

Department of Climate Change, Energy, the Environment and Water


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# Storage curve guideline

Floodplain harvesting measurement

June 2024



# Acknowledgement of Country

The Department Climate Change, Energy, the Environment and Water acknowledges that it stands on Aboriginal land. We acknowledge the Traditional Custodians of the land and we show our respect for Elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

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# 1 Introduction

The NSW Government is implementing a framework to licence and measure floodplain harvesting to ensure this take occurs within legal, sustainable limits.

An important part of this framework is that floodplain take is measured by accurate, auditable, and tamper-proof metering equipment.

The NSW Government has developed a series of implementation guidelines to assist water users and duly qualified persons (DQPs) in understanding their compliance obligations under this framework and to ensure that the floodplain harvesting water take is consistent with the individual's licensed volumes and legal limits.

A DQP has the prescribed qualifications, skills and experience to carry out certain work relating to metering equipment.

## 2 Purpose of this guideline

Floodplain harvesting measurement rules became law on 1 July 2022, through amendments to the Water Management (General) Regulation 2018 and are being rolled out across the northern Basin valleys with the commencement of each valley's amended water sharing plan.

This guideline will assist landholders, surveyors and engineers to understand default storage curves and provide practical guidance on what is needed to update storage information.

Water taken under a floodplain harvesting access licence must be measured by either storage or point-of-intake metering equipment. This guideline is relevant for the measurement of water take using storage metering equipment.

## 3 Why you need a storage curve

Storage metering equipment includes a local intelligence device (LID) that transmits the water level data to WaterNSW. There, the data is converted to a volume using a storage curve, allowing water take to be calculated.

Storage metering equipment relies on the use of storage curves, which define the depth, volume and surface area relationship for each storage. Storage curves are also known as a staged-storage table or rating curve.

Storage curves are unique for each storage.

## 4 Storage measurement

Storage metering equipment measures the depth of water in a storage. This depth is converted to a volume using the storage curve. A storage curve is represented in tabular form (as shown in Table 1).

Table 1. Water level versus storage volume data

Water level	Surface area	Volume
mAHD	ha	ML
121.0	9.4	203
121.1	9.9	215
121.2	10.4	227
121.3	11.0	238
121.4	11.5	250
121.5	12.0	262
121.6	12.6	274
121.7	13.1	285
121.8	13.7	297
121.9	14.2	309
122.0	14.7	321

## 5 Default storage curves

The NSW Government has developed storage curves for floodplain harvesting storages using Light Detection and Ranging (LiDAR) surveys and aerial photogrammetry, captured between 2008 and 2014.

The accuracy of this data was improved using a three-dimensional Digital Elevation Model (DEM) of the ground surface of each storage. This data was then used to generate a storage curve for each eligible storage.

These storage curves are the default storage curves used for floodplain harvesting measurement.

You will find more information on how the default storage curves have been generated in the [\*Storage Bathymetry Model Update and Application – April 2018\*](#).

## 6 Where storage curve data is held

Storage curve data is held by WaterNSW in the [DQP Portal](#). Default storage curves for all eligible storages have already been uploaded to the DQP Portal. If a landholder does not update their storage curve, the default storage curves will be used for floodplain harvesting measurement calculations.

## 7 Storage curve amendment

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### 7.1 Updating storage curves

The Regulation requires the landholder to ensure that their storage curve in the DQP Portal is accurate (see section 7.2).

Some landholders will have submitted information on their storages (including storage curves) to the department as part of the farm scale validation process. This information has *not* been captured by the default storage curves and those landholders will need to engage a DQP to prepare and submit an updated storage curve with supporting documentation via the DQP Portal in accordance with this guideline.

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## 7.2 Mandatory storage curve update triggers

An amended storage curve must be submitted to the department within 21 days of a water user becoming aware that the existing storage curve is inaccurate by +/-5%.

Works that alter the configuration or capacity of the storage may affect the accuracy of your storage curve, for example, changes to embankment height, earthworks within the storage or configuration changes to the inlet pipe and overflow.

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## 7.3 Recalibration of metering equipment

Amendment of the storage curve data may require the storage meter and secondary measurement system to be revalidated by a DQP, particularly if there are changes to the gauge zero level. A DQP will be able to advise if revalidation is required.

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## 7.4 Qualifications and certification

All fieldwork to generate a volumetric survey of a storage and storage curve should be done by a suitably experienced person, like a registered surveyor.

The final survey plan and storage curve data must be certified (signed off) by a surveyor registered under the *Surveying and Spatial Information Act 2002*, or a corresponding law of another state or territory.

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## 7.5 Aligning storage curve with survey benchmarks

The storage curve survey must be referenced to survey benchmarks at each site. This will ensure the volumetric survey is in the correct coordinate (MGA2020) and level datum (AHD). Primary and secondary measurement devices are also levelled-in to AHD.

If a storage curve survey has been undertaken before the installation of survey benchmarks, the storage curve survey must be checked by the surveyor for accuracy against the survey benchmarks. If they are not aligned, the storage curve survey will need to be updated or renewed by a registered surveyor.

The AHD levels of the storage curve must be accurate and align with the benchmarks so that both the secondary and primary metering devices reconcile with the volumes provided by storage curves.

## 7.5.1 Survey codes

A survey of the storage must be completed with sufficient point density to enable an accurate calculation of volume and surface area.

All surveys must report similarly to survey benchmark codes to ensure consistency. Surveyors must adopt the survey codes listed in Table 2.

Table 2. Survey codes

Point description	Code
<b>Permanent survey mark</b> “xxxxx” = mark number from SCIMS	PMxxxxx, MMxxxxx, MMxxxxx
Temporary benchmark (if needed)	TBMx
Survey benchmark	BM1, BM2, BM3, BMx
Embankment internal crest	EMB_IC
Embankment external crest	EMB_EC
Embankment internal toe	EMB_ITOE
Dam (full supply) top water level	DTOPWL
Dam lowest point (near outlet)	DLP
Existing surface	ES
Change of grade	CG
Borrow pit batter top	BPTOP
Borrow pit batter toe	BPTOE
Structure invert	IL
Dam meter (primary)*	DMETERP
Dam meter (secondary)*	DMETERSx
Water level at the specified date and time (if applicable)	WL1, WL2

*\*If available*

Existing surveys completed before the release of this guideline may use codes that differ from those described above, and these are acceptable for submission.



## 7.5.2 Survey plans

Survey plans must be produced and submitted in PDF format. To ensure consistency, all survey plans must include the following information:

### Layout plan

- storage ID
- storage location
- survey benchmark ID
- north point
- survey method
- ground survey point locations, including level annotation for key infrastructure levels (that is, pipe inverts). No annotation is required for general points
- contours (mAHD, 0.5 m interval)
- location of embankment longitudinal section
- centroid of the storage (latitude and longitude)
- temporary benchmarks (that is, local farm marks).

### Longitudinal section

- embankment longitudinal section profile:
  - chainages at intervals of no more than 100 m
  - design freeboard
  - storage full supply level
  - existing crest levels, showing deviation from average or design crest level
  - design crest level.

The storage curve must show:

- reduced level in mAHD in 10 cm increments from storage base to storage crest level
- storage volume in megalitres (ML)
- storage surface area in Ha.

# 8 Data format for submission

When submitting data for multiple storages, separate files are required for each storage.

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## 8.1 General information and process

To ensure consistency all storage curve data must be reported in a similar format. The following format has been developed (as per Table 1):

- text-based, comma-separated values file: <filename>.CSV
- four columns, in the order of:
  - elevation (mAHD, 0.1 m increments)
  - area (Ha, to accuracy of 0.1 Ha)
  - volume (ML, to accuracy of 1 ML)
  - description of key elevations, such as embankment crest level, full supply level
- two header rows:
  - the first row identifies the column (as above)
  - the second row identifies the unit (mAHD, HA, ML)
- data presented (monotonically) increasingly in mAHD.

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## 8.2 Storage curve naming convention

Storages and storage curves must have consistent naming conventions to allow each to be linked.

The following naming conventions must be adopted: ROI Number\_FPH Activity Number\_OFS Reference.csv (for example: M050\_1\_Storage1.csv).

# 9 Submitting information

A registered surveyor, as defined in section 7.4 must certify all survey work, calculations, and final storage curves.

The following supporting information must be uploaded to the DQP Portal:

- PDF of the certified survey plans
- CSV data file in the required format (refer to section 8 above)
- certification that all survey plans and storage curve data have been prepared or approved by a qualified person.

A DQP can upload storage curves to the DQP Portal on behalf of a landholder.

DQPs will need to email WaterNSW at: [dqp.enquiries@waternsw.com.au](mailto:dqp.enquiries@waternsw.com.au) and provide their DQP details along with the landholder's consent (this could be an email from the landholder approving the work or a signed contract). The email to WaterNSW should contain the following subject line: 'Request floodplain harvesting storage curve upload'. Please include Registration Of Interest (ROI) number or Works Approval number.

It is an offence to provide inaccurate or misleading information.

## For more information on

- how storage curves have been generated, read the [Storage Bathymetry Model Update and Application – April 2018](#)
- floodplain harvesting measurement, visit our website: [water.dpie.nsw.gov.au](http://water.dpie.nsw.gov.au) > Plans and programs > Floodplain management > Floodplain harvesting measurement

## Contact us

- email [dqp.enquiries@waternsw.com.au](mailto:dqp.enquiries@waternsw.com.au) with 'Storage curve request' in the subject
- call 1300 081 047