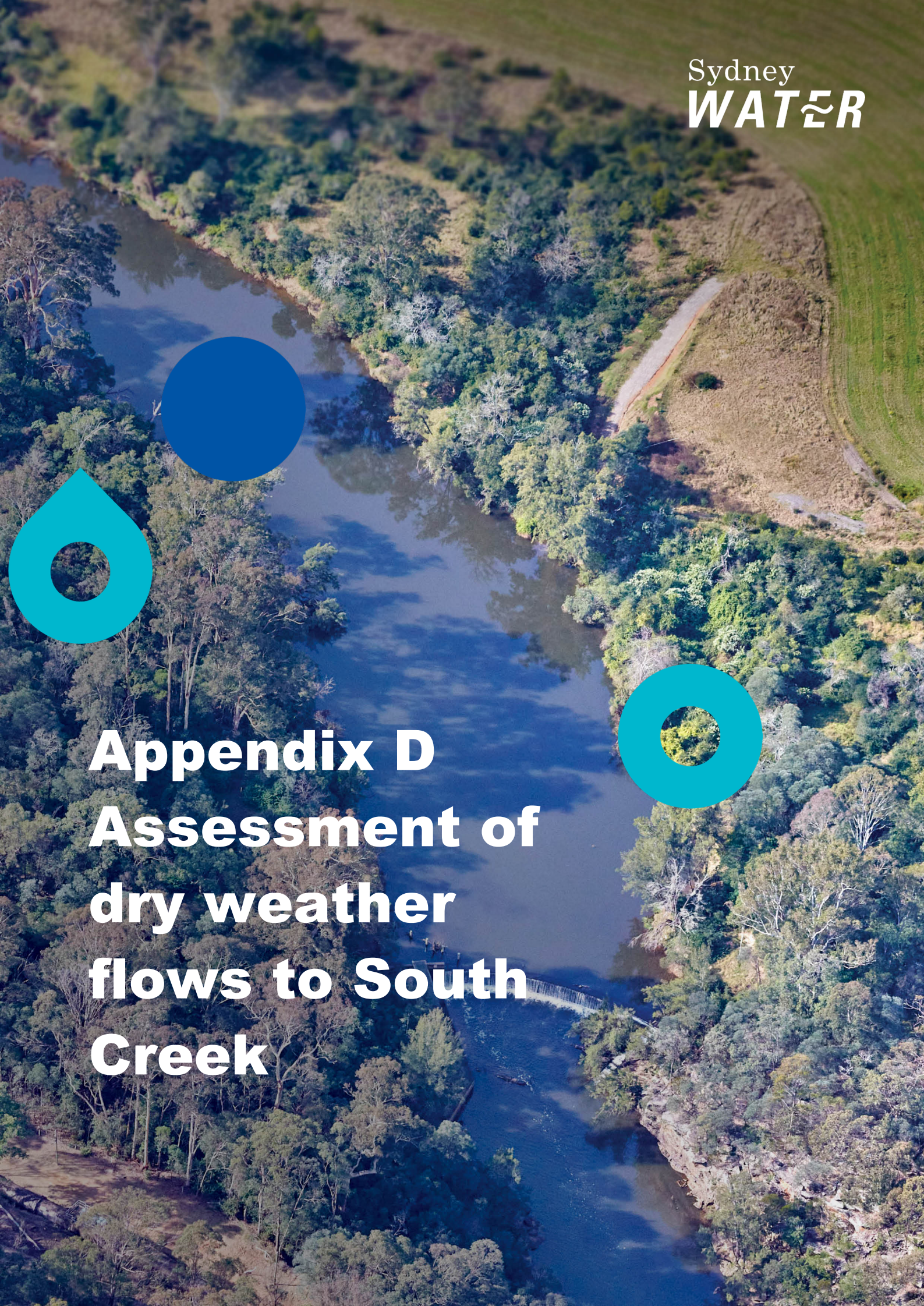

Sydney WATER

Appendix D Assessment of dry weather flows to South Creek

Appendix D – Assessment of dry weather flows to South Creek

This appendix summarises Sydney Water's reasoning for not proceeding with treated water flows to South Creek during dry weather.

Relevant objectives

The NSW Government, through DPIE EES has developed waterway health objectives for South Creek. DPIE EES has consulted across relevant state and local government organisations in developing these objectives, which are summarised in Table 1. Although the objectives were initially developed for WSAGA, Sydney Water understands from consulting with DPIE that they intend to apply them to the whole South Creek catchment and to point sources and distributed flows.

DPIE EES is currently preparing guidance material on how to incorporate the numerical criteria into Water Sensitive Urban Design (WSUD) or other works. Finalised guidance material will ultimately define the way that new development may discharge to the local waterways. Given the high quality of treated water produced by the AWRC, flow volumes are likely to be the limiting factor in any treated water releases so our assessment focuses on these.

The first metrics in Table 1 describe streamflow as an average daily volume. Given the variation in flow across a year, the metric can be expressed at an annual time step rather than a daily time step. From here the daily average flow metric is expressed as the Mean Annual Runoff Volume (MARV). This is the total volume of streamflow contributed to a waterway across a year.

When a rural area is made impervious by roads, pavements and roofs, there is an increase in the MARV from 0.9 ML/Ha/yr to 6.5 ML/Ha/yr which is significantly more than the flow objective of 2.0ML/Ha/yr. This requires interventions to limit the volume of runoff reaching waterways by either capping development or using Water Sensitive Urban Design (WSUD) approaches such as rainwater and stormwater harvesting and measures to retain stormwater in the landscape.

By applying the mean daily or average flow volume objective, the combined volume of distributed and point source streamflow can be no higher than 2.0 ML/Ha/yr, which effectively doubles the current annual streamflow volume.

Table 1 Waterway health (flow) objectives established by DPIE for Western Sydney Planning Partnership Office

Flow metric	Current (baseline hydrology) Objective for first and second order waterways	Tipping point (upper limit of changed hydrology before waterway health decline occurs) Objective for third order waterways and greater
Median daily flow volume (L/ha)	71.8 ± 22.0	1095.0 ± 157.3
Mean daily flow volume (L/ha)	2351.1 ± 604.6	5542.2 ± 320.9
Mean annual runoff volume (ML/ha/year)	0.9ML/ha/year	2.0ML/ha/year
High spell (L/ha) ≥ 90th percentile daily flow volume	2048.4 ± 739.2	10,091.7 ± 769.7
High spell – frequency (number/year)	6.9 ± 0.4	19.2 ± 1.0
High spell – average duration (days/year)	6.1 ± 0.4	2.2 ± 0.2
Freshes (L/ha) ≥75th and ≤ 90th percentile daily flow volume	327.1 to 2048.4	2642.9 to 10091.7
Freshes – frequency (number/year)	4.0 ± 0.9	24.6 ± 0.7
Freshes – average duration (days/year)	38.2 ± 5.8	2.5 ± 0.1
Cease to flow (proportion of time/year)	0.34 ± 0.04	0.03 ± 0.007

Water balance modelling

Water balance modelling using MUSIC software has demonstrated the effectiveness of various WSUD measures in achieving the proposed MARV target in Table 1. The other metrics in the table, while equally important, can generally be achieved through standard WSUD detention approaches.

The modelling shows that the 2.0ML/ha/year target is achievable in industrial and commercial land in the catchment using a combination of measures such as internal rainwater use, bioretention, reduced impervious services, irrigation using rainwater, passive irrigation of street trees, wetlands and stormwater harvesting.

To understand whether there is capacity for the waterways to receive treated water from the AWRC, it is important to understand the MARV contribution from future urban zones as well as those areas which will remain undeveloped due to flood constraints, retained vegetation or public open space. Similarly, it is important to understand the contribution of stormwater from development that has taken the business-as-usual approach and achieves only a modest reduction in stormwater.

In doing this analysis, Sydney Water has characterised land in the South Creek catchment into four land use types as shown in Table 2.

Table 2 South Creek catchment land use types

Land use type	Description	MARV assumption (ML/ha/year)
Undeveloped lands	Any lands that are retained in an undeveloped condition (such as floodplains, remnant native vegetation) or as urban and regional parks. The floodplain is assumed to comprise 15% to 20% of the catchment based on review of regional flood mapping. Any lands that are not developed and are still zoned rural are also assumed to contribute this volume into the future.	0.6-0.9

Land use type	Description	MARV assumption (ML/ha/year)
Existing residential development – business as usual approach	Except for the Western Sydney Airport, existing development in the upper catchment is predominantly low density residential with some medium density, town centres and special infrastructure (for example Oran Park, Austral, North Leppington, Catherine Fields). Under current stormwater management approaches, the dominant method of managing stormwater from existing development in the upper catchment is via a combination of: rainwater tanks on residential development to achieve BASIX legislation GPT and biofiltration to achieve pollution reduction targets. This approach has only focussed on pollutant load reductions. While the approach is often claimed to match baseline hydrologic conditions, model performance demonstrates that residual flow conditions from rainwater tanks and biofiltration does not match baseline conditions or achieve the waterway health objectives. In very few cases constructed stormwater wetlands are also included but not in numbers to affect the stream flow volumes. Similarly, some development includes filtration cartridges which do less for achieving stormwater management objectives.	4.2
Future WSAGA and GPEC rezoning – parkland approach	Within these precincts, the new development control plans for the Mamre Road and the WSAGA precincts adopt the waterway health objectives as targets for stormwater management.	2.0

Land use type	Description	MARV assumption (ML/ha/year)
Areas where rezoning underway	For a significant piece of land in the SWGA between the existing released precincts and the WSAGA, rezoning remains uncertain. For this land, some rezoning is known to have occurred or is underway (for example, Lowes Creek) but the extent to which that land will apply the new WQOs is unknown. Given the rezoning status is unclear, Sydney Water has made assumptions as described in the next column.	4.2 (where land is rezoned or rezoning is underway – assumed to be two thirds of the area covered by remaining precincts in the SWGA) 2.0 (where land is not yet rezoned and subject to new stormwater management targets – assumed to be one third of the area covered by remaining precincts in the SWGA).

The opportunity to set aside lands for stormwater management is only during rezoning. As such, it is unlikely that lands that are already rezoned or rezoning is underway would be able to put aside the lands for stormwater management.

Adopting stormwater contributions from existing development (4.2 ML/Ha/yr), flood prone land (0.9 ML/Ha/yr), public open space (0.9 ML/Ha/yr) and new parkland development typologies with reduced imperviousness (2.0 ML/Ha/yr) provides a basis for determining when the stormwater discharge from the developing catchment would exceed the tipping point for waterway health as defined by the new numerical flow criteria for South Creek.

Sydney Water has completed water balance modelling that shows there is capacity for dry weather releases to South Creek from the AWRC while the catchment is not contributing more than 2.0 ML/Ha/yr of stream flow. However, this would only be for a short period until 40-50% of developable land within the catchment is built upon in the WSAGA and SWGA and up to a maximum of about 5 ML/day at ultimate development of these growth areas.

For these reasons, the project will require a release location for dry weather flows outside of the South Creek catchment. Given this and the uncertainty around growth forecasts and development rates, Sydney Water has decided not to progress an option for dry weather releases to South Creek.