	T. Castelli	4.0	Update to sample drawings
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	Survey	1.0	Initial

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1. Purpose

This document provides specifications and instructions for drafting or amending a Station Summary and will serve as a reference guideline for Landgate-contracted geodetic work activities and those undertaken by third-party organisations or individuals.

As a Land Information Authority, Landgate manages the geodetic infrastructure to provide an accurate and a reliable geodetic system for all users in WA. Geodetic marks are regularly inspected and maintained after its establishment to ensure accuracy, long-term stability, and usability.

The geodetic marks are categorised into Standard Survey Marks (SSM) or Bench Marks (BM) based on their use and horizontal and vertical positional accuracy requirements. As per the requirements provided in ***GSU-01 – Landgate Requirements for Placement of Geodetic Survey Marks***, the SSMs and BMs are referenced by at least three and two physical marks set in the ground, respectively, which are called Reference Marks (RMs). A Station Summary is an access sketch used to locate a geodetic mark and includes dimensions to the RMs and other permanent features (e.g., trees, roads, power pole, etc.).

2. Definitions and abbreviations

Abbreviation	Definition
AutoCAD®	Autodesk® Inc. software for drafting
BM	Bench Mark
CAD	Computer Aided Design
Geodetic Survey Mark	SSM or BM or RM
GESMAR	Geodetic Survey Mark Register
PCM	Permanent Control Mark
Primary Mark	SSM or BM used to indicate the main focus in this document
PSM	Permanent Survey Mark
RM	Reference Mark
RO	Reference Object
RO	Reference Object
SIP	Star Iron Picket
SSM	Standard Survey Mark
TCM	Temporary Control Mark
WP	Witness Plate

3. Drafting specifications

3.1.1 The Station Summary drawings are to be prepared using standard SSM template provided by Landgate. The Landgate Station Summary template is designed using AutoCAD® LT and includes a .dwt file and a Colour-dependent Plot Style Table (.ctb) file.

a) the Station Summary template .dwt file contains **Blocks** for easy data entry, layers for managing the drawing, and standard **Symbols**. See the template overview in **Section 6.1**.

b) the Colour Table (.ctb) file is used to control how drawing is printed or plotted based on their colour in the **Layer**. It assigns grey-scale colour for the Station Summary to be printed in black and white.

3.1.2 A licensed AutoCAD® software is required. Alternative software may be used, however, it needs to be converted to a format that can be easily read by AutoCAD (e.g. .dwg, .dxf) when provided to Landgate.

3.1.3 The Station Summary shall be stored by the DB Number of Primary Mark, which can be found at the top of a Station Summary for an existing Primary Mark. For a new SSM or a BM, it can be left Blank. See examples in Section 6.2 and 6.3.

a) Adjacent SSMs can be shown on the same drawing as shown in **Section 6.4**. However, they need to be stored with their corresponding DB Number.

b) If there are more than one adjacent SSMs, the additional DB Numbers and Mark Names can be manually added.

3.1.4 A Station Summary is drafted on a A4 size sheet (portrait) and consists of a RM sketch at the top of the page, angle or direction table on the top right, and a location or access sketch at the bottom half of the page as shown on the template layout in **Section 6.1**.

3.1.5 The Station Summary drawing must be legible and clear suitable for photocopying and scanning. The access or location sketch do not need to be to scale but it should show adequate information to locate the SSM or BM. Use enlargements, if necessary.

3.1.6 By default, the top of the Station Summary drawing shall be considered as North. If the drawing orientation differs from this convention, the direction of North must be clearly indicated with a North arrow placed at the bottom right corner of the drawing.

3.1.7 Ensure correct orientation of the Primary Mark(s) regarding relation to RMs and other Geodetic Survey Marks or cadastral alignments. Connections to adjoining marks indicated in the field notes are to be depicted in the drawing using appropriate lines to represent their spatial relationships.

3.1.8 Maintain consistent use of Symbols, fonts and text sizes. Symbols representing Primary Mark(s) and RM(s) must confirm to the standard size provided in the Station Summary template (.dwt) block library. When using AutoCAD®, the standard font is Romans and the text size is generally 2.0 mm (but no smaller than 1.8 mm), and 2.5 mm for mark names and street names to ensure clarity and emphasis.

3.1.9 The Primary Mark name on the Station Summary shall be underlined and the Symbol shall be a solid triangle for an SSM or solid circle for a BM. Other SSMs or BMs shown in

the access sketch shall be depicted as an open triangle or circle and the mark name must not be underlined.

3.1.10 Where applicable, the RM diagram indicate the direction to the Reference Object (RO) by drawing a Ray from the Primary Mark to the RO and the name of the RO labelled along the end of Ray. See example in Section 6.2. This is in addition to the RO direction shown in the angle table, if applicable.

3.1.11 Distance or bearing from the Primary Mark to the Witness Plate (WP) do not need to be included.

3.1.12 The RM diagram shall include the following where applicable:

a) Distances measured from **SSM** to RMs and in between RMs to 3 decimal places

b) Distances measured from **BM** to RMs and in between RMs to 2 decimal places

c) Angles measured at **SSM** between the RMs rounded to the nearest second

d) Angles measured at RM (eccentric) to the SSM

e) Co-linear lines to be shown in as continuous line.

f) Non co-linear lines between RM's to be broken line.

g) Angles measured at **BM** between the RMs rounded to the nearest minute or Magnetic Bearing from the **BM** to the RM(s).

Note – *Refer to **GSU-06-Landgate Guideline for Dealing with Disturbed Geodetic Survey Marks** where measurements differ from original values on existing Primary Marks.*

3.1.13 Clearly indicate the physical type of the Primary Mark(s) and the RMs installed or located (e.g., brass plaque set in concrete in concrete hatch cover or S.I.P. set in concrete). Also indicate the status of WP.

3.1.14 The access or location sketch shall include:

a) Adjacent features such as Power Poles, utility boxes or trees to identify the location of the mark

b) Distance to the nearest road junctions/intersections and adjacent features

c) Any other information that will assist with future location of both the Primary Marks and RM(s). Location of the WP (if applicable).

3.1.15 Where the Primary Mark is on a cadastral alignment or on a prolongation of an alignment then details of that relationship must be shown on the locality sketch.

3.1.16 For replaced Primary Marks, indicate the connection between the old and the new Primary Mark.

3.1.17 Draw a combined summary for a T-Station and its parent mark where the relevant details can be clearly shown, and the access sketch is the same as the main mark. Show the connection between parent and T-Station. Draw a separate summary for a T station having a different access.

4. Station Summary template

4.1. Template file

4.1.1 The Station Summary template file is stored as **SSMBM2021 template.dwt** and is generally pre-supplied for Geodetic Surveys conducted for or on behalf of Landgate. The template can be provided to any third-party individuals or organisations conducting Geodetic Surveys and wishing to contribute to the ongoing maintenance of the Geodetic Network in Western Australia.

4.2. Preferred software and format

4.2.1 Landgate's preferred drafting package is AutoCAD®. Digital Station Summaries prepared for the purpose of Landgate requested works shall be in a format that can be easily read and re-produced by AutoCAD®.

4.2.2 In general, digital Station Summaries produced by third-party organisations and contributed to Landgate shall also be converted to a format easily read and re-produced using AutoCAD®.

4.3. AutoCAD® setup

5.3.1 The Station Summary template (.dwt) shall have the following settings:

- Units: - Decimal
- Angle: - Deg/Min/Sec. - 0°00'00"
- Insertion scale: Units to scale inserted content - Millimetres
- Angle Measure: - North
- Angle Direction: - Clockwise
- Model space is the drawing area
- Page size – A4 Portrait (W210 mm x H297 mm)

5. Using the Station Summary template

5.1. Template layout

5.1.1 The Station Summary template layout is designed as a **Title Block** – which is essentially a collection of objects – such as points, lines, shapes, and texts.

5.1.2 The Title Block acts as a Form to insert the required attributes or metadata of the Primary Mark. It can be activated or triggered by double-clocking on the Block element or by simply typing > "***attedit***" in the command line.

5.1.3 Other pre-defined block elements or **Symbols** can be accessed from the Symbol Library or Tool Palettes. Pre-defined **Layers** are visible in the Layer Manager and **Colour Table** or the .ctb file can be connected or defined when printing or plotting the layout.

5.1.4 The Station Summary is plotted or printed from the **Model** space and do not require any layout customisation. Select the “Extents” option for *plot area* to include the entirety of the template layout.

5.2. Block attributes

5.2.1 By selecting the Title Block (or the template layout) and typing “*attedit*” in the command line, the details of the mark can be directly entered in the *Edit Attributes* Form windows (see **Figure 1**: *Edit attributes dialog window*:

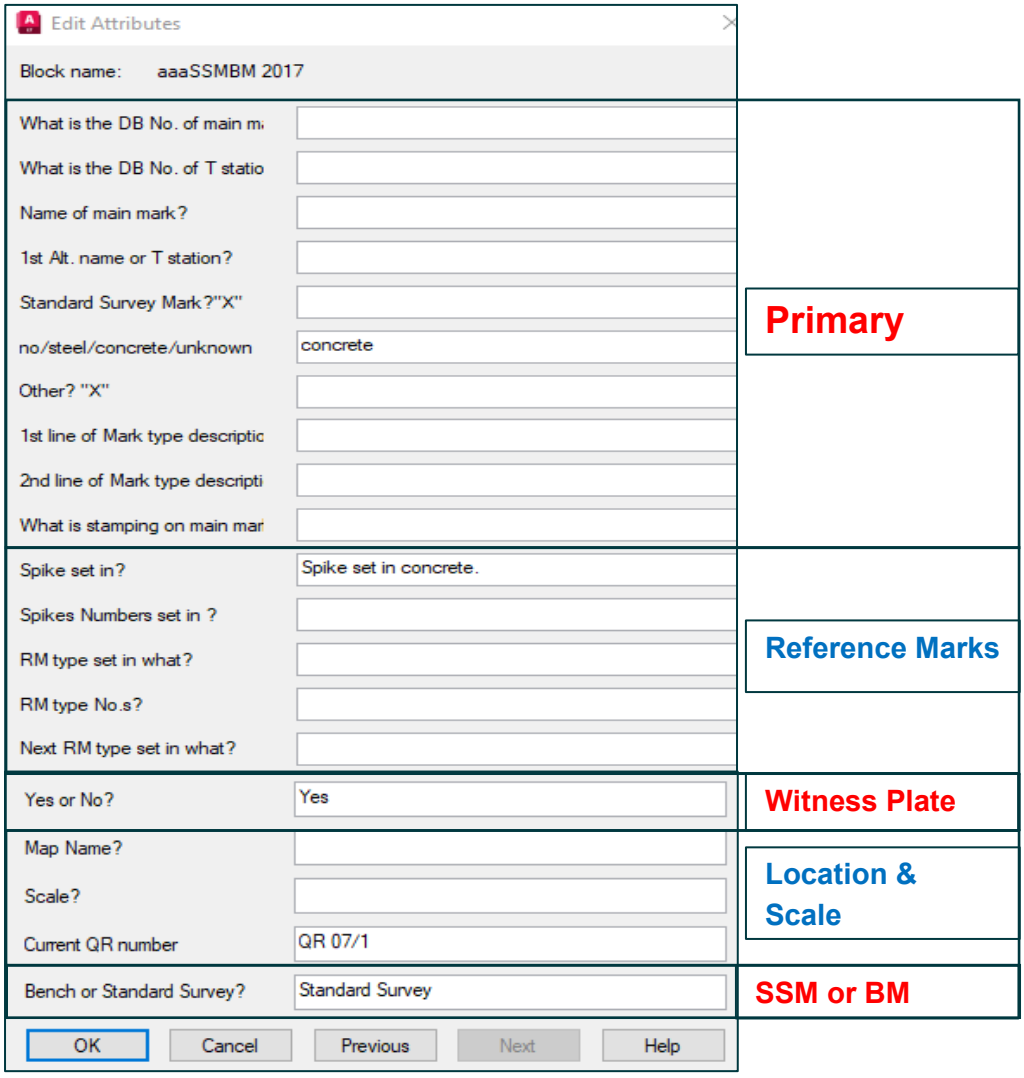


Figure 1: Edit attributes dialog window

5.2.2 The terms or definitions of the attributes are provided in the table below:

Field	Description
What is the DB No. of main mark.?	Enter the database number of the Primary Mark. Leave blank if unknown.
What is the DB No. of T station.?	Enter the database number of the adjacent Primary Mark, if applicable. Leave blank if unknown.
Name of main mark?	Type in full name of Primary Mark in upper case (e.g., SOUTHERN CROSS 149)
1st Alt. Name or T Station?	Type the full name of the adjacent Primary Mark, if applicable or the alternative name of the Primary Mark, if available.
Standard Survey Mark? “X”	Select this option, if the Primary Mark is a brass plaque.
no/steel/concrete/unknown	Type of hatch or lid construction for the above, if applicable.
Other? “X”	Select this option, if the Primary Mark is not a brass plaque.
1st line of Mark type description	Describe the type and what it is set in for the above (e.g., BAYS 29T is a spike set in bitumen).
2nd line of Mark type description	Extra space for description above or description for any additional adjacent Primary Mark.
What is stamping on main mark?	Type the Stamp Name on the mark (e.g., SC 149) or leave blank if not stamped.
Spike set in?	(RM type) Spike set in e.g., concrete. Leave blank if no RM exists.
Spikes Numbers set in?	Enter RM numbers for the above. Leave blank if no RM exists.
RM Type set in what?	For all other RMs that are not spikes, e.g., *SIP set in concrete.* If none leave blank.
RM type No’s.?	Enter RM numbers for the above.
Next RM type set in?	For all other RMs that are not spikes, e.g., *SP set in bitumen.* If none leave blank.
Next type RM No’s.?	Enter RM numbers for the above.
Yes or No?	Does it have a Witness Plate? Type Yes or No.
Map Name?	Type the associated map name for the Primary Mark, e.g., BAYSWATER BG34-4.6. Leave blank if not known.
Scale?	Type Map Scale of the above map.

Current QR number	Refers to the version of template and does not need to be changed.
Bench or Standard Survey?	Refers to the type of mark – SSM or BM. Enter "*Standard Survey*" or "*Bench*" as required. Note – The word mark is not required.

5.2.3 The attributes can also be edited by double clicking on the template in the model space. This will activate the window below (**Figure 2**). The font size can be altered under the <Text Options tab> to fit the name of the Primary Marks. Check specifications in Section 3.

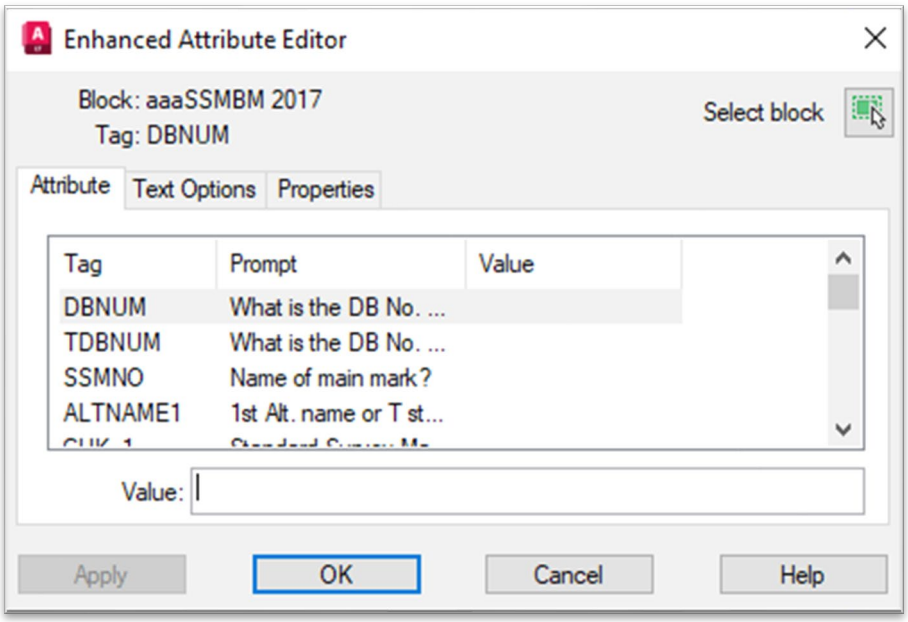


Figure 2 - Enhanced attribute editor

5.3. Layers available

5.3.1 Standard layers and their specific settings are defined as shown in **Figure 3**. To be consistent with the Colour Table (.ctb file) settings when printing or plotting, additional layers should **not** be created.

5.4. Symbols

5.4.1 There are several pre-defined block elements (or Symbols) within the template – such as SSM, BM, RM, etc., that can easily be placed in the drawing by clicking the <Insert> button or typing the <Insert Block> in the command line (see **Figure 4**).

5.4.2 These Symbols are drawn with pre-defined scale and insertion points. Mark Symbols – SSM, BM, and RM symbols should not be re-scaled unless

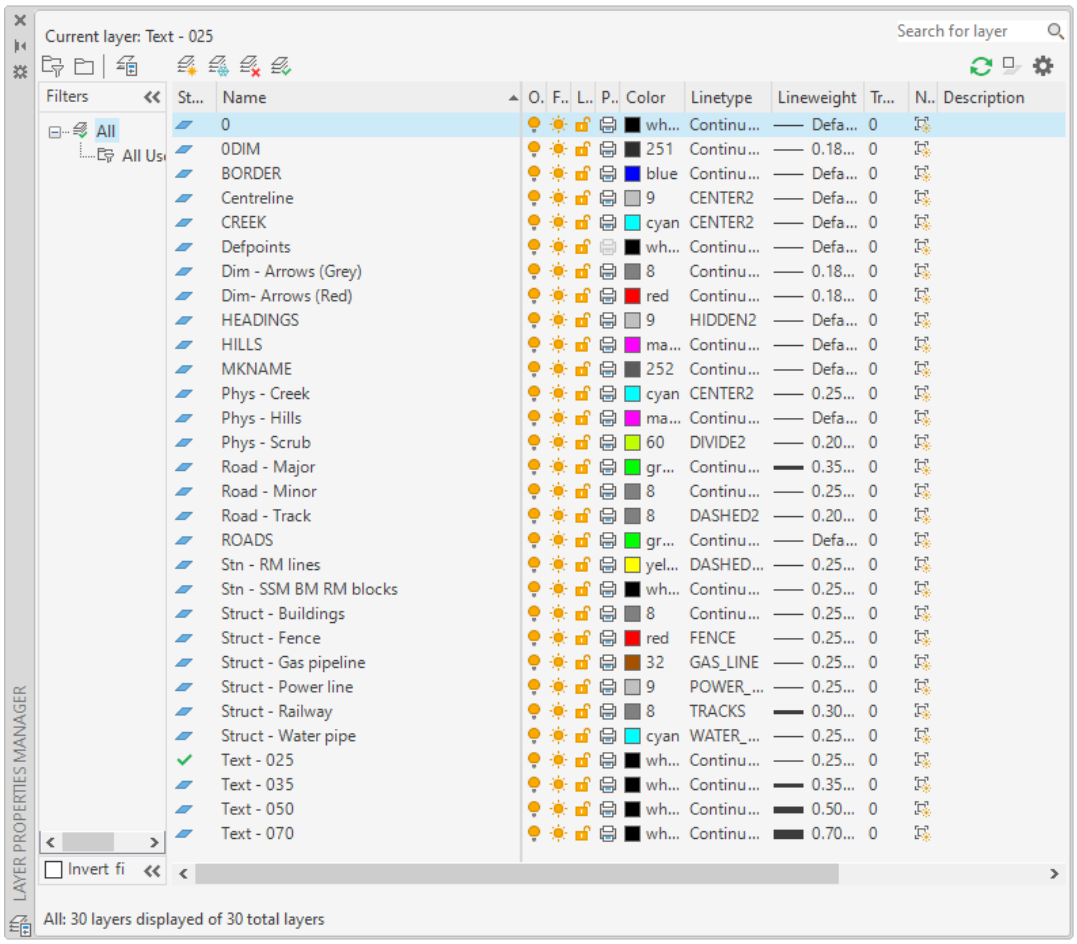


Figure 3 – Pre-defined layers in the template

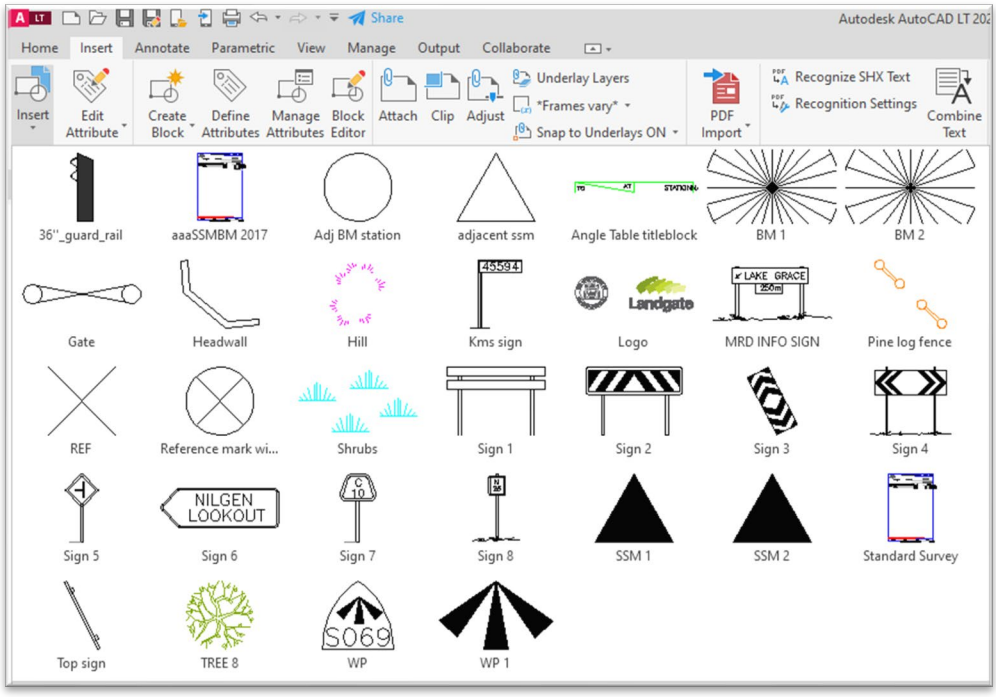


Figure 4 – Pre-defined Blocks or Symbols in the template

5.5. Colour dependent plot style

5.5.1 The **colours.ctb** file that comes together with the Station Summary template file assigns greyscale colours to the **Layers** when printing or plotting, which will result in a clear and legible black and white Station Summary.

5.5.2 The colours.ctb file can be linked and selected by clicking the *Printer* icon under "*Plot style table (pen assignments)*" on the right top in the **Print Window** (see **Figure 5)**.

5.5.3 Landgate prints or plots the Station Summary as an image (in .**tif** format). There is no requirement to provide Station Summaries stored in .tif format at this stage.

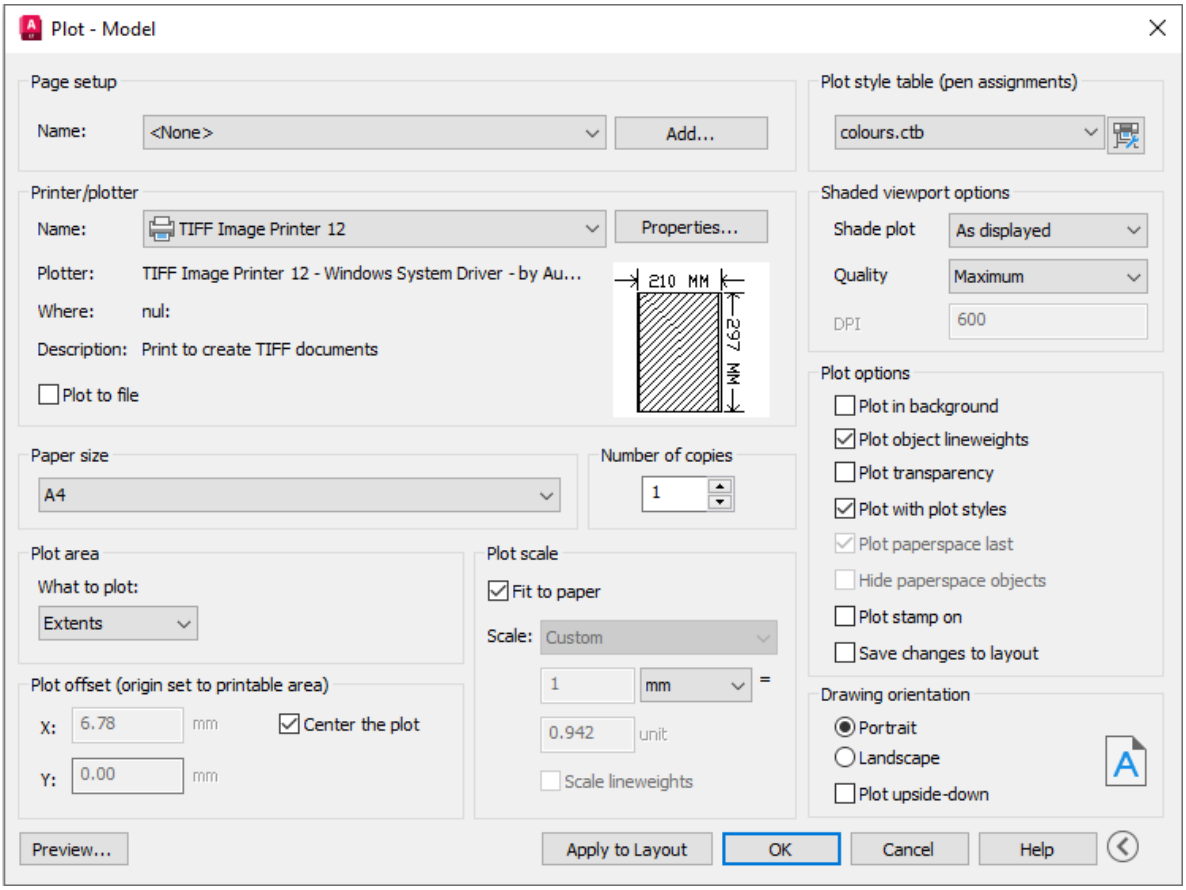
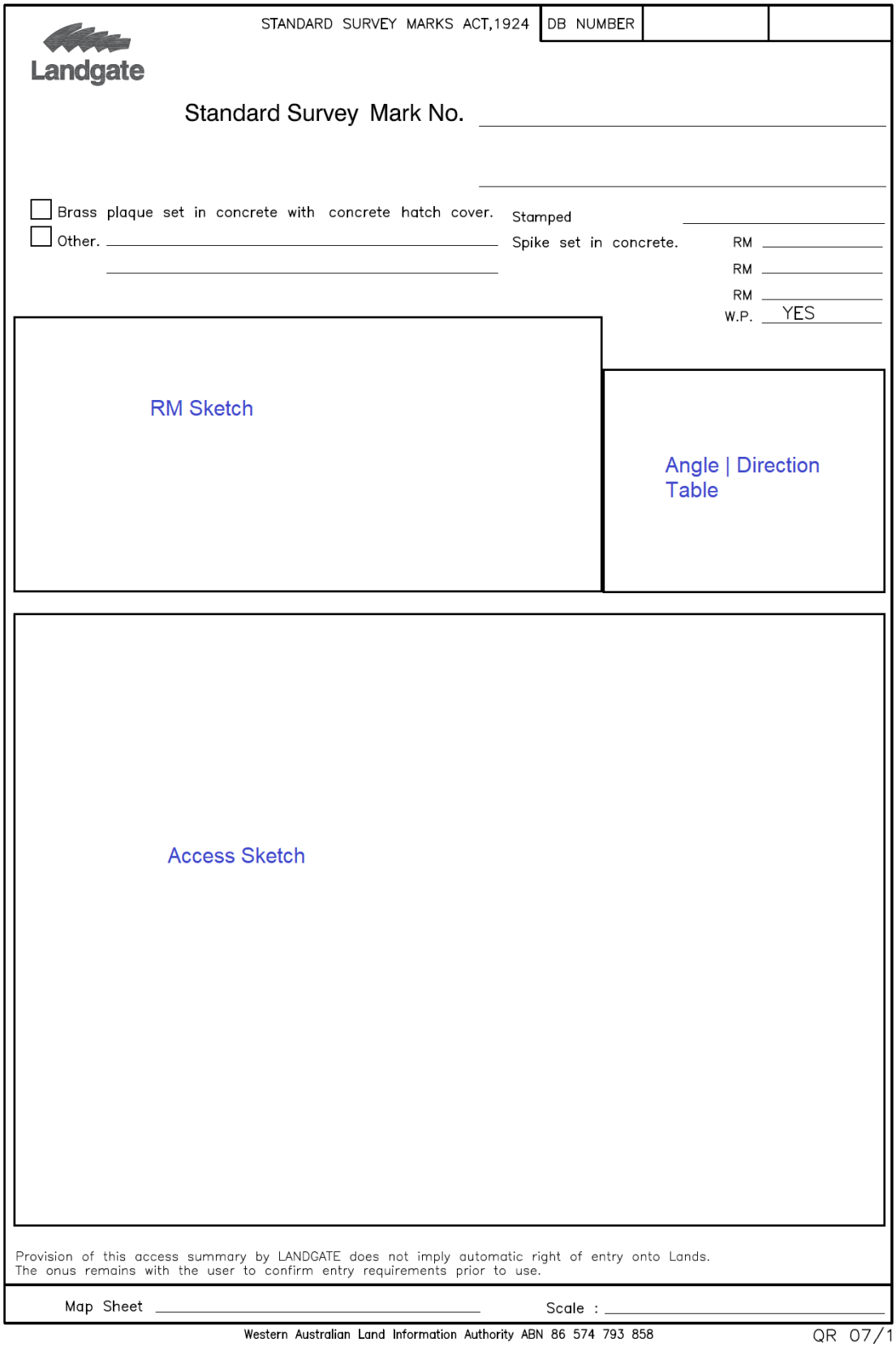


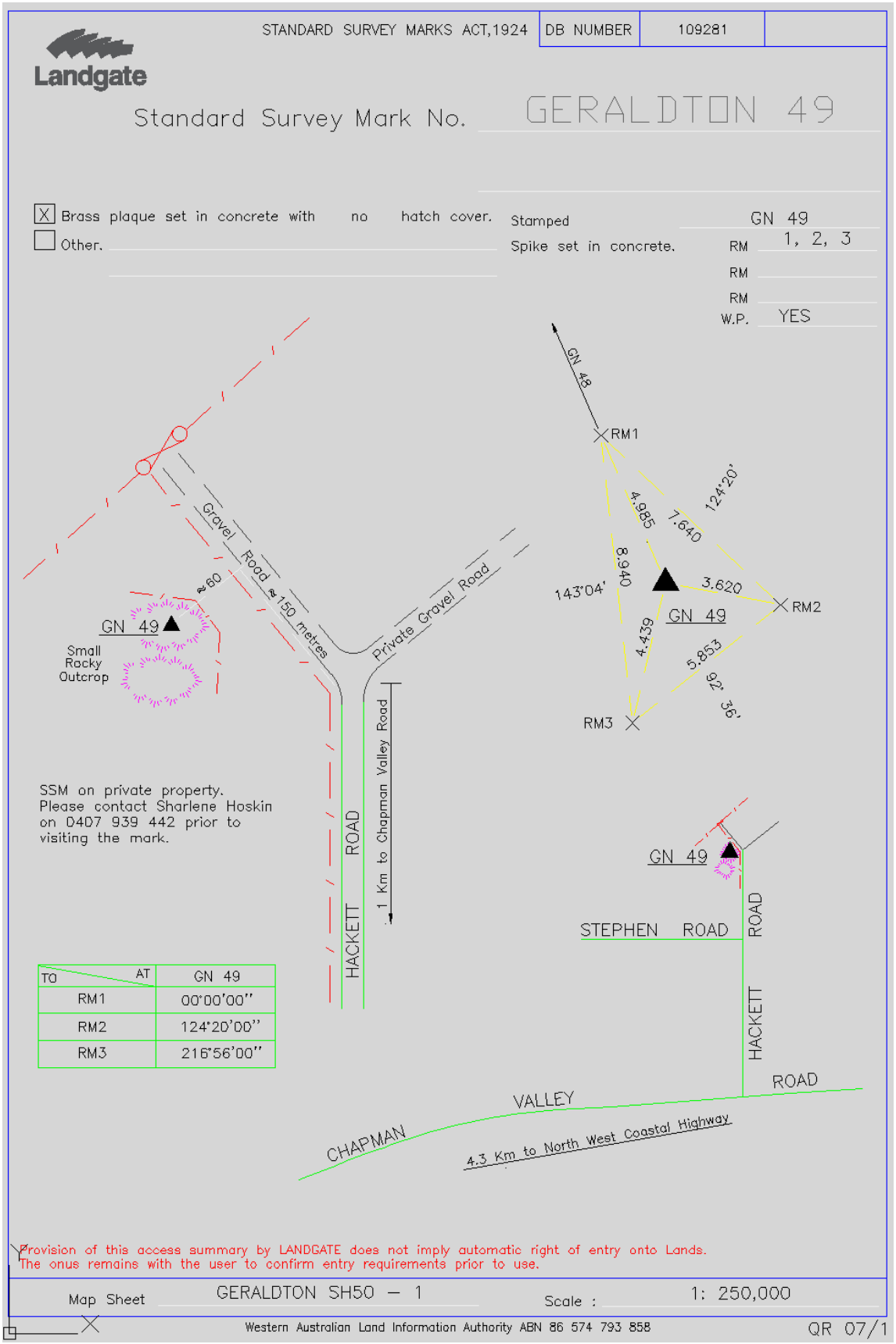
Figure 5 - Plot settings window

6. Sample of Station Summary drawings

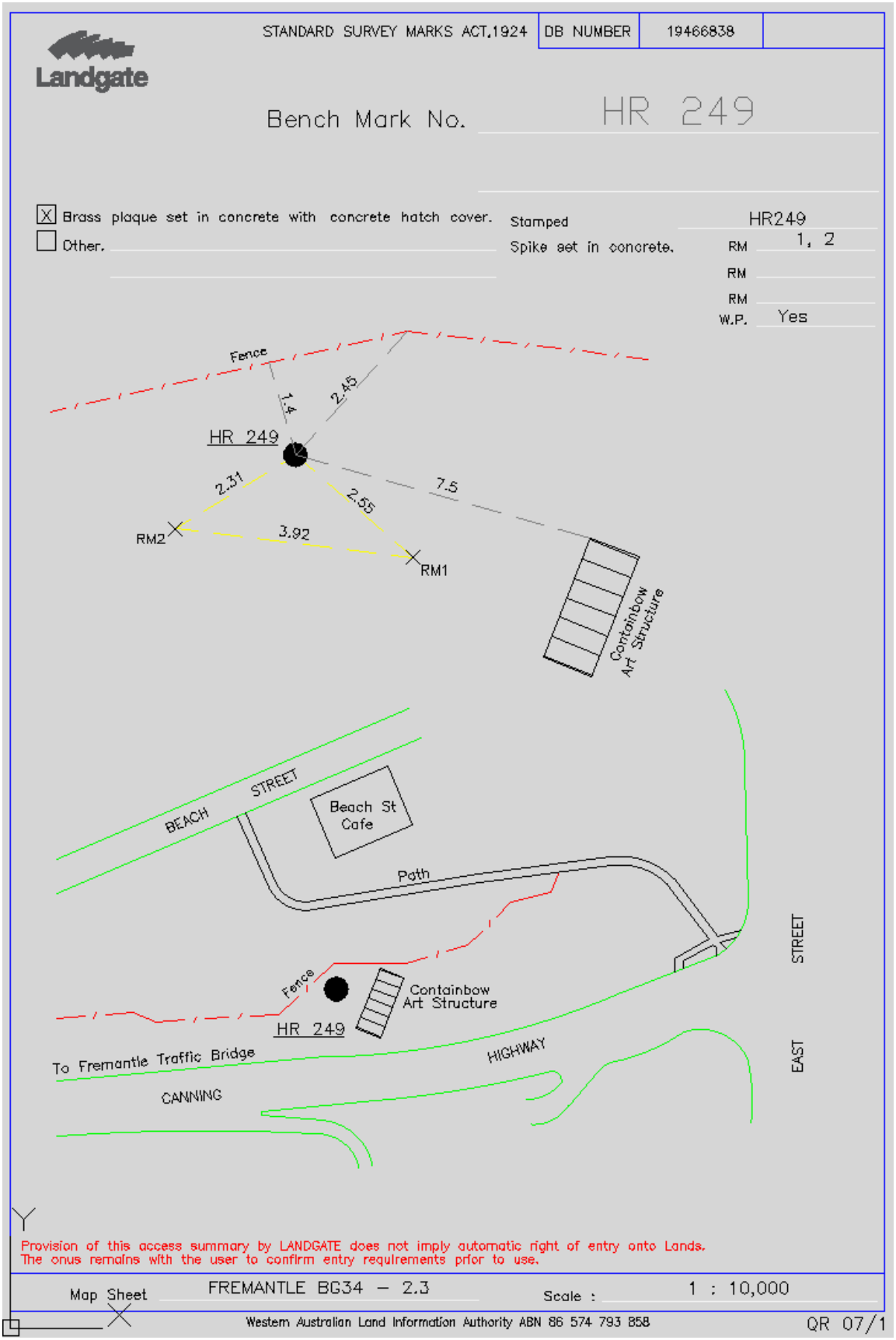
6.1. Station Summary SSM template



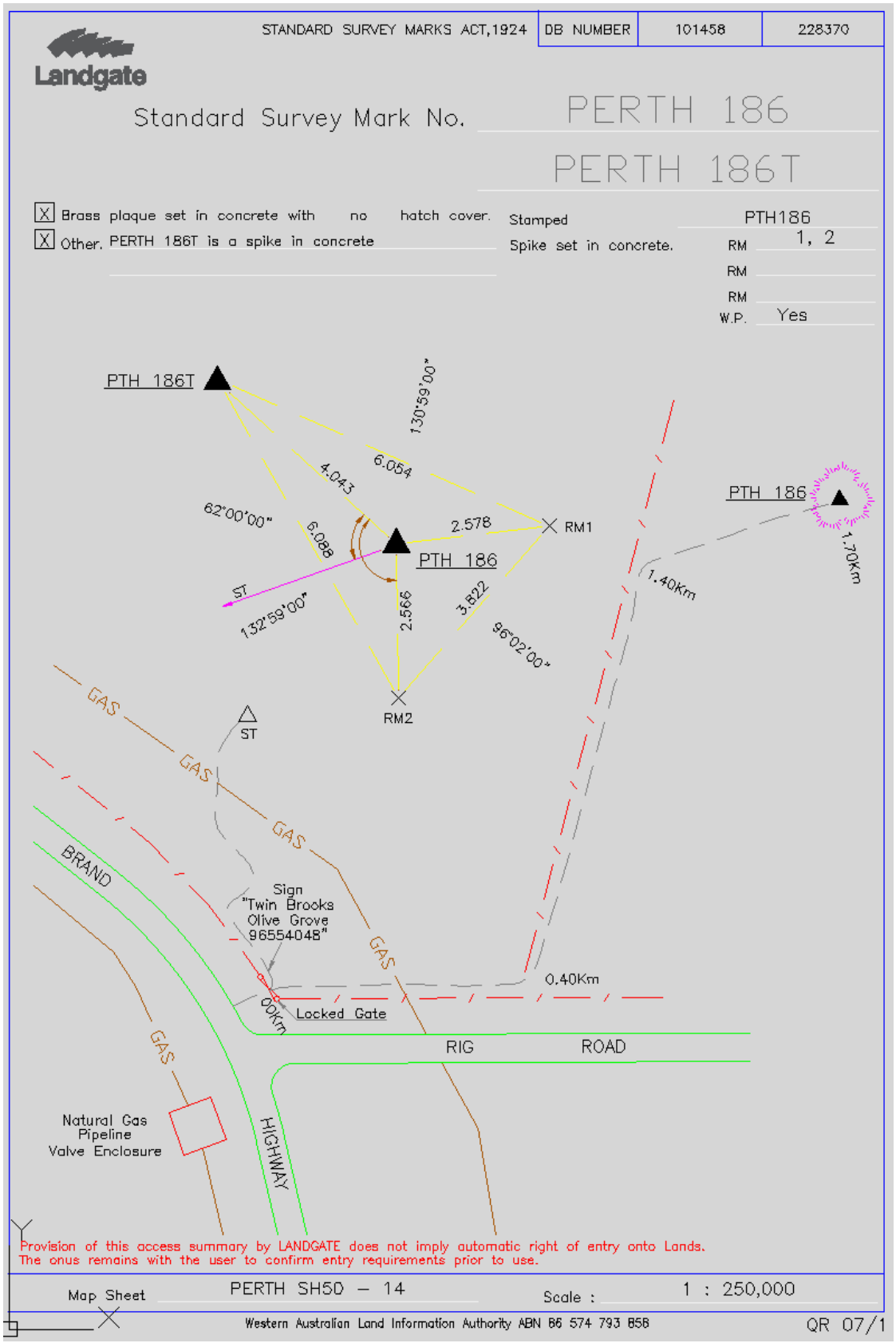
6.2. Sample of SSM Station Summary



6.3. Sample of BM Station Summary



6.4. Sample of SSM Station Summary (with adjacent mark)



6.5. Sample of SSM Station Summary plotted with colours.ctb