Memo Version B

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Subject: Elwood Foreshore: WSUD Stormwater Management

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Preamble

City of Port Phillip has engaged Storm Consulting to prepare WSUD advice to inform the Master planning the proposed renewal at Elwood Foreshore.

WSUD is an important aspect of this renewal project and that Council wishes to investigate the opportunities and constraints that will inform Masterplanning of the site. This memorandum provides the advice describing potential strategies based on experience on similar sites and for City of Port Phillip. It is noted this advice is preliminary in nature and that further advice and clarification may be required as the Masterplan is progressed with next stage of input is to refine the WSUD/IWCM elements within the Masterplan. The final input prior to detailed design is the functional design or design development where the modelling is undertaken to size specific elements and confirm feasibility.

Desired Approach for Stormwater Management

The general strategy for managing stormwater on the site is to adopt WSUD and IWCM principals which are consistent with council's planning policies. The intent is to minimise the impact of stormwater on Port Phillip Bay including stormwater pollution. In this case the volume of stormwater entering the bay will not cause issues compared to draining to natural waterways however there are benefits that are recognised by reduction in runoff volumes. Reducing stormwater runoff volumes will reduce the pollution loads however it also can reduce the size of stormwater infrastructure, reduce the scour and pollution impacts on beaches (refer to Dendy St Pavilion project for a relevant example) and provide an opportunity for reuse to offset potable water demands (eg roof water harvesting, passive irrigation and stormwater harvesting).

Site rapid assessment

The documents located on the CoPP website were reviewed to glean the relevant elements that may affect WSUD, water cycle management (WCM) or drainage. The focus was to glean relevant geotechnical and soil contamination information as well as general site appreciation. This assessment was more to inform the constraints of the site. The key relevant information has been extracted and presented in this memo.

https://www.portphillip.vic.gov.au/about-the-council/projects-and-works/elwood-foreshore-looking-to-the-future

More recently Storm was provide the draft Masterplan dated 29/10/2021 from NMBW that is assumed to reflect the latest proposal.

Figure 1 masterplan excerpt

Geotechnical and Site Soils

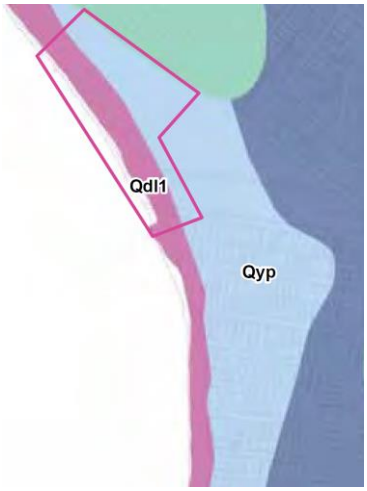
The site is approximately 9.4Ha with levels typically being 2-4m AHD. Rock has been identified at approximately -40m AHD.

No acid sulfate soils were identified however there was considerable mention of soil contamination.

Previous environmental reports confirm the presence of contaminated soil at the site (up to Category B where removed). A Soil Management Plan identifies this, however, no overall site assessment regarding ongoing site uses was noted. The land is apparently not on EPAV registers or databases.

Although the Preliminary Soil Contamination Assessment (10 Mar 2017) was not provided, the Soil Management Plan (25 July 2017) indicated the following maximum contaminant levels from previous investigations:

Benzo(a)pyrene - maximum concentration:	21 mg/kg
Total Polycyclic Aromatic Hydrocarbons (max concentration):	210 mg/kg
Total Petroleum Hydrocarbons (C10-C36) (max concentration):	1,415 mg/kg
Mercury – maximum concentration:	13 mg/kg
Copper – maximum concentration:	330 mg/kg
Lead – maximum concentration:	400 mg/kg
Zinc - maximum concentration:	680 mg/kg

Qdl1 coastal dune deposits: Sand, silt, clay: well sorted, poorly consolidated; coastal dune and beach deposits, some swamp deposits Holocene to Holocene sand (significant); silt material (significant); clay lithology (significant) Qyp Port Melbourne Sand: Aeolian and beach ridges. Bedded and cross-bedded sand, moderately silty, with shelly fossils including bivalves and gastropods. Holocene to Holocene medium sand material (all); fine sand (all)	

Summary:

Soils are predominantly silts and sands with high permeability (excellent)

The low-lying lands will limit depth of infiltration structures and create hydrostatic pressures (buoyancy) on underground storages (careful design required)

No acid sulfate soils (good)

Contamination of some soils exist. This will need to be managed where excavation is planned. Best to avoid infiltration in these areas unless clean-up is proposed. (Careful design required to avoid contamination that remains)

Sea Level Rise

Planning schemes state that we should "plan for" a sea level rise of 0.8m in 2100. There is debate about whether this is realistic and general agreement that 0.2m rise will occur by 2040. There is no requirement to build for a 0.8m sea level rise but we certainly need to consider this possibility.

The current draft Masterplan by NMBW includes a DELWP 2100 prediction of storm tide and this is shown in the Figure below (extracted from draft Masterplan).

Figure 2 Storm tide prediction excerpt

Summary:

Sea level rise with further hinder infiltration measures so that some locations may be inundated permanently or semi-permanently (careful design required)

Increase in sea level rise may create hydrostatic pressures for underground storages (careful design required)

Cultural Heritage

The study area intersects with an area of Aboriginal cultural heritage sensitivity defined by its proximity to Coastal Crown Land and Coastal Land.

The study area does not contain any registered Aboriginal cultural heritage places. The closest registered place to the study area is VAHR 7822-0027, a now destroyed shell midden located approximately 500m to the north-west.

Summary:

There appears to be no impact on stormwater management (confirmation required)

Existing Stormwater Management

The primary drainage from the upstream catchment is managed by Melbourne Water and is directed adjacent the Southern boundary with the outfall under an existing jetty. Various connections are made to this trunk drain from the existing areas including buildings, carparks and fields as far north as the tennis courts and the sailing club. There are no known WSUD measures on the site although an inspection has not yet been undertaken.

Proposed Masterplan

It is understood from the drawing supplied by NMBW that the carparking will be relocated along with some facilities and new buildings as well as an increase in vegetation.

Summary:

Relocating carparks to higher ground improves opportunity for WSUD measures to be applied to a relatively high pollutant source (excellent)

New buildings present opportunity to harvest roof water (excellent)

Extended vegetation areas may be complimentary to WSUD (good)

Stormwater Management Measures

A number of stormwater management measures for WSUD and IWCM are described in the table overleaf. Consideration has been given to the specific opportunities and constraints of the site and proposed development. Comment is also provided on the specifics of application to inform conceptual and functional design.

Potential WSUD Measures at Elwood Foreshore

Element	Application	Limitations	Considerations
Rainwater tank	Buildings	Existing buildings may be more challenging. Needs to be a demand for the water. Hydrostatic pressures may impact on underground storages.	Tanks can be integrated into the architectural design although they are generally not opposed by the public as a separate building element. Vandalism should be considered in the design. Demands from the tank should be non-potable only. Overflows should be managed by infiltration or stormwater harvesting storage where possible. A mains water bypass is required for when tank is empty or there is a pump fault.
Raingardens	Carparks, roads, impervious pavements. Roof areas where no tank is proposed in combination with infiltration.	Profile can be relatively deep which limits subsequent infiltration and can lower connected stormwater infrastructure. This is exacerbated if the inflows are piped into the raingarden. Sea level rise will impact the deeper infrastructure sooner than shallow infrastructure.	An alternative media is recommended – reactive filter media – that is primarily made from recycled materials and performs better for pollutant removal and vegetation growth. This will allow a shallower profile and eliminate the transition layer. The drainage layer can also be reconfigured or eliminated to keep the drainage system shallow to accommodate sea level rise. Best to keep inflows at surface level rather than pipe flows into raingardens to keep the raingarden elevated and maximise infiltration over the long term. Can rely on infiltration to manage majority of volume and then incorporate high flow outlet into drainage system. This maximises infiltration and keeps the stormwater system elevated to mitigate against sea level rise.
Permeable pavements	Any pavement that receives direct rainfall. Permeable areas will generally have no runoff.	Typically more expensive than impervious pavements particularly when needing to accommodate vehicles. Cleaning will be required to maintain permeability of pavers.	Likely not suitable for playing courts The higher costs for roads due to pavement requirements will likely make it only viable for primarily pedestrian pathways or non-vehicular areas. Best to use pavers that have permeability so as to not rely on perimeter infiltration. Pavers also allow removal if required for maintenance or repair.

Infiltration systems	This is the preferred method of stormwater "disposal" regardless of the treatment beforehand.	Should not encourage infiltration in contaminated areas. Infiltration is less effective in low lying areas near sea level. This will be exacerbated by sea level rise. Sediment will block sub-surface systems without adequate pre-treatment.	This is likely the primary method of "disposal" and can be incorporated with most WSUD pre-treatments and preferably located in areas that deeper rooted vegetation can benefit. All raingardens should be unlined where possible so infiltration occurs. Vegetation buffers will allow infiltration. It is critical to manage sediment prior to entering sub-surface systems for infiltration. Other configurations include trenches and beds as well as tanks. Low-lying end-of-line systems may become somewhat permanently inundated closer to year 2100. Best to keep systems dispersed and close to the source to maintain higher elevations.
Vegetation buffers/strips	Carparks, roads, impervious pavements.	More informal drainage. Relies on the ground/vegetation being level – any damage to the surface may concentrate the flows although it is relatively inexpensive to repair.	There is very good pollutant retention performance by grass buffer strips. This element is encouraged as it is very inexpensive to install and maintain (grass mowing typically). Best to locate in less pedestrian traffic areas to maintain good grass condition. Good pre-treatment for raingardens and infiltration systems to remove sediment.
Stormwater harvesting	Fields will require irrigation. Stormwater source can be MW drain or local catchments including field sub-surface drainage (if they exist).	Above ground storage likely not preferred. Underground system needs to accommodate hydrostatic pressure unless it is shallow. Limited volume generated from impervious areas within foreshore as it conflicts with the WSUD measures.	The feasibility of this would require further investigation. There is very limited source of water within the foreshore. Sub-surface drainage from the fields would be a good clean source however it is expected that this drainage does not exist. It is likely the only source is from the Melbourne Water trunk drainage. Would need to confirm impact of tidal waters on offtake location. MW connection and extraction approvals will be required. MW likely to be supportive.
Gross pollutant traps or proprietary devices	Carparks, roads where pollutants loads are expected to be high.	Large units not applicable to source control measures suggested further above.	Larger scale unit would be applicable for stormwater harvesting system with extraction from MW trunk drain. Small-scale units could be utilised in locations with the foreshore such as Smart Soaker pits for passive watering where other WSUD is not proposed.