HEALTHY FLOODPLAINS PROJECT

Floodplain Harvesting Measurement – Storage curves

Guideline

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Contents

Introduction

The NSW Floodplain Harvesting Policy (2018) will licence and limit floodplain harvesting water extractions. The Floodplain Harvesting Measurement Policy (2020) has been released together with implementation guidelines to assist water users and duly qualified persons in understanding their compliance obligations.

This guideline*, Storage Curves,* provides landowners with details on what a storage curve is, the process for deriving one and guidance on what to do to modify one.

Floodplain Harvesting Measurement

The NSW *Floodplain Harvesting Measurement Policy (2020)* sets out the objectives, methods and rules for floodplain harvesting measurement. The policy requires all landholders receiving a floodplain harvesting access licence to measure water extracted or taken through an approved storage meter that monitors the depth of water in storage. The storage meter is connected to a Local Intelligence Device (LID) that transmits the water level data to WaterNSW.

A key element of floodplain harvesting measurement is the use of storage curves, which defines the depth, volume and surface area relationship for each storage. Storage curves are otherwise known as a staged-storage table or rating curve. This guideline will assist landholders, surveyors and engineers to understand the default storage curves and provide guidance on what is needed to update storage information.

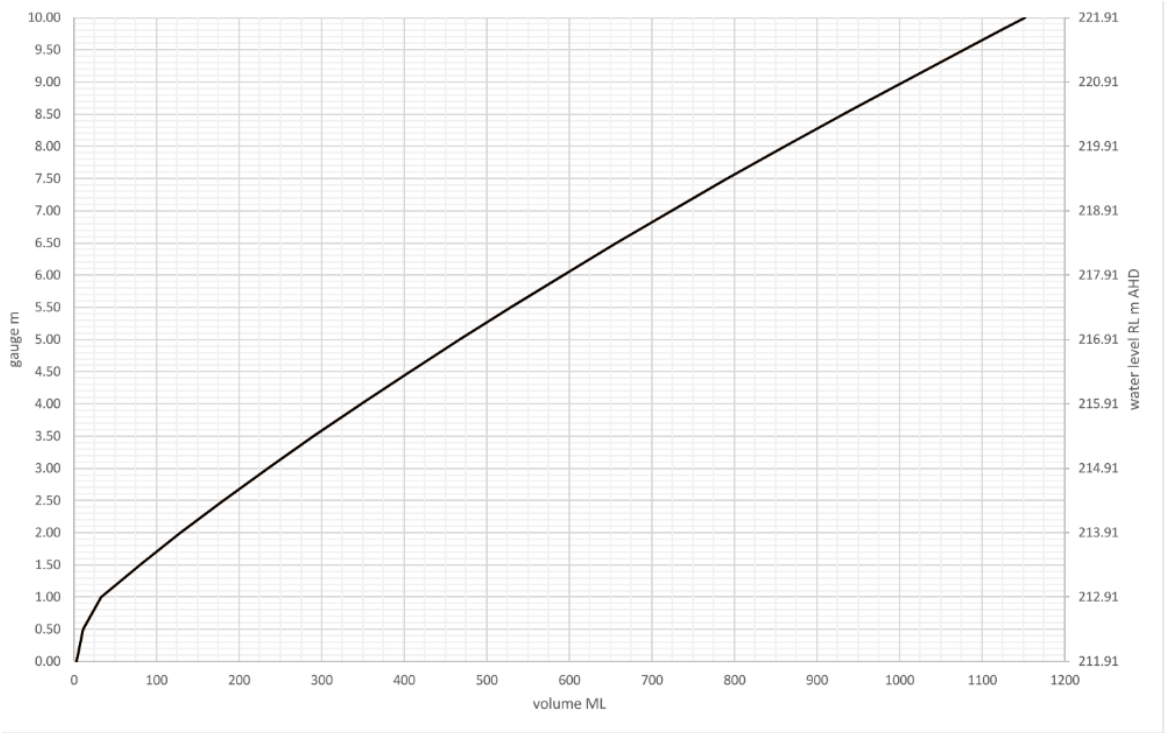
Storage measurement

Measurement by continuous water level change in a storage is the default method adopted in the *Floodplain Harvesting Measurement Policy (2020)*. The method uses a storage meter (sometimes referred to as a sensor), which measures the depth of water in a storage. The depth of water in the storage has a direct relationship to the volume of water.

A storage curve allows for a direct conversion of water depth to a storage volume (usually in megalitres). Storage curves are calculated using specialist software. Each storage curve is unique to the individual on-farm storage.

A storage curve can be represented graphically or in tabular form as shown in **Figure 1**.

Figure 1. Example storage curves



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
122.1	15.3	332
122.2	15.8	344
122.3	16.4	356
122.4	16.9	367
122.5	17.4	379
122.6	18.0	391
122.7	18.5	403
122.8	19.1	414
122.9	19.6	426

Default storage curves

The NSW government has developed storage curves for eligible floodplain harvesting storages primarily using survey data collected using LiDAR (Light Detection and Ranging) surveys and aerial photogrammetry.

A three-dimensional Digital Elevation Model (DEM) of the ground surface of a storage was created from the survey data. This data was then used to create the relationship between the depth of the storage, its volume and surface area.

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

Storage curve amendment

Voluntary update of storage curves

If a landholder has more accurate storage information than the default storage curve, an updated storage curve with supporting documentation may be submitted via the DQP Portal in accordance with this guideline.

Mandatory storage curve update triggers

An amended storage curve must be submitted within 28 days, in accordance with this guideline if the landholder becomes aware or reasonably ought to have been aware that:

- the storage capacity has increased or decreased by more than 5%
- there are changes to the storage geometry (ie changes to embankment height or earthworks within the storage) or storage parameters (ie inlet pipe, overflow) or other factors that could have a material effect on the accuracy of the storage curve.

Recalibration of metering equipment

Amendment of the storage curve data *may* require the storage meter and redundancy measurement system to be recalibrated by a DQP, particularly if there are changes to the gauge zero level.

Qualifications and certification

To perform this type of work, personnel and firms should be experienced in land surveying or civil engineering. All field work should be undertaken by a suitably experienced person.

The final survey plan and storage curve data must be certified (signed off) by one following people:

- A Registered Surveyor as recognised by the NSW Board of Surveying and Spatial Information (BOSSI)
- A Registered Engineer as recognised by Engineers Australia,
- Another person or class of persons approved by the Minister

Volumetric survey

A volumetric survey of the storage must be undertaken, with sufficient point density to enable an accurate calculation of volume and surface area, to update a storage curve.

The survey is to be referenced to the survey benchmarks at each site. This will ensure the volumetric survey is in the correct coordinate (GDA20) and level datum (AHD).

If a volumetric survey has been undertaken prior to the installation of the on-farm survey benchmarks, the survey must be referenced to the survey benchmarks. This must be done by an experienced person as defined in section 0.

Survey codes

All surveys must report in a similar manner to ensure consistency. The following survey codes have been developed and surveyors must adopt the survey codes listed in **Table 1**.

Table 1 - Survey codes

Point description	Code
Benchmark	BM1, BM2, BM3
Temporary benchmark (if needed)	TBM1
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 gauge meter (optional)	DMETER

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

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 i.e. pipe inverts. No annotation is required for general points)
- Contours (mAHD, 0.5m interval)
- Location of embankment longitudinal section
- Centroid of the storage (latitude and longitude)
- Temporary benchmarks (i.e. local farm marks).

Longitudinal section

- Embankment longitudinal section profile
    - Maximum 100m intervals
    - Existing crest levels (showing deviation from average or design crest level)
    - Full supply level
    - Design freeboard.

Data format for submission

Data submitted must be unique to one storage only. Data for multiple storages must not be combined into a single data file.

Storage curve format

All storage curve data must report in a similar format to ensure consistency. The following format has been developed (as per **Figure 1**):

- Text-based, comma-separated values file – *<filename>.*CSV
- Four columns, in the order of:
    - Elevation (mAHD, 0.1m increments)
    - Area (ha, to accuracy of 0.1ha)
    - Volume (ML, to accuracy of 1ML)
    - Description of key elevations, i.e. embankment crest level, full supply level, etc.
- Two header rows
    - The first row identifying the column (as per above)
    - The second row identifying the unit (mAHD, Ha, ML)
- Data presented (monotonically) increasingly in mAHD.

Survey data format

All storage survey data must report in a similar format to ensure consistency. The following format has been developed:

- Text-based data table *<filename>.*CSV
- Seven columns, in the order of:
    - Point number (1 to *n*)
    - Point code
    - Easting (m)
    - Northing (m)
    - Elevation (mAHD)
    - Map Grid of Australia (MGA) zone
    - Point annotation / attribute notes (if any).
- One header row identifying the column (as per above).Naming conventions

It is important that storages and storage curves have consistent naming conventions to allow each to be linked. The following naming conventions must adopt.

Storage curves

Catchment name abbreviation and sequential number_FPH Activity Number_OFS Reference.csv

Example:

BD003_1_StorageA.csv

(BD = Barwon Darling catchment)

Note: Spaces are not permitted.

Storages

ROI Number_FPH Activity Number_OFS Reference

Example:

- M050_1_Storage1
- M050_2_SurgeArea

Note: Spaces are not permitted.

Submitting information

A qualified person, as defined in section 0, must certify all survey work, calculations and final storage curves.

A DQP or qualified person, as defined in section 0, must update of the new storage curve in the DQP Portal (https://dqp.waternsw.com.au/) with the following supporting information.

1. **PDF** of the certified survey plans and data table (refer Section 0)
2. **CSV data file** in the required format (refer Section 0)
3. **Certification** that all survey plans and storage curves data has been prepared or approved by a qualified person.

A DQP or qualified person, as defined in section 5.2, must upload the revised storage curve files and certification documentation to the DQP Portal. It is an offence to provide inaccurate or misleading information.