



Engineering Services

Technical Standard

TS 0103

Survey Requirements Specification

Version: 2.00

Date: 30/06/19

Status: Issued

Document ID: SAWS-AM-0103

© 2019 SA Water Corporation. All rights reserved. This document may contain confidential information of SA Water Corporation. Disclosure or dissemination to unauthorised individuals is strictly prohibited. Uncontrolled when printed or downloaded.



**Government of
South Australia**

Copyright

This Standard is an intellectual property of the South Australian Water Corporation. It is copyright and all rights are reserved by SA Water. No part may be reproduced, copied or transmitted in any form or by any means without the express written permission of SA Water.

The information contained in this Standard is strictly for the private use of the intended recipient in relation to works or projects of SA Water.

This Standard has been prepared for SA Water's own internal use and SA Water makes no representation as to the quality, accuracy or suitability of the information for any other purpose.

Application & Interpretation of this Document

It is the responsibility of the users of this Standard to ensure that the application of information is appropriate and that any designs based on this Standard are fit for SA Water's purposes and comply with all relevant Australian Standards, Acts and regulations.

Users of this Standard accept sole responsibility for interpretation and use of the information contained in this Standard. Users should independently verify the accuracy, fitness for purpose and application of information contained in this Standard.

Only the current revision of this Standard should be used which is available for download from the SA Water website.

Significant/Major Changes Incorporated in This Edition

Expanded the scope of the standard to include:

- Design,
- As-Constructed, and
- Site surveys

Document Controls

Version History

Version	Date	Author	Comments
1.00	1/11/2017	Peter Sutter	First version.
2.00	30/06/2019	Peter Sutter	Second issue

Template: Document - Long Version 4.0 31/07/17

Approvers

Role	Signature and Date
Manager Asset Information Jim Carlson-Jones	13/06/2019 X Jim Carlson-Jones ----- Signer's Name Signed by: CA043284
Senior Manager Asset Management Peter Seltsikas	14/06/2019 X Peter Seltsikas ----- Signer's Name Signed by: SE001670

Reviewers

Role	Name	Version	Review Date
Manager Asset Information	Jim Carlson-Jones	1.00	13/10/17
Manager Asset Information	Jim Carlson-Jones	2.00	15/06/19

Contents

1	Introduction	5
1.1	Purpose.....	5
1.2	Scope.....	6
1.4	Glossary	7
1.5	References.....	8
2	Survey Requirements	9
2.1	Survey Accuracies	9
2.2	Survey Control Accuracies	9
2.3	Survey Datum	9
2.3.1	Horizontal Datum.....	9
2.3.2	Vertical Datum	9
2.3.3	Project Datum Information	9
2.4	Quality Levels.....	10
2.4.1	Overview	10
2.4.2	As-Constructed Survey Quality Level	10
2.4.3	Other Survey Type Quality Level	10
Appendix A	Recommended Survey Methods	11
A1	Horizontal Datum	11
A2	Vertical Datum	11
Appendix B	AS5488 Quality Levels	12

List of tables

Table 1: Surveys in Scope	6
Table 2: Project Datum Information.....	9
Table 3: SA Water Quality Levels.....	10
Table 4: AS 5488-2019 Quality Levels	12

1 Introduction

SA Water receives surveying information during the life of an asset including conceptual design, detailed design, construction set-out, as-constructed and on-going monitoring.

Traditionally the as-constructed survey is used to update the SA Water Geographic Information System (GIS), particularly with network (or pipe) infrastructure. SA Water is expanding the information in the asset registers (e.g. GIS) and is implementing a standard format and process for network infrastructure known as **Automated Assessment**.

Automated Assessment of asset information, includes the:

- Electronic lodgement of survey information relating to the asset,
- Automated validation and notification of the quality of the information,
- Automated processing of the submitted information to update asset management databases.

Underpinning **Automated Assessment** are Surveying methods to record asset information defined by:

- horizontal coordinates based on Map grid Australia (MGA) and relevant zone,
- elevations reduced to Australian Height Datum (AHD).

The accuracy of the surveys must be appropriate to update the SA Water asset management databases.

The SA Water GIS has been maintained from information shown on as-constructed plans, including offsets to boundaries, distances to property corners and chainages along pipes. The positional accuracy of the asset information is therefore relative to the positional accuracy of the digital cadastral boundaries. Automated Assessment is changing from relative positional accuracy to absolute accuracy of coordinates.

1.1 Purpose

The purpose of this technical specification is to standardise the accuracy requirements of surveys to ensure the information requirements of Automated Assessment can be met. This technical specification details SA Water accuracy requirements of surveys to record the location of new and existing network infrastructure created or impacted as a result of land development or capital works. The information is recorded in electronic format for automated processing. The requirements relate to surveys based on the MGA projection and elevations reduced to AHD.

Specific accuracy requirements for design, construction and as-constructed surveys for land development are in the SA Water Supplements to the WSAA Code (Supplements) – refer to **Building and Development** at www.sawater.com.au. The purpose of these requirements, as defined in the Supplements, is to confirm the assets are built within design tolerances and to record the position of the infrastructure relative to the land parcel framework. These requirements remain.

Additional surveying requirements for capital works may be included in the terms of the contract.

This technical specification describes SA Water survey requirements to support Automated Assessment.

1.2 Scope

These requirements apply to the following survey types:

Survey Type	Description
Design	Initial survey that includes the location of existing infrastructure that may be impacted by the project.
As-Constructed	Surveys to record the location of new and existing network infrastructure created or impacted as the result of a Major Land Development or capital works.
Site	Survey to identify existing infrastructure at a site including land boundary, buildings, overhead and underground services.

Table 1: Surveys in Scope

1.4 Glossary

The following glossary items are used in this document:

Term	Description
Accuracy	The level of closeness of an estimated value – measured or computed – of a quantity to its true or accepted value.
ACDC	As-Constructed Design Certification. Software used to facilitate Automated Assessment including a web portal.
AHD	Australian Height Datum – Currently AHD71.
AS 5488	The Australian Standard AS5488-2019 “Classification of Subsurface Utility Information (SUI)” describes a classification system for the quality of the location and attribute data of buried infrastructure.
AS 5488 Absolute Spatial Position	The location of a point on the utility shown by reference to a three-dimensional coordinate system from which can be derived horizontal MGA coordinates and a vertical position referenced to the AHD. The AS5488 quality level tolerances are an expression of the local uncertainty of a point, as defined by ICSM SP1.
AS 5488 Quality Level	The AS5488 quality level in this document refers only to the AS5488 positional tolerances and does not refer to the attribute or metadata information requirements of AS5488.
AS 5488 Relative Spatial Position	The horizontal and/or vertical position related by measurement to physical structures (e.g. kerbs, fences, retaining walls, ground level) that are themselves capable of being referenced to a survey datum.
As-Constructed Information	Representation of the utility infrastructure as it exists in the field, showing a relationship to a defined absolute or relative reference system.
As-constructed Survey Accuracy	The maximum local uncertainty of a surveyed entity in relation to the project survey control.
Asset Information	Contents of the submission validated by the Portal such as As-Constructed information.
Automated Assessment	Process and systems for electronically submitting asset information for assessment and updating asset databases.
Construction Tolerance	The allowable difference between the constructed position/grade and the design position/grade specified by the engineering design, SA Water Technical Standards and the AS/NZ Standards.
Capital works	Refers to survey information submitted to SA Water not relating to land development.
CORS	Continually Operating Reference System of permanent GNSS tracking stations connected to the national geodetic datum with Regulation 13 certificates.
DWG	AutoCAD native file format. DWG is the standard file format for Automated Assessment.
GDA	Geocentric Datum of Australia
GIS	Geographic Information System.
Ground Plane Grid	A local survey grid usually based on a base MGA official survey mark and oriented to MGA. A scale factor is applied with the base point as origin to convert from the MGA projection to the ground horizontal plane at an average height above sea level for the project.
Horizontal Datum	An official national geodetic datum spatial reference frame known as the Geocentric Datum of Australia (GDA). The national geodetic datum will be updated from time to time e.g. GDA94, GDA2020. There may be a time delay between the publication of the official national geodetic datum and implementation by SA Water of the datum. The datum to be used for SA Water as-constructed surveys shall be published on the SA Water website.

Local Uncertainty	As defined by ICSM SP1. The average measure, in metres at the 95% confidence level, of the relative uncertainty of the coordinates, or height, of a point(s), with respect to the survey connections to adjacent points in the defined frame.
Network Infrastructure	Assets related to the provision of water, sewer and recycled water services.
Official Survey Mark	Survey marks that form part of the state's horizontal and/or vertical control network with information published by, or with the express authority of the State Government of South Australia
Plan	The Drafting representation of the submission. For example, the As-Constructed plan complying with TS 0095 Requirements for Technical Drawings.
Portal	As Constructed Design Certification Web Portal. Web Portal for submission and validation of asset information in DWG format.
Positional Uncertainty	As defined by ICSM SP1. The uncertainty of the coordinates or height of a point, in metres, at the 95% confidence level, with respect to the defined reference frame.
Project	The name of the Subdivision or Project (if capital). A Project can include any number of submissions.
Projection	The Universal Transverse Mercator (UTM) projection of the datum known as the Map Grid of Australia (e.g. MGA94, MGA2020). This is the grid coordinate realisation of the GDA. To define the grid coordinate system the projection, datum and zone are required e.g. MGA94 Zone 53.
SA Water	South Australian Water Corporation
SA Water Design and Construction Standards	Specific requirements for the design and construction of reticulation infrastructure. These requirements are available on the SA Water website www.sawater.com.au .
Suitably qualified surveyor	A surveyor licensed or registered with the Surveyor's Board of SA
Submission	A DWG file submitted to the Portal for validation. Water, Sewer and Recycled Water must each be submitted in their own DWG file. Each is separate submissions.
Tolerance	The required degree of accuracy. The amount by which a measurement or calculation might change and still be acceptable. In this document Accuracy and Tolerance can be interchangeable.
Web Portal ('Portal')	As Constructed Design Certification Web Portal. Web Portal for submission and validation of asset information in DWG format.

1.5 References

The following table identifies the documents and/or articles that are referenced in this document:

Title/URL	Version	Date
TS 0153 Requirements for Automated Assessment	1.00	1/11/17
TS 100 Requirements for Technical Drawings	5.00	02/05/19
Supplement to Water Supply Code of Australia - WSA 03-2011	4.00	1/12/12
Supplement to Gravity Sewerage Code of Australia – WSA 02-2014	5.00	1/03/14

2 Survey Requirements

2.1 Survey Accuracies

All co-ordinate values, levels and distances must be quoted to two decimal places of a metre.

2.2 Survey Control Accuracies

For the survey to be considered on the appropriate datum the horizontal and vertical survey control shall comply with the following **positional uncertainty** requirements:

- a. on urban projects: 0.05 metres,
- b. on rural projects: 0.15 metres.

Urban projects are those where any Allotment within the project area or abutting the project area is less than one half of a hectare in area. Otherwise the project is considered as Rural.

Refer to **Appendix A** for recommended methods for connecting the control survey to the horizontal and vertical datums.

2.3 Survey Datum

Refer to Appendix A for recommended methods for connecting the control survey to the horizontal and vertical datums.

2.3.1 Horizontal Datum

All data must be supplied on the MGA projection using the Horizontal Datum specified by SA Water. The MGA zone is to be determined from the zone of the published information of official survey control marks used on the project. The entire project shall be on a single zone.

All data shall be scaled to true MGA (not supplied on a survey ground plane grid). Co-ordinates shall not be truncated.

2.3.2 Vertical Datum

The Australian Height Datum shall be used as the vertical datum.

2.3.3 Project Datum Information

Automated Assessment requires 'project level' information. These are attributes that apply to the project. The following project level coordinate system and datum attributes are required:

Attribute	Description
HorizontalCoordinateSystem	e.g. MGA Zone 54 (Allowed 52,53,54)
HorizontalDatum	e.g. GDA94, GDA2020
VerticalDatum	AHD/Derived AHD
Notes	Additional notes regarding coordinate system e.g. Horizontal Origin PSM 6628/12345 (Smartnet Base MRYB, AUSPOS) AHD Origin PSM 6628/6789 (Smartnet Base MRYB, AUSPOS, Local TBM)

Table 2: Project Datum Information

2.4 Quality Levels

2.4.1 Overview

The Australian Standard AS5488-2019 “Classification of Subsurface Utility Information (SUI)” describes a classification system for the quality of the location and attribute data of buried infrastructure. The quality levels are listed in Appendix B.

SA Water has expanded the AS5488 quality levels to include additional levels - see Table 2 below. The horizontal and vertical survey accuracies are an expression of the local uncertainty of the surveyed entity.

SA Water Quality Level	Conditions	Horizontal Survey Accuracy	Vertical Survey Accuracy	Complies with AS5488 Quality Level
A+	Accurate AHD levels required	±50mm	±20mm	A
A	General standard	±50mm	±50mm	A
B+	Determined from electronic tracing, trenchless guidance instruments. Verified by non-destructive utility exposure and survey.	±200mm	±200mm	B
C	Utilities where no depth or AHD values are surveyed	±300mm	N/A	C

Table 3: SA Water Quality Levels

2.4.2 As-Constructed Survey Quality Level

SA Water accuracy requirements for as-constructed information is **Quality Level A+**.

For the purposes of this specification where a utility is partially exposed due to backfilling or construction by trenchless methods the utility shall be deemed to comply with the applicable quality level in the following circumstances:

- On gravity sewer mains where the maximum distance between points surveyed on the utility is 25 metres and at every change of direction and/or grade.
- On sewer pumping mains and water pipelines where the maximum distance between points surveyed on the utility is 50 metres and at every change of direction and/or grade.

It may be necessary to expose the utility by potholing or other non-destructive methods to be able to survey the utility with these maximum spacings.

2.4.3 Other Survey Type Quality Level

The accuracy requirement for all other surveys submitted to SA Water for Automated Assessment processing is **Quality Level A+**.

Appendix A Recommended Survey Methods

A1 Horizontal Datum

It is recommended that the following methods are used to determine the horizontal datum:

1. Where two or more official survey marks with published MGA co-ordinates to fourth order or better are within 1km of the project, the project survey control shall be adjusted to a minimum of two survey control marks.
2. Where there are no survey control marks with published MGA co-ordinates to fourth order or better within 1km of the project -
 - Use GNSS observations with the datum determined from AUSPOS GPS processing,
 - Use CORS GNSS observations.
3. Where the survey has been undertaken on a ground plane grid with an MGA origin the survey shall be scaled to true MGA prior to submission to SA Water.
4. Where the survey has been undertaken on a local or different datum the survey can be transformed to the horizontal datum using common survey marks suitably spaced across the project area. The common marks can be official survey marks with published MGA co-ordinates to fourth order or better or survey control derived by methods from 1 or 2 above.

A2 Vertical Datum

It is recommended that the following methods are used to determine the vertical datum:

1. Where one or more official survey marks with published AHD values to fourth order or better are within 1km of the project. The survey shall be adjusted to a single survey mark and checked to a second mark. If a second mark is not available within 1km of the project, one of the methods in 2 below shall be used as verification.
2. Where there are no survey control marks with published AHD values to fourth order or better within 1km of the project the AHD height can be derived by:
 - GNSS observations with the Derived AHD value determined from AUSPOS GPS processing,
 - CORS GNSS observations to obtain a Derived AHD value.

Appendix B AS5488 Quality Levels

The AS5488 classification defines various quality levels based on the source of information that is used to determine the position of assets and the positional accuracy of the asset. This Specification applies the positional accuracy principles of AS5488 to both surface features and buried features. The AS5488 quality levels are summarised in Table 4 below.

SA Water Quality Level	Conditions	Horizontal Survey Accuracy	Vertical Survey Accuracy
D	Indicative position of utilities using existing records, cursory site inspection, anecdotal evidence.	N/A	N/A
C	Relative spatial position using existing records and the position of measured surface features to interpolate the location of subsurface utilities.	±300mm	N/A
B	Relative spatial position using existing records, the position of measured surface features and measured subsurface utilities determined by electronic service location or tracing.	±300mm	±500mm
A	Absolute spatial position where the utility is fully or partially exposed and directly surveyed.	±50mm	±50mm

Table 4: AS 5488-2019 Quality Levels