ECOLOGY
ENGINEERING
DESIGN

E2DESIGNLAB

Sunbury South PSP and 35-60 Fox Hollow Drive, Sunbury

# STORMWATER MANAGEMENT EVIDENCE STATEMENT

Prepared by Gary Walsh

August 2017

# CONTENTS

# 1. Preliminary Information

-

## 1.1 Name and Address

Gary Walsh, Civil Engineer.
E2Designlab. Suite 904, Carlow House, Flinders Lane, Melbourne 3000

## 1.2 Education and Experience

My educational and professional qualifications are as follows:

- Bachelor of Engineering (Civil) (hons), 1987, Swinburne Institute of Technology

My professional experience includes 30 years' experience as a Civil Engineer, comprising:

- 6 years, Director, Water Sensitive Urban Design Specialist, E2Designlab
- 5 years, Associate Director, Ecological Engineering EDAW/AECOM
- 5 years, Civil Engineer, Ecological Engineering P/L
- 10 years, Waterways & Drainage Investigations Engineer & Operations Manager Melbourne Water
- 4 years, Construction and Operations Engineer, Dandenong Valley Authority

## 1.3 Area of Expertise

I have been involved in the land development and civil infrastructure projects for thirteen (13) years and spent most of that time practising in the field of Civil Engineering and specialising in the design and delivery of rural, urban, residential and industrial roads, drainage, sewer and water main infrastructure in Australia.

## 1.4 Expertise to Make the Report

Thirty years of practice have positioned me amongst industry leaders in stormwater management, water sensitive urban design (WSUD) and integrated water management (IWM). My experience in developing infrastructure planning strategy and policy is supported by specialist design and technical analysis skills underpinned by a background in construction, maintenance, project

management and public liaison.

I have been involved in many landmark WSUD initiatives and guidelines. These include the 'ABM' stormwater project (which subsequently supported stormwater management requirements for residential subdivision in Clause 56.07 of the VPP's), Melbourne Water's Constructed Wetland Guidelines and stormwater quality offset mechanism, City of Hume's stormwater code of practice for industrial development and various landmark IWM strategies. I contribute to the discourse shaping WSUD's response to managing the detrimental hydrologic impact of urbanisation on stream health. My portfolio includes a series of larger-scale urban stormwater harvesting schemes, the incorporation of WSUD into around twenty five residential developments and numerous municipal WSUD retrofits.

I am a founding director of E2DESIGNLAB, and was a core team member of its predecessor, Ecological Engineering. I have published four papers on Water Sensitive Urban Design. I have prepared and presented evidence relating to stormwater management at Planning Panel on two occasions and prepared material relating to stormwater management for VCAT proceedings on two occasions.

## 1.5 Instructions

I was instructed by Asia-Pacific Property Group Pty Ltd to prepare an evidence statement presenting my opinion on stormwater management initiatives proposed in the Sunbury South PSP.

## 1.6 Report Preparation

In the preparation of this statement I have:

- Reviewed the current Melbourne Water Developer Services Scheme and drainage strategy concept plans
- Undertaken a site inspection

## 1.7 Identity of Other Persons Relied upon in this Report

I was assisted in the preparation of this report by colleagues with E2Designlab including a freshwater ecologist specialising in urban hydrology acting under my express instructions. The opinions in this report, however, remain my own.

## 1.8 Summary of Opinions

My opinions in relation to this matter are attached.

## 1.9 Provisional Opinions Not Fully Researched

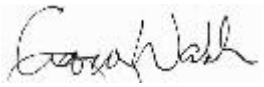
To the best of my knowledge all matters on which I have made comment in this statement have been appropriately researched or are based on my knowledge and experience. The statement does not contain any provisional opinions that have not been appropriately researched.

## 1.10 Matters Outside of My Expertise

To the best of my knowledge, none of the matters on which I have made comment in this statement are outside my area of expertise. To the best of my knowledge the report is complete and does not contain matters which are inaccurate.

## 1.11 Practice Note Declaration

I have made all the enquiries that I believe are desirable and appropriate and that no matters of significance that I regard as relevant have, to my knowledge been withheld from the Panel. I have read the Guide to Evidence and agree to be bound by it.

Signature: 

Date: 14Th August 2017

# 2. Introduction

I have undertaken a review of the exhibited PSP primarily with respect to stormwater management elements described in the Melbourne Water Developer Services Schemes (DSS) that affect the Subject Site. The Subject Site (illustrated in Figure 1) comprises 77.11 hectares of land on eight (8) individual titles:

95 Watsons Rd – Lot 5 PS404987;
35 Fox Hollow Drive – Lot 18 PS617530;
37 – 43 Fox Hollow Drive – Lot 17 PS617530;
45 Fox Hollow Drive – Lot 6 PS404987;
50 Fox Hollow Drive – Lot 14 PS404987;
55 Fox Hollow Drive – Lot S6 PS404987;
60 Fox Hollow Drive – Lot 13PS404987;
65 Fox Hollow Drive – Lot 12 PS404987.

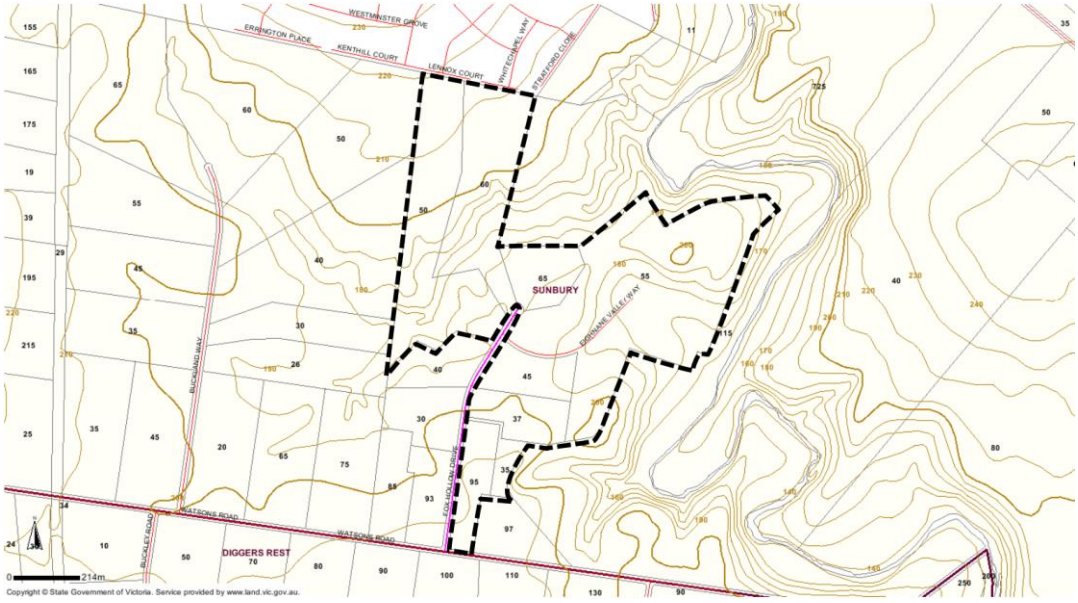



Figure 1. Subject Site (source LandVic)

Figure 2 shows that Melbourne Water's Fox Hollow Drive and Redstone Hill West DSS's apply to the site and that proposed stormwater management assets WL-25, WL-26 and WL-27 are located on the site.

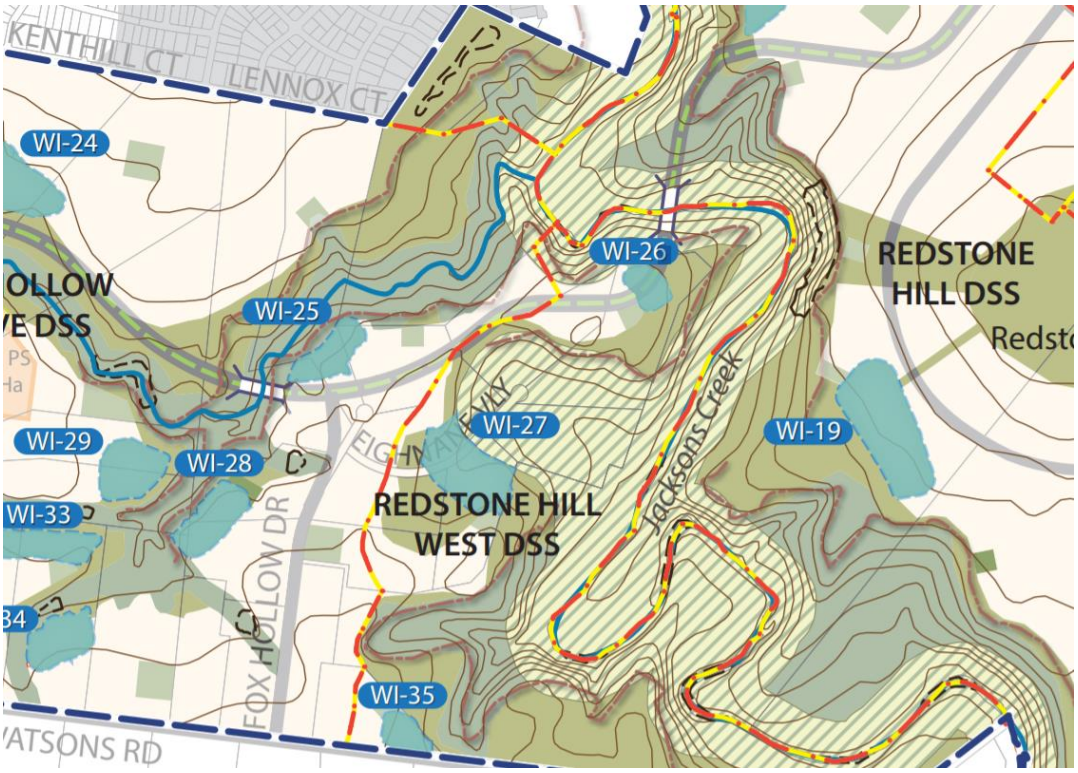



Figure 2. Plan 11 from the Sunbury South PSP showing the location of stormwater management assets and reserves

I have worked within a multidisciplinary team of consultants engaged by Asia-Pacific Property Group Pty Ltd (the development consultant team) to assemble a development layout and stormwater management concept for the catchment associated with the stormwater management asset designated **WL-27**. This concept differs from the development extent and layout of stormwater management assets described in exhibited PSP material and in Melbourne Water's corresponding DSS. The most significant distinguishing difference is that a stormwater treatment wetland located outside of a conservation area in the exhibited PSP has been relocated to within that conservation area in the concept prepared by the development consultants team. The relocated stormwater treatment wetland places it upstream of proposed Growling Grass Frog (GGF) habitat wetlands also within the conservation zone: Within this evidence statement I refer to these two concepts as the *Exhibited Scenario* and the *Co-location Scenario* respectively.

My evidence to the panel involves a comparison of the merits of these two scenarios. My evidence is informed by knowledge of the design and operational management of stormwater treatment wetlands and other waterbodies subject to urban hydrology. Since the design and management of the proposed treatment and habit wetlands and interlinked with civil design and urban

hydrology my evidence references evidence statements prepared by Andrew Matheson and Aaron Organ.

My evidence also considers the adequacy of two other stormwater management reserves shown in the exhibited PSP material and located within the subject site. These reserves are associated with stormwater management assets designated **WL-26** and **WL-25** in the exhibited material.

This Statement has been structured in a manner that responds to the above items as follows:

| **Section** | **Issue/s Considered** |
|---|---|
| Section 4. | Comparison of Exhibited and Co-location Scenarios for stormwater management at WL-27 |
| Section 5. | Discussion of adequacy of exhibited PSP material for assets WL-26 and WL-25 |

# 3. Definitions

| | |
|---|---|
| **VPA** | Victorian Planning Authority |
| **PSP** | Sunbury South Precinct Structure Plan |
| **MW** | Melbourne Water Corporation |
| **DSS** | Developer Services Scheme |
| **WSUD** | Water Sensitive Urban Design |
| **DELWP** | Department of Environment, Land, Water and Planning |
| **GGF** | Growling Grass Frog |
| **VPP** | Victorian Planning Provisions |

# 4. Comparison of Exhibited and Co-location Scenarios for asset WL-27

## 4.1 Description of designs for the two scenarios and design method

Critical design aspects that determine size, layout, general configuration and overall site area have been determined by the development consultant team for the two scenarios. These critical design aspects have been undertaken in accordance with MW's Constructed Wetland Design Guidelines (wetland

guidelines) and provide the level of confidence required for functional design approvals. The design methods include:

- MUSIC modelling to determine the size of treatment wetland required to achieve 'Best Practice' pollutant reduction targets specified in Clause 56.07-4 of VPP
- Compliance with various requirements in the guidelines that determine shape and overall footprint (eg: length to width ratios, sediment drying areas, access tracks, buffers to adjacent development, permissible approach batter slopes adjacent to the wetland, wetland cross sections compliant with maximum flow velocity criteria).
- Assembly of three-dimensional civil works models of the treatment wetlands and surrounds and of GGF habit wetland areas as indicated in figures 3 and 4.

This collaborative design process by the development consultant team has allowed site areas to be designated for the treatment wetlands (including all extent of works and required buffer distances). It also allows the extent of works to be designated for the proposed new GGF habitat wetland. Figure 5 is an extract of the functional design plan prepared by Andrew Matheson derived from this design process.

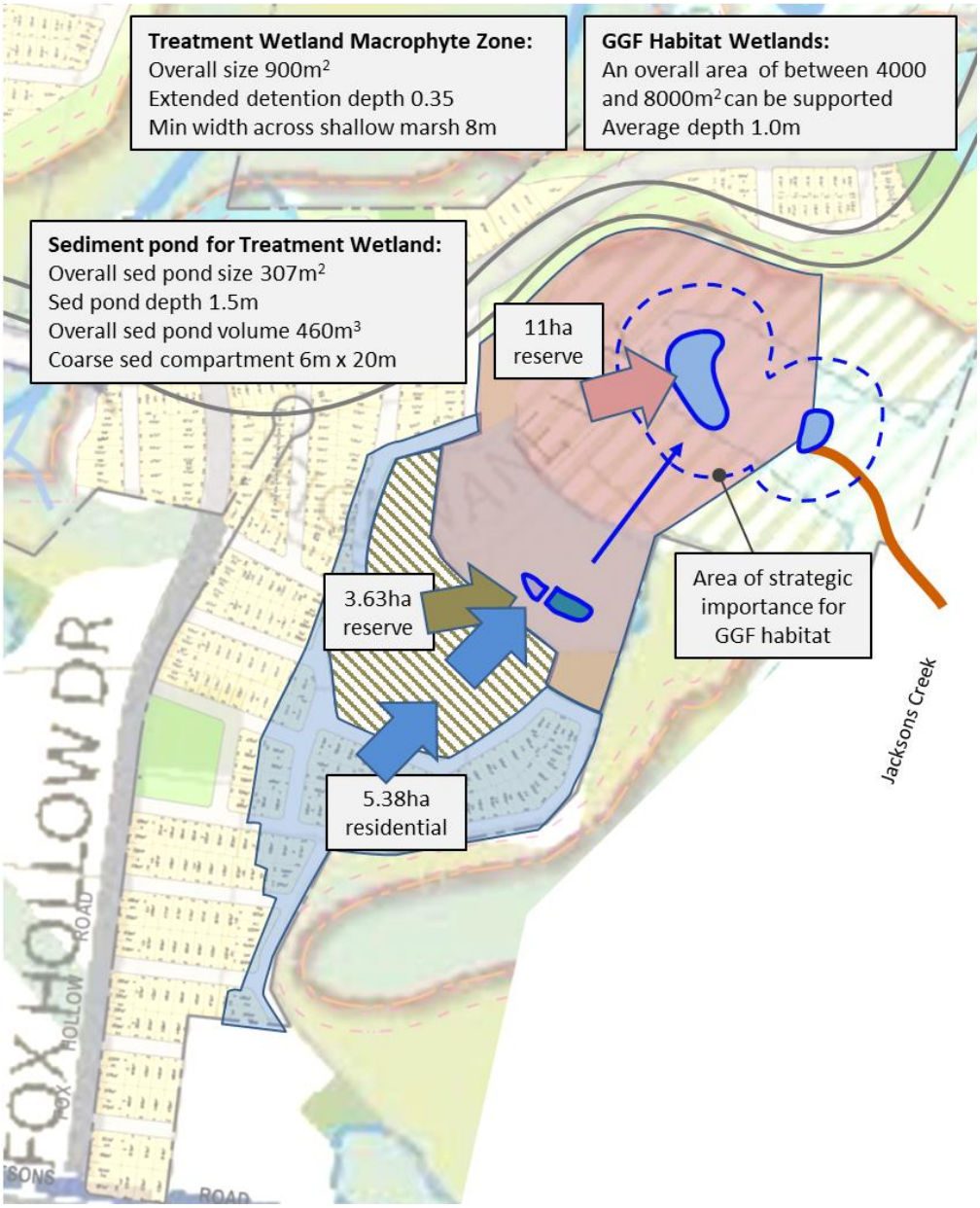



Figure 3. General configuration of Exhibited PSP Scenario for asset WL-27

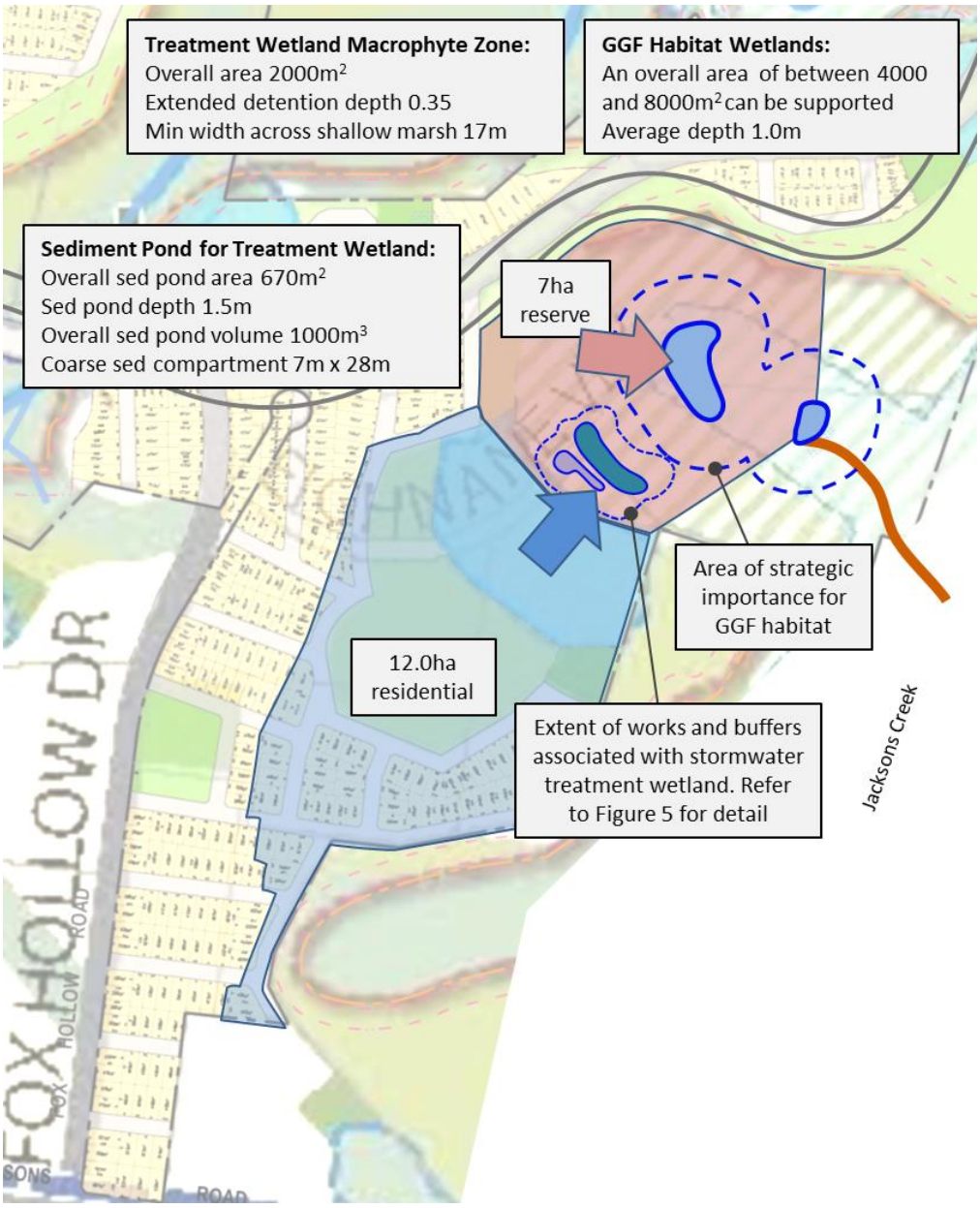



Figure 4. General configuration of Co-location Scenario for asset WL-27

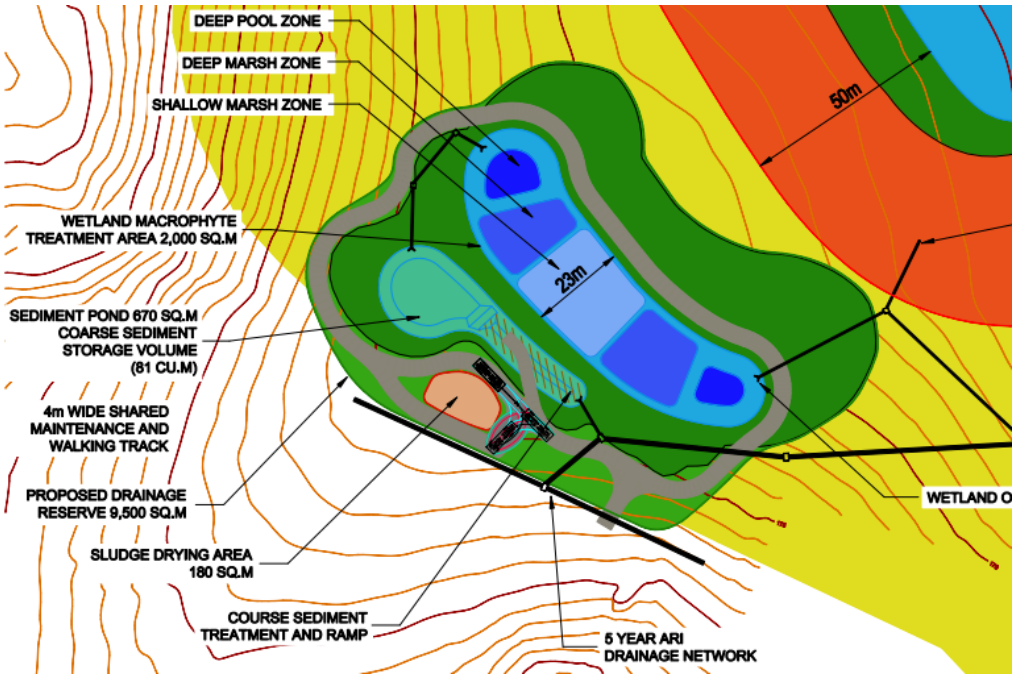



Figure 5. Extract of functional design drawing prepared by Andrew Matheson for asset WL-27 within Co-location Scenario.

## 4.2 Comparison of merits of the two scenarios

The investigation, design and negotiation process undertaken by the development consultants team has considered the relative merits of the 'Exhibited PSP' and 'Co-location' scenarios on an ongoing basis. Before assembling this evidence statement, I have agreed on a list of merits that will be discussed collectively across the evidence presented by Andrew Matheson, Aaron Organ and myself. The evidence statement that primarily addresses each merit is shown in table 1.

Table 1.

| | Merit | Evidence Statement |
|---|---|---|
| A | Minimal area disturbed by works (compatibility with terrain) | AM |
| B | Developable area | AM |
| C | Influence of catchment hydrology on GGF wetlands | GW |
| D | Extent and area of reserves | AM |

| | | |
|---|---|---|
| E | Management complexity | GW |
| F | Potential benefit of treatment wetlands for GGF foraging | BG |
| G | Influence on terrestrial vegetation (native and weeds) | BG |
| H | Impact on approvals process | BG |

I understand and have contributed to the discussion of the merits being presented in the evidence of Andrew Matheson and Aaron Organ.

### 4.2.1 Influence of catchment hydrology on the proposed GGF habitat wetlands

The investigation sought to identify whether the 'Exhibited PSP' and 'Co-location' scenarios would provide favourable hydrology for the resilience and diversity of aquatic vegetation and sustenance of appropriate water surface areas for the GGF habitat wetlands. It also sought to confirm whether the GGF wetland sizes being discussed with DELWP were optimal and whether these could be expanded in the future.

#### Method

MUSIC software was used to create water balance models to report the water level behaviour for a broad range of configurations and conditions. A sensitivity analysis approach was used to identify conditions that would be problematic for the habitat wetlands. Modelling and model parameters were informed by MW's MUSIC guidelines; this includes rainfall and evaporation data for a 10-year period provided by MW.

#### Analysis and Results

Figures 6 and 7 illustrate water level behaviour in the GGF habitat wetlands. They show the percentage of time that various water levels are expected to be experienced

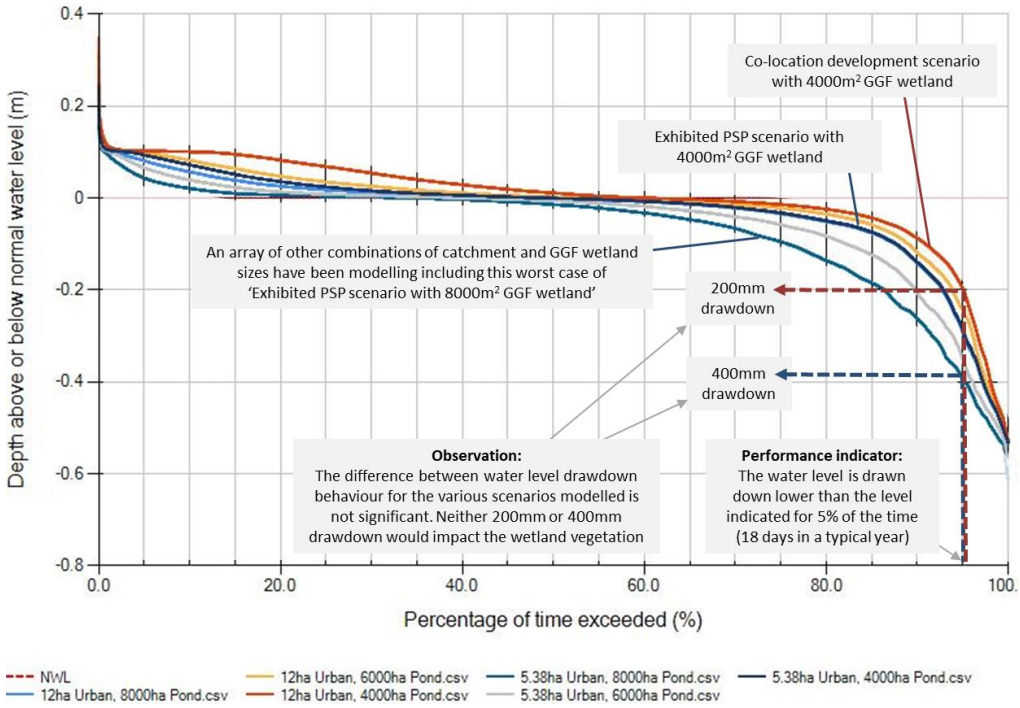



Figure 6. Comparison of water level behavior in variously sized GGF habitat wetlands subject to various upstream catchment and WSUD configurations

The plots in figure 6 show that the difference between water level drawdown behaviour for the various scenarios modelled were not significant enough to impact aquatic vegetation fringing the wetland. I have been assisted by an aquatic ecologist with industry leading experience in wetland vegetation in this observation. It should be noted that these outcomes are based on a wetland that has no effective exfiltration losses; this assumes a well compacted heavy clay base protected by topsoil.

I understand a 4000m2 habitat wetland is currently desired by DELWP;

*my observation is that a well-constructed 4000m2 wetland would be* ***adequately supported by either the 'Exhibited PSP' or 'Co-located'*** *scenarios and that an increase of wetland area up to 8000m2 would also be adequately supported by either scenario.*

The sensitivity of a 4000m2 habitat wetland was then tested against changes in exfiltration rates. The analysis showed that acceptable water level behaviour was quite sensitive to this factor and that the maximum tolerable exfiltration rate was 0.36mm/hr under certain conditions. It should be noted that medium clays, poorly compacted clays or a moderate leak would not comply with the 0.36mm/hr maximum rate.

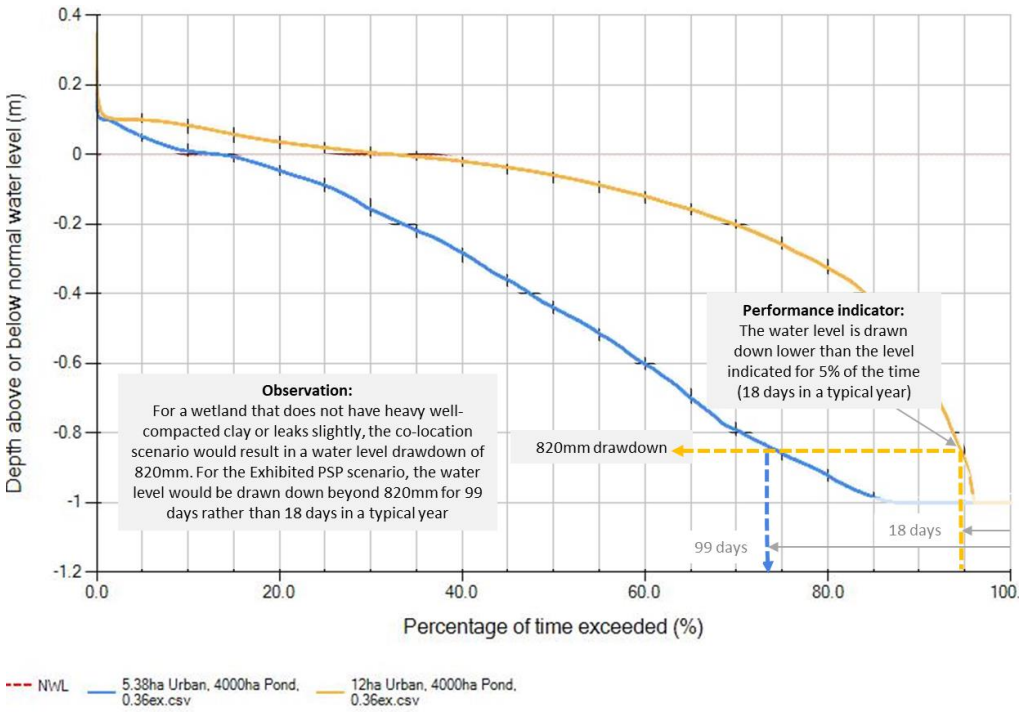



Figure 7. Comparison of water level behavior between 'Exhibited PSP' and 'Co-location' scenarios for a 4000m2 habitat wetland with 0.36mm/hr exfiltration.

Figure 7 demonstrates that the Co-location scenario has significantly advantage over the 'Exhibited PSP' scenario if exfiltration in the habitat wetland isn't optimal.

Another observation based on my analysis is that designing a significant section of wetland area with depth greater than 1.5 metres would provide a refuge if excessive exfiltration/leakage was to occur. I anticipate that features such as this will be incorporated into the bathymetry of the wetland during the design process; which will address the many other advantageous conditions for GGF habitat beyond the influence of water level behaviour that I have considered.

### 4.2.2 Management efficiency

#### Responsibilities and tasks

My opinion in these matters is based on the following understanding of management responsibilities:

- MW will have requirements that determine the design of the treatment

wetland but that Council is likely to be the asset owner and operator.

- DELWP will be responsible for the design of the GGF habitat wetlands and will likely be the asset owner.
- The ongoing monitoring operation and maintenance of the GGF habitat wetlands might optionally be undertaken by various agencies and that MW has been mentioned as having the necessary capabilities.

My observation at that:

- Decisions determining physical configurations, need to accommodate these somewhat undetermined management responsibilities.
- Management tasks for the treatment and GGF habitat wetlands are similar
- The GGF habitat wetlands depend on the treatment wetlands being functional and the management of both wetlands are linked.

My opinion is that although these things can be achieved without the two wetlands being in close proximity, the Co-location scenario would allow maintenance and operational tasks to be marginally more efficient; and may also remind the managers to think of them as a linked system. The following is an example desirable operation phase analysis that are more likely to occur if the wetlands are close to each other: 'are the habitat wetland water levels unusually low? - if so, are the inflow diversion arrangement set correctly? or have the treatment wetlands been taken off-line?.

*My opinion is that the involvement of multiple agencies is a potential barrier to good integrated system analysis and co-location will help to mitigate this risk.*

**Less disturbance**

The treatment wetlands and the stormwater connections to Jackson Creek are likely to be constructed before the habitat wetlands. The Co-location scenario will provide all weather access to the conservation area. This will mean the later construction of the habitat wetlands will be less disruptive than otherwise.

**Cost savings**

- The standard of access required for the treatment wetlands means this capital cost is reduced for construction of the habitat wetlands if the Co-location scenario is adopted.
- Regardless of how management responsibilities are spread across agencies, the smaller overall areas of reserves in the Co-location scenario means less overall operation costs for the community.

# 5. Adequacy of Exhibited PSP material for assets WL-26 and WL-25

## 5.1 Influences on the configuration and overall reserve footprint for WL-26

The feasibility of Asset WL-26 is subject to the significant cost of an outfall down the escarpment to the tributary to serve a very small catchment. Ultimately, the development team will verify the economic feasibility of developing its small upstream catchment.

Another issue for this small catchment is that wetlands of this size are inefficient in terms of the required footprint of the reserve (because of buffers, access etc); this creates a lot more reserve for council to manage. My experience of WSUD in Sunbury's climate conditions is that constructed wetlands are generally more resilient than bio-retention systems at a scale typically associated with DSS assets; the primary issues being vegetation health and blockage of the filter media surface. Plant health requires the retention of adequate soil moisture during long dry spells; which is also influenced by adequate spreading of inflows. I have previously been involved in a project commissioned by Melbourne Water to research and advise them on the suitability and recommended adaptions for bio-retention in these climates.  My opinion is that in this instance, a bioretention system including a saturated anoxic zone (SAZ) is a viable alternative to a wetland. The relatively small scale of this catchment reduces the challenge of spreading inflows and a A SAX provides a reservoir of water beneath the bio-retention filter media which can provide moisture to the plants either directly via deep roots or via

capillary rise into the filter media. Reducing the risk of blockage of the filter media can be managed at any scale when carefully considered, but is more straightforward in small catchment such as this.

## 5.2 Influences on the configuration and overall reserve footprint for WL-25

Regardless of my opinion of the viability of bioretention for WL-26, its configuration of Asset WL-26 will need to be negotiated and agreed with Council (as the future asset owner). Beyond preliminary engineering feasibility investigations undertaken by Taylors, the combination of these issues leaves some residual uncertainty in the feasibility of WL-26.

One possible response to improving the feasibility of developing the catchment of WL-26 is to arrange earthworks and drainage so that it predominately drains to WL-25; the balance of its catchment would not be developed. In this scenario, WL-25 would be increased in size marginally.

## 5.3 Overall observation regarding Wl-25 and WL-26

These issues regarding design solutions for WL-25 and WL-26 may be negotiated and resolved as the development proposals are further progressed, however my opinion is that the need for future flexibility in approving the size and locations of the stormwater management reserves should be acknowledged by the VPA and MW now.

# 6. Conclusions

1. **I support the WL-27 Co-location Scenario:** The basis for my conclusion is in three parts:
    - The 'Co-location' scenario does not significantly change the water level behaviour or the health of aquatic vegetation for a range of possible future GGF habitat wetland sizes compared to the 'Exhibited PSP' scenario; however, this is dependent on the design and construction of the wetlands being undertaken to the highest standards. My investigations identify that the 'Co-location' scenario provides a useful buffer against the detriment impact of leakage or compromised design and construction.
    - Co-location presents a significant opportunity for efficient co-ordinated management of the wetlands and conservation area.
    - I have been involved in the analysis of merits of the 'Co-location' scenario undertaken by Andrew Mathison and Aaron Organ and I agree with the observations and conclusions in their evidence statements.
2. **I emphasise the need for flexibility in approving the size and location of reserves for WL-25 and WL-26:** I support the recommendation in the evidence statement of Andrew Matheson proposing to add a note to Plan 11 in the PSP stating that "confirmation of size and final location of wetland reserves is subject to functional and detailed design approval to the satisfaction of Melbourne Water and Council".