Appendix G – Levee Memorandum

Memorandum

01 April 2019

To	Melbourne Water Corporation		
Copy to			
From	GHD team	Tel	+61 3 8687 8827
Subject	The Levee Discussion	Job no.	3136555

1 Introduction

This memorandum summarises information prepared to date on the proposed levee for Fishermans Bend to inform development of the *Fishermans Bend Water Sensitive Drainage and Flood Management Strategy* and to assist scoping next steps. This was originally provided on 20th December 2018, with some minor updates made in this second version.

For the purposes of this document, the term “levee” is used in the general sense to describe a continuous physical barrier against coastal and riverine flooding which may comprise the existing ground surface, earthen levees, concrete barriers, flood walls, raised roads, etc.

2 Purpose

This memorandum compiles the relevant information prepared to date by GHD, Melbourne Water and other parties on the proposed levee for Fishermans Bend, to inform discussions between GHD, Melbourne Water, Councils and the Fishermans Bend Taskforce on the proposed levee.

3 Background

- Fishermans Bend is relatively low lying with ground levels varying from 1.0-4.0m AHD.
- A levee (or flood barrier/wall) along the edge of the Yarra River is required as part of the overall drainage solution, because the water levels in the Yarra River are higher than the ground surface levels during (1) tidal events in Port Phillip Bay (coastal flooding) and (2) flood events in the Lower Yarra River (riverine flooding). *Noting that water level in the Yarra River downstream of Wurundjeri Way is principally determined by the bay level, whereas the water level upstream of Wurundjeri Way is principally flow-dominated during flood events in the lower Yarra River.*[1]
- A levee can protect against inundation directly from the Yarra River. *Noting however that a high water level behind the levee (the ‘tailwater level’ for the underground drainage network) means*

[1] Flood events in the lower Yarra are under review and this is an area which must be revisited once that work is completed. Current levee heights near and upstream of Wurundjeri Way do not account for this.

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that the stormwater can't free drain under gravity, so pumping would also be required to alleviate the constraint.

- The levee will be needed regardless of whether pipe upgrades ('baseline drainage' or distributed storages ('hybrid approach') are used within the catchments.

4 Explaining Flood levels

The current and future flood levels at Fishermans Bend are discussed below. Coastal flooding and riverine flooding are discussed separately.

4.1 Tidal water levels (influences downstream of Wurundjeri Way)

Melbourne Water's 1% AEP tide level in Port Phillip Bay is 1.6m AHD today.[2] [3] This means that parts of Fishermans Bend are currently subject to inundation under tidal events, particularly towards the North-East By 2100, allowing for a projected sea level rise of 0.8 m in Port Phillip Bay, the 1% AEP tide level would increase from ~1.6m AHD to ~2.4m AHD. This means that over time, due to sea level rise resulting from climate change, greater areas of Fishermans Bend would be subject to inundation under tidal events. *Note that these 'tidal' levels include the effects of a 1% AEP storm event leading to storm surge from low air pressure and wind/wave effects.*

The map of ground levels in Figure 1 below shows the areas that are lower than the current 1% AEP tidal level (red and orange) and the 2100 1% AEP (all coloured areas).

4.2 Lower Yarra flood levels (influences upstream of Wurundjeri Way)

Melbourne Water's designated flood levels in the lower Yarra River are currently subject to review in the Lower Yarra flood modelling project (GHD for Melbourne Water). The current levels Melbourne Water uses, we understand, are those recorded from the 1943 flood, which was considered to be a 1% AEP event. Initial modelling for the project, which is modelling current conditions (rather than an historical event), indicates much higher flood levels are likely for the Lower Yarra.[5]

[2] Melbourne Water's 1% AEP (Annual Exceedance Probability) (or 100 year ARI) flood levels within Port Phillip Bay include a projected sea level rise of 0.8 m by 2100. Under these guidelines the flood levels applicable to Fishermans Bend for a 1% AEP flood level are 1.6 m AHD (today), 1.8 m AHD by 2040, and 2.4 m AHD by 2100. *Source: Planning for Sea Level Rise Guidelines, Melbourne Water, 2017*.

[3] It is important to note however that many of the modelling assumptions are slightly different to these levels. For example, modelling for the latest Fishermans Bend Baseline Drainage Plan (from GHD, 2018) used a time varying tail-water level peaking at 1.45m AHD for existing conditions and 2.25m AHD for the year 2100 (from Water Technology 2017). The 2100 level combines a 100 year ARI extreme water level event in Port Phillip with sea level rise of 0.8m, in line with the current planning requirements for sea level rise. This is considered appropriate and is not inconsistent with the general 1.6m AHD (existing) and 2.4m AHD (2100) requirement. Note however that for the purpose of setting the levee height and setting floor levels Melbourne Water will use the 2.4m AHD 2100 level.

[5] Yarra River 1% AEP flood profiles given in current Yarra River Flood Mapping project – Modelling Assumptions & Implications (Memo from GHD to Melbourne Water dated 29 March 2018) show that for the river below Wurundjeri Way are principally determined by the bay level and river flow has a very minor influence. However, upstream of Wurundjeri Way the river levels are flow-dominated during flood events and are higher than the Bay level. As flood flows are not included in the current modelling it will be underpredicting flood levels in the eastern-most part of the site which floods from the Yarra upstream of Wurundjeri Way.

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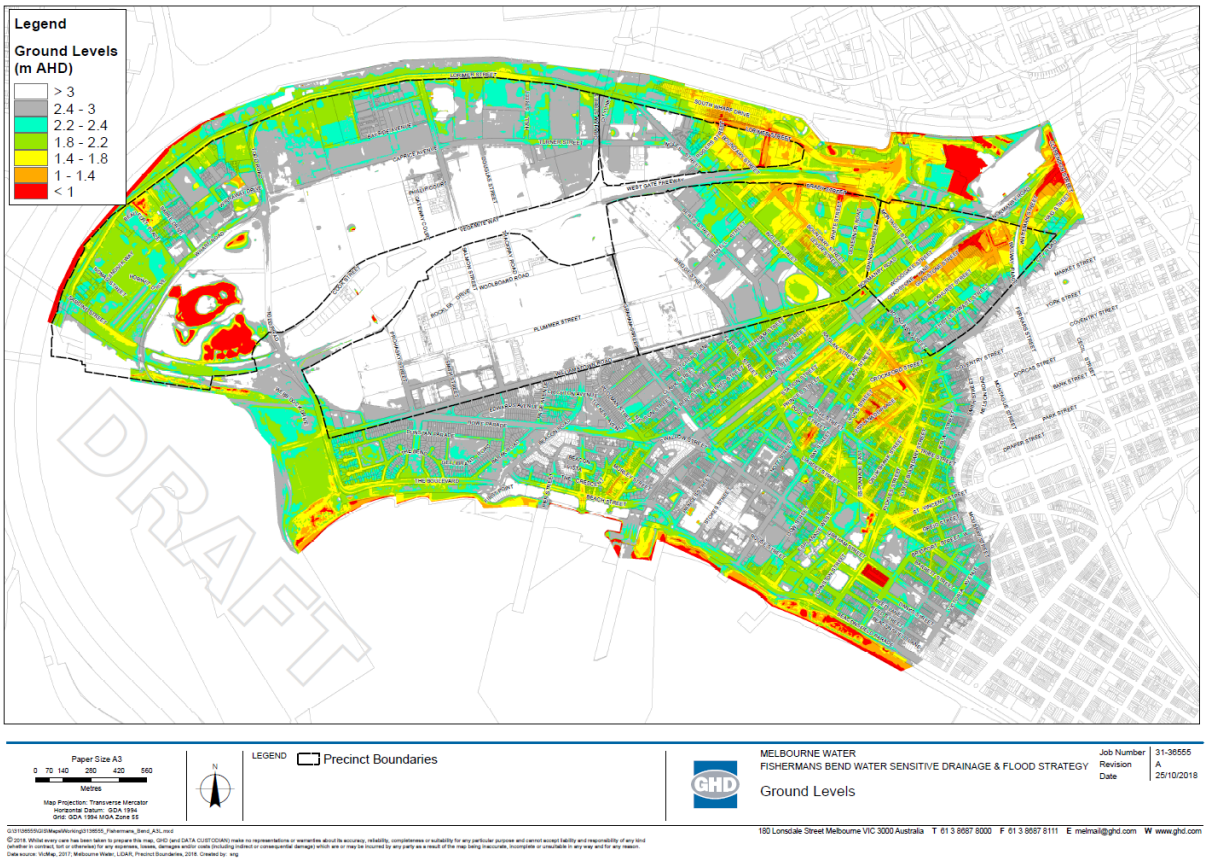
This uncertainty around the flood level has broader implications for the extent and height of the levee, drainage infrastructure (including pump stations), and planning controls.

Given this uncertainty, all past drainage modelling for Fishermans Bend used the same level (i.e. the level in Port Phillip Bay) as the boundary condition for both downstream and upstream of Wurundjeri Way.

For the purposes of this strategy, the same approach has also been used. It is important however that the uncertainty is explicitly stated and understood by stakeholders, and that the planning assumptions and strategy are revisited once (or if) a new Yarra River flood level is determined.

Figure 1 Ground Levels



5 Flood Plots

Flood depth plots are provided below. These show the extent and depth of flooding under different conditions. It is important to highlight for the purpose of interpreting these plots, that Melbourne Water's safety risk criteria for the 1% AEP rainfall event is that flooding on roads must be less than 0.4m. This means any flooding on footpaths or private property, or any flooding on roads greater than 0.4m does not meet the required 100 year level of service.

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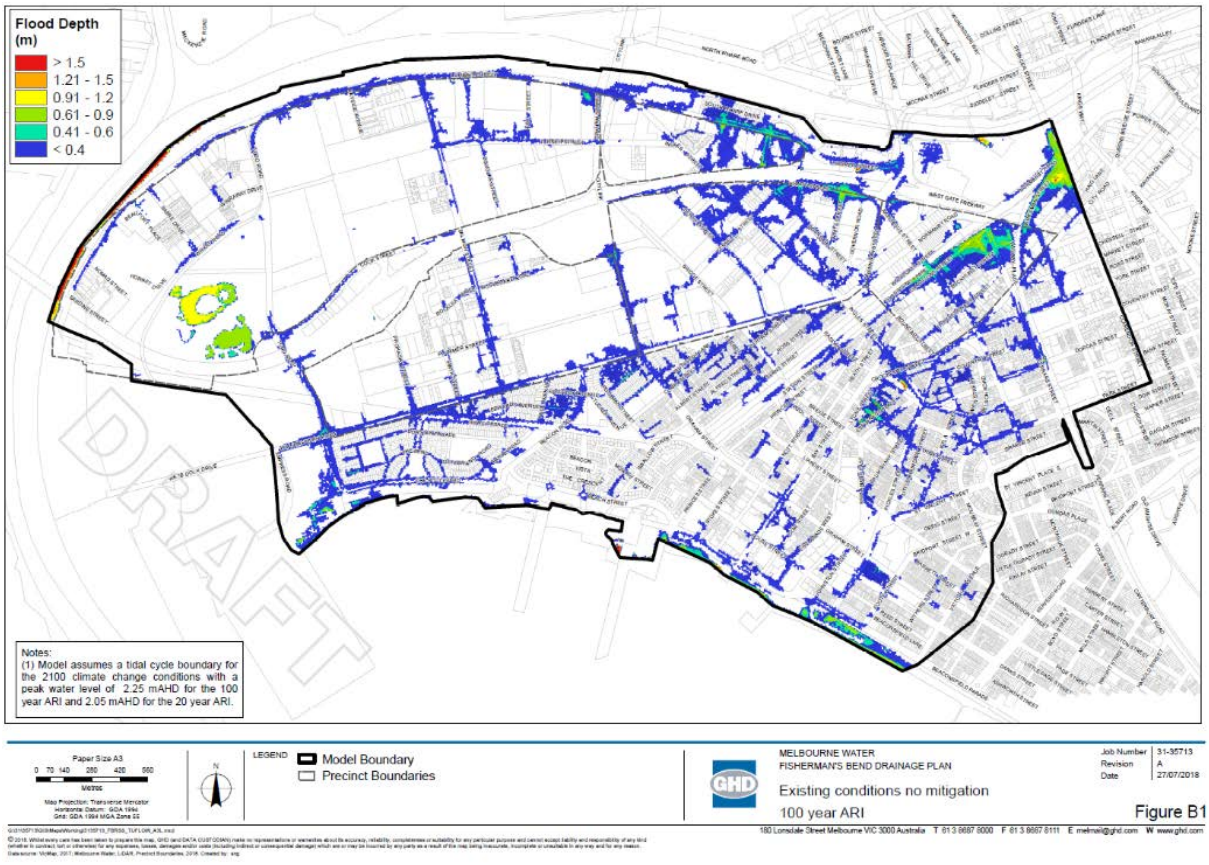
5.1 Existing conditions flooding, without mitigation

A flood depth plot for existing conditions without mitigation for the 1% AEP rainfall event is shown in Figure 2 below. This demonstrates that there is flooding that does not meet the level of service in some areas. However it does show that the surface level along the water's edge in nearly all places is higher than the peak water level, so there is relatively no flooding from tidal inundation (rather it is a tailwater constraint causing stormwater flooding within Fishermans Bend, or possible backwatering through the drainage network).

Figure 2 Existing conditions flooding, 1% AEP rainfall event, no mitigation



5.2 Future (2100) flooding, without mitigation

The flood depth plot for conditions in 2100 (with the potential effects of climate change) without mitigation for the 1% AEP rainfall event is shown in Figure 3 below. Due principally to the higher tidal level, there is flooding that does not meet the level of service in a number of locations. It can be seen that there is direct inundation from the Yarra in large areas of Fishermans Bend, particularly at the Western and Eastern areas.

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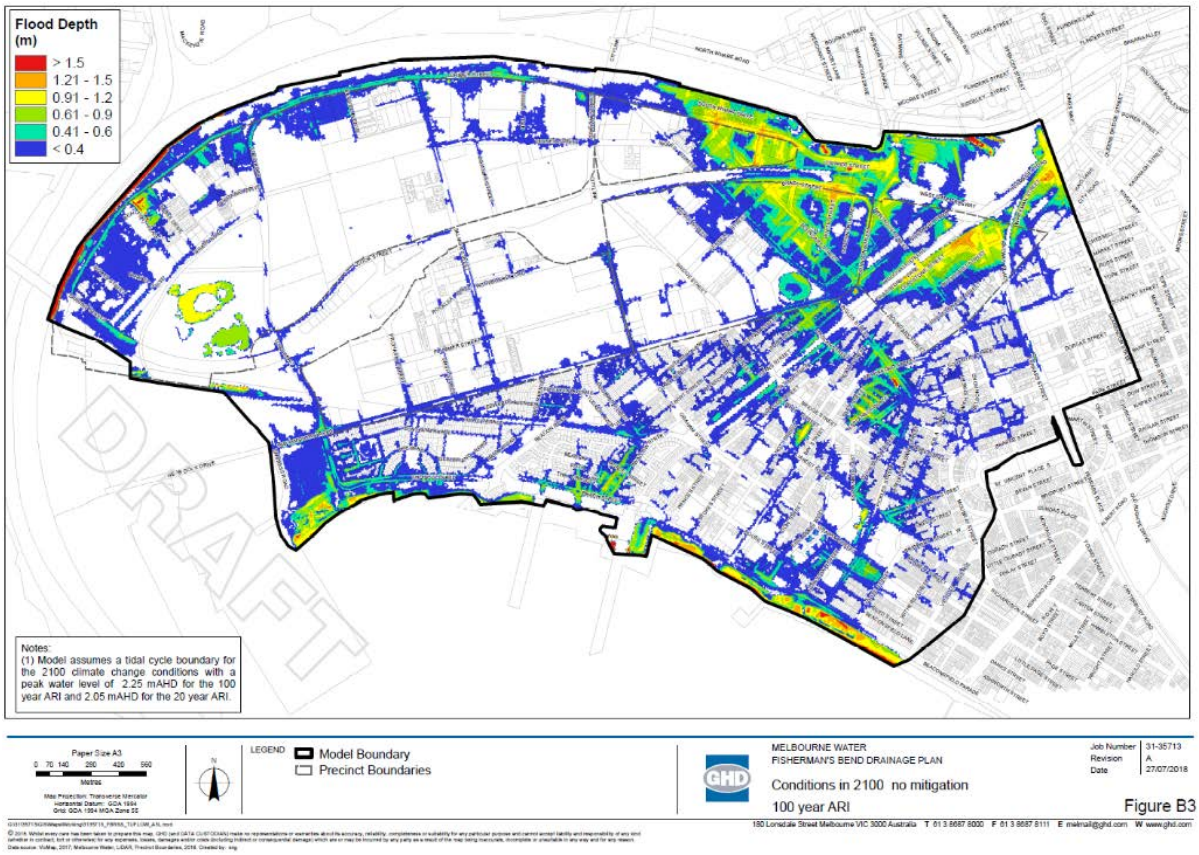
This tidal flooding can be alleviated with a levee (see next section below).

Figure 3 Future (2100) conditions flooding, 1% AEP rainfall event, no mitigation



5.3 Levee

The map below shows the location of a levee (as defined in the *Baseline Drainage Plan*, GHD, 2018). It can be seen that the alignment adopted for the modelling follows the water's edge, starting near the Westgate Lakes and continuing all the way around past Fishermans Bend into Southbank. It is not necessarily the case that this is the optimal alignment (as discussed in sections below).

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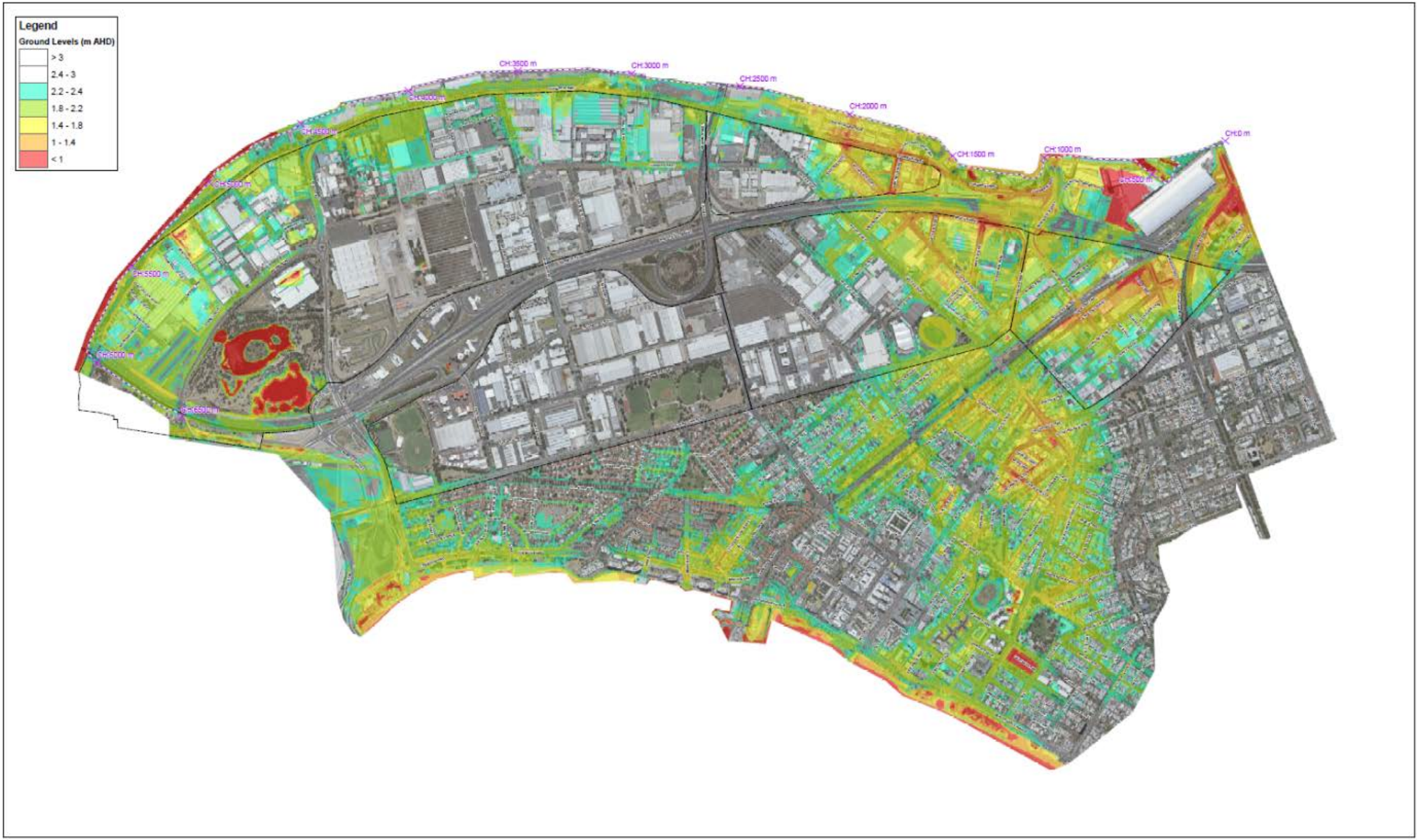

Paper Size A1

0 50 100 200 300 400 500 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND
Precinct Boundaries
Proposed Levee

MELBOURNE WATER

FISHERMANS BEND WATER SENSITIVE DRAINAGE & FLOOD STRATEGY

Ground Levels & Proposed Levee

Job Number	31-36555
Revision	A
Date	14/12/2018

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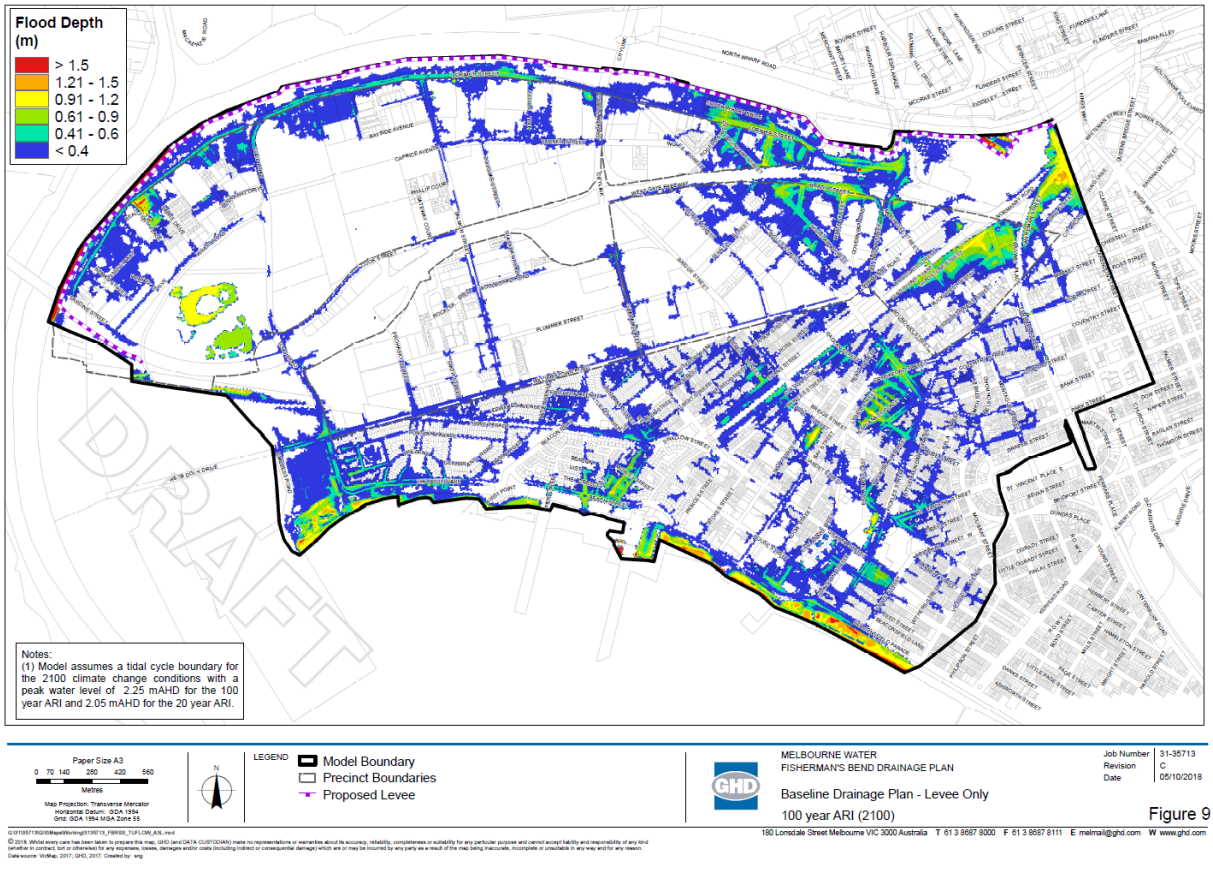
5.4 Future (2100) flooding, with a levee as the only flood mitigation

The flood depth plot for conditions in 2100 (with the potential effects of climate change), with the levee shown above as the only mitigation measure, for the 1% AEP rainfall event is shown in Figure 5 below.

This represents the impact of stormwater flooding, as the area is protected from tidal flooding by the levee. Noting that the tidal water level still influences the stormwater flooding, because the water level behind the levee is a constraint on the ability of the drainage system to free-drain under gravity.

This shows that even with the levee, there is still flooding that does not meet the level of service in many of the same areas.

Figure 5 Future (2100) conditions flooding, 1% AEP rainfall event, with levee as only mitigation



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6 Past Studies

This section summarises the information on the levee that was presented in past studies.

6.1 Integrated Water Management Strategy (GHD, 2015)

The IWM Strategy was the first detailed consideration of drainage and flood management for Fishermans Bend. The study discusses the impacts of climate change and the need for a levee, but flood modelling was not undertaken for climate change scenarios and so a levee was not considered in any detail.

6.2 Baseline drainage plan options (GHD, 2017)

This work built upon the initial consideration of drainage and flood management in the IWM Strategy. In particular, this explored the difference in providing a 5 year or 20 year level of service (LOS), and for each of these, whether to provide a "base" or "higher" LOS. The 5 and 20 year LOS were considered for two scenarios:

1. Base LOS: Rainwater tanks, pipe capacity upgrades and raised roads for providing access and egress.
2. Higher LOS: Rainwater tanks, levees, pipe capacity upgrades and pumping.

Ultimately the higher level of service was adopted, which included levees and pumping rather than road raising.

This study only considered works sited within the boundary of Fishermans Bend. It looked at flood levees around the perimeter of the renewal area to provide protection from tidal flooding, which included a Northern Levee and a Southern Levee. The general height of the flood levee would be between 0.5 and 1.0m, although it varied from where it ties into existing ground up to a maximum height of approximately 1.5m where it passes through the Lorimer, Sandridge and Montague Precincts.

For the purpose of the drainage plan and until further details were known about the form of the levee, it was agreed with the Fishermans Bend Task Force that no freeboard should be included with the height of the levee, although the rationale is not documented.

Table 6 Main flood levee details

Total length	5928m
Crest level	Varies. It is not less than 2.4mAHD (100-yr ARI tide level with the effects of climate change in 2100) but may be higher in some locations subject to the additional effect of flows generated from rainfall runoff.
Freeboard	0m (as discussed and agreed with the Fishermans Bend Task Force)
Height	Varies with ground level. See Appendix E5 for the 100-yr ARI flood depth plot. The depth of flooding presented along the alignment of the flood levee is equal to the required height of the levee.

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The cost of the levees was estimated at $3.08M, and it was assumed would be owned by the Councils.

6.3 Baseline Drainage Plan (GHD, 2018)

A flood levee was identified as being required around the Northern edge of the renewal area (but not the Southern edge)

Alignment

The alignment of the flood levee generally follows the Southern bank of the Yarra River from the West Gate Bridge to Spencer Street Bridge near the Crown Casino. This alignment has changed from that indicated in the previous study, where the location of proposed works for the drainage plan were limited to within the urban renewal area. The general alignment was discussed and agreed with the City of Melbourne and Melbourne Water.

The alignment of the levee is shown to end at Spencer St Bridge. However it is likely that it may need to extend further east into Southbank, where ground levels continue to be low lying. It is recognised that the further extension of the levee into Southbank would need to be considered as part of a more regional solution and that that was beyond the scope of the study.

The study identified that any regional solution would need to consider the results of the Lower Yarra flood modelling investigation, which was underway at the time. Initial results from that investigation showed that flood water levels have the potential to increase significantly above bay tide levels along the Yarra River upstream from the Wurundjeri Way bridge crossing, where the river narrows and a number of other further bridge crossings are located.

A summary of the main details for the flood levee are presented below.

Total length	6445m
Crest level	Varies. It is not less than 2.25 mAHD (100 year ARI tide level with the effects of climate change in 2100) but may be higher in some locations if existing ground level are higher than 2.25 mAHD.
Freeboard	0 m (as discussed and agreed with the Fishermans Bend Task Force)
Height	Varies with ground level.

Following the inclusion of the updated sea wall survey data and the adoption of the tidal cycle within the hydraulic model, it was established that a levee along the southern boundary of the urban renewal area would not be required. Note that in any case, a significant area of existing suburbs would be flooded on the other side of any such levee.

Levee height

The required height of the flood levee was 2.25 mAHD. A longitudinal profile of the flood levee height, relative to existing ground levels, is presented in the figure below. The height above ground of the

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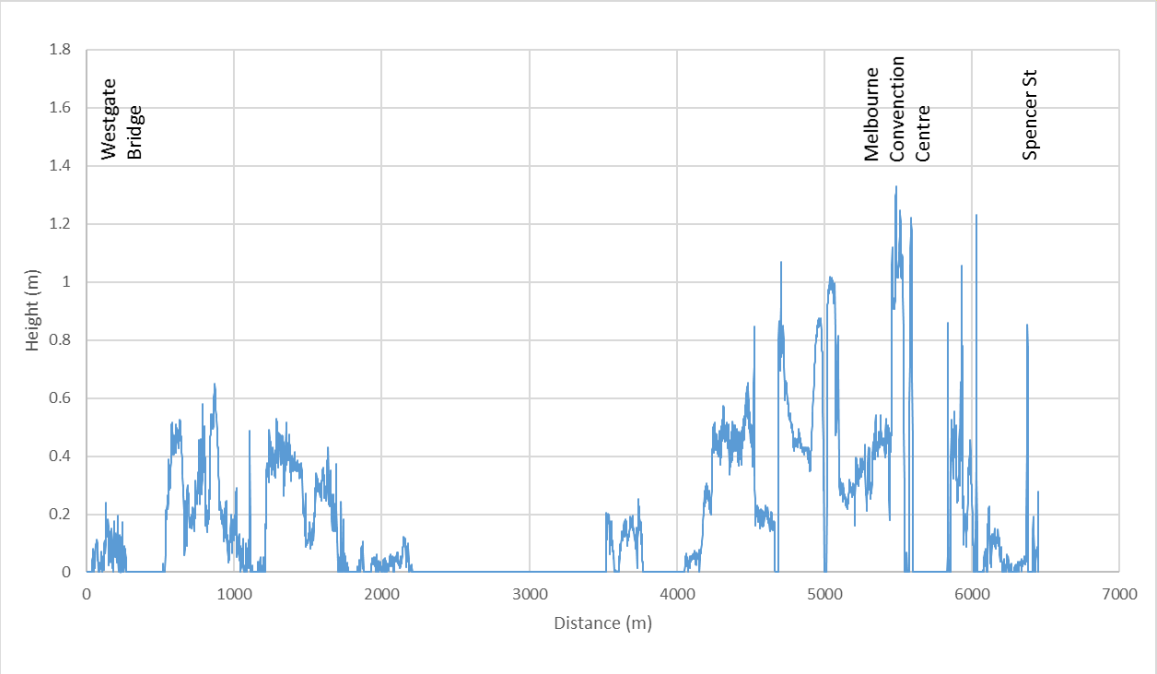
flood levee varies from where it ties into existing ground up to a maximum height of approximately 1.3m near the Melbourne Convention Centre. However for much of the length of the levee, its height above ground level is relatively low at less than 0.5m.

For the purposes of this drainage plan and until further details are known about the form of the levee, it was agreed with the Fisherman's Bend Task Force that no freeboard should be included with the height of the levee.



Levee form

The specific alignment of the flood levee and its form would be subject to many considerations. For example, the flood levee could be incorporated within the design of new buildings and/or new roads, bike paths or general landscaping, which could potentially be raised or profiled to provide the barrier. Many of these details on the future urban form are not known at present and therefore the form of the levee was not defined as part of the baseline drainage plan. While an alignment was presented, the details of this could also be changed to further suit the urban form.

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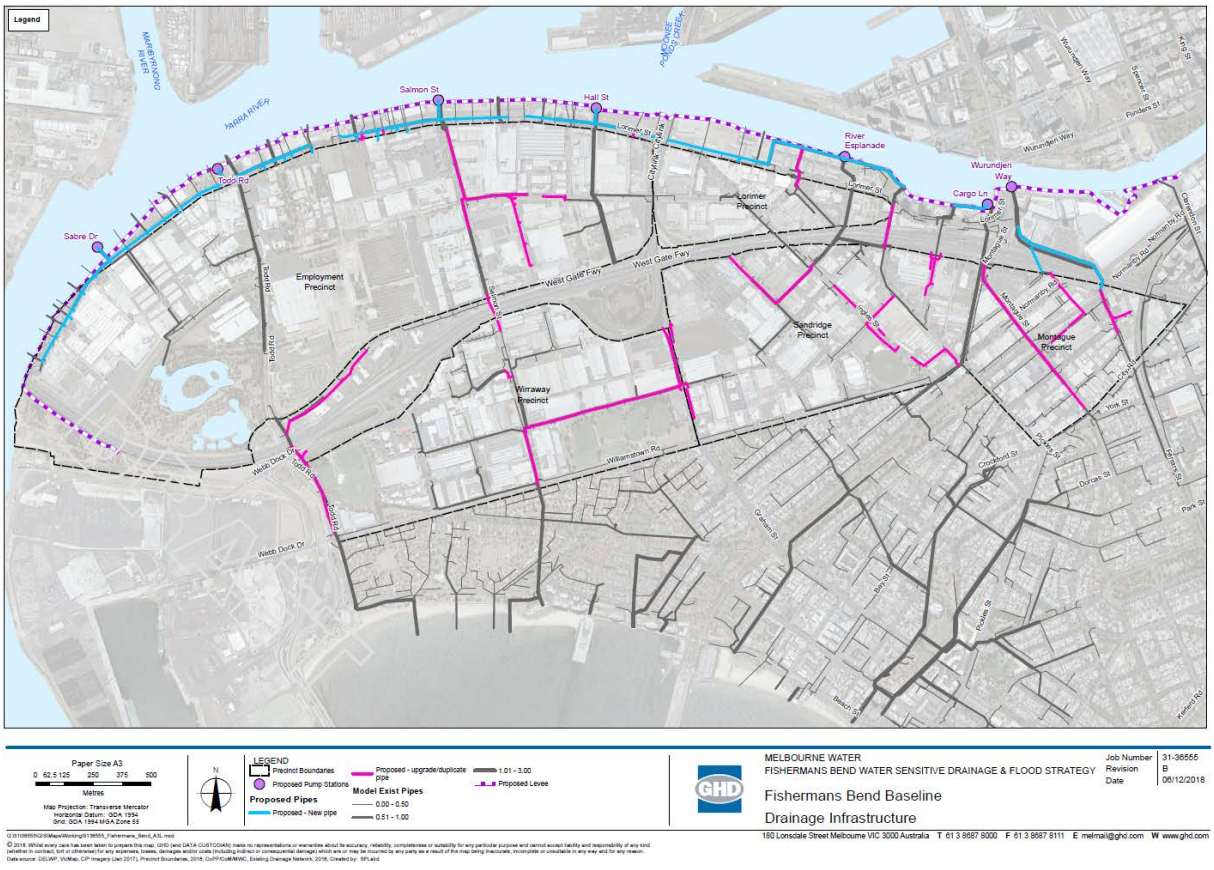
Figure 6 Baseline Drainage Infrastructure



Cost

The preliminary cost estimate for the levee was $1.12M.

Cost Basis

It was identified that there is significant uncertainty with the flood levee cost estimates as they will depend on a number of factors that were determined at the time of the study, including:

- Detailed alignment
- Cost of the land
- The form of the levee and whether it will be incorporated within new future development through walls on new buildings or raised road levels etc.
- Access to the site for construction.

Following discussion with Melbourne Water, the preliminary cost estimate was therefore based on a nominal rate of $1000 / m^3, assuming that the levee would be 1 m wide.

The cost estimate makes no allowance for the following:

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- Land take costs.
- Potential savings/extra costs from the incorporation of the flood levee within new future development.

6.4 Integrated and Innovative Water Management (Ramboll, 2018)

Ramboll were commissioned by City of Port Phillip to explore at a high level alternative flood management techniques for Fishermans Bend. The proposed approach included what was referred to as a “livable levee”.

This describes a robust levee that is able to reduce the risk of flooding. This is shown as being +3m AHD. The argued benefit of this (i.e. imposing a freeboard of ~600mm) is that it removes the need for imposing floor level requirements. Key discussion points:

- Levees can be large structures, but they can be “hidden” in the urban landscape through integration with green areas, roads and rail lines.
- Such systems should be considered as chains that are only as strong as the weakest link. Evidence-based assessment, good design, effective adaptation, good inspection and routine maintenance are vital if levees (particularly those representing the weakest parts of levee systems) are to perform well on the occasions when they are loaded in storm or flood events. It should be noted that levees may stand for much of their lives without being loaded to their design capacity. This can create a false sense of security in the level of protection they will provide
- Two parallel levees have been suggested for the River Esplanade area to the north of the Fishermans Bend Site. This allows the compartmentalization of flood areas, allowing a lower, less intrusive levee to protect the River Esplanade area and a higher levee to protect the Site.
- The concept of compartmentalization can be used in other areas at Fishermans Bend. This will need to be undertaken with a full risk and breach analysis of the site to determine the most suitable locations for these compartmentalised areas.
- Levees can be designed to adapt to changes in the hydrodynamic conditions (sea level rise, increasing storm impact, etc.). In general, adaptation requires raising the height of the structure. In situations with buildings or other values adjacent to a levee, adaptation can be complex. In order to provide a sufficiently high coastal protection level at the longer term, levee design should account for future climate scenarios.

The report includes some artistic style concepts of the liveable levee.

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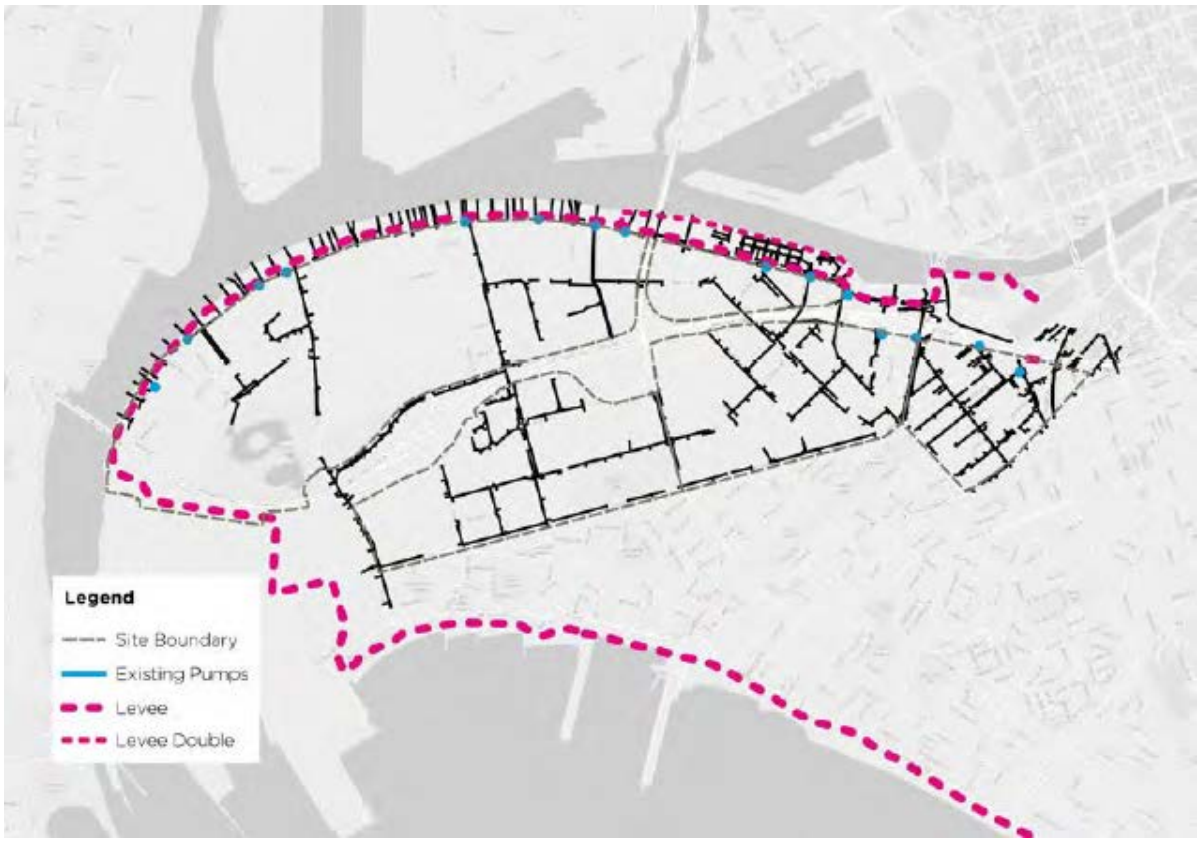

Source: Ramboll, 2018

6.5 Melbourne Water Cost Estimates (2017-18)

Melbourne Water separately prepared cost estimates for drainage infrastructure at Fishermans Bend, with inputs from KBR/John Holland and Major Projects Delivery at Melbourne Water.

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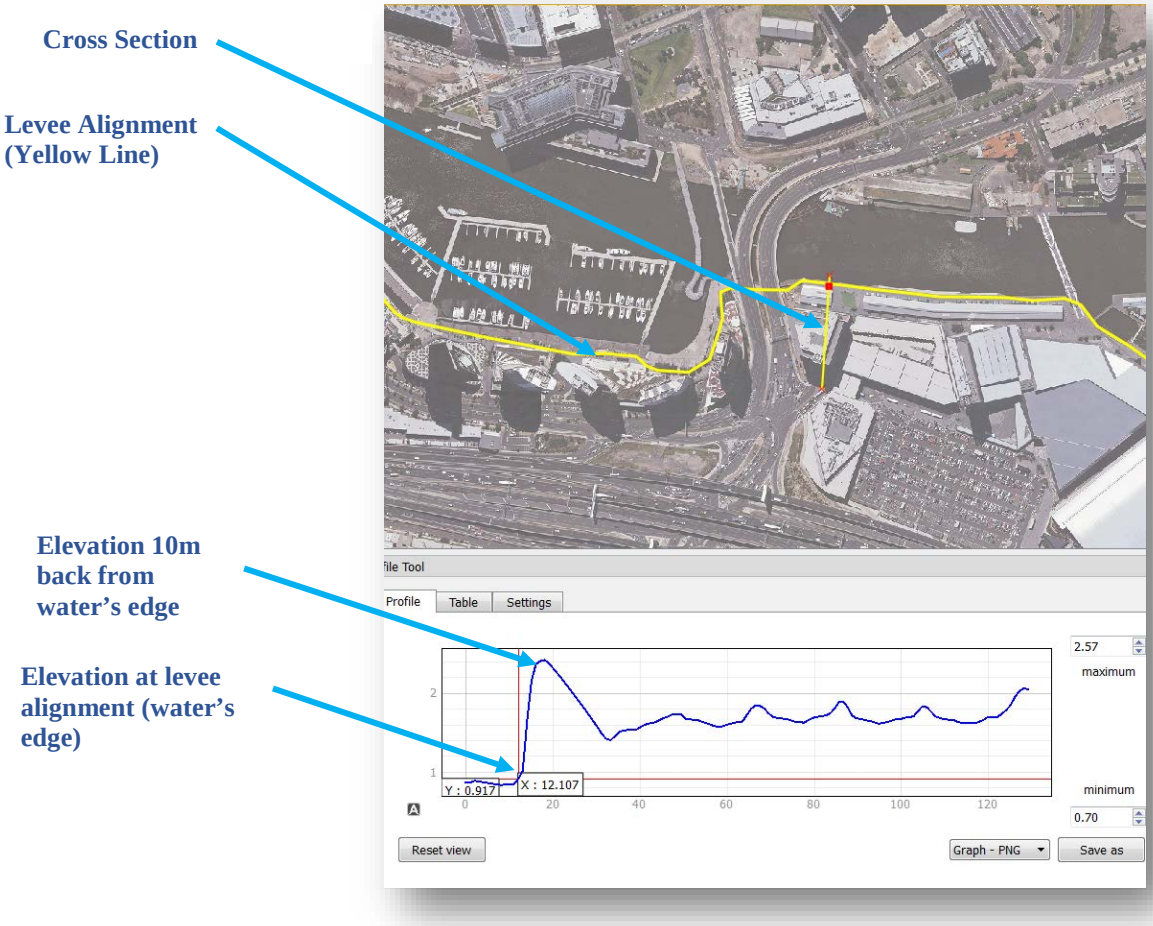
7 Optimising the Levee Route based on Elevation

The route shown in the Baseline Drainage Plan follows the water's edge. This is not necessarily the highest existing surface level in each segment, and so it is not optimised to minimise the height of the levee.

This is shown in the screenshots below, which show the location of the existing GIS alignment of the levee against the background of a digital elevation model. The cross-sectional view shows where the levee alignment is situated on the ground surface, and whether it is on the high-point or not. *An annotated example is shown below.*

Example



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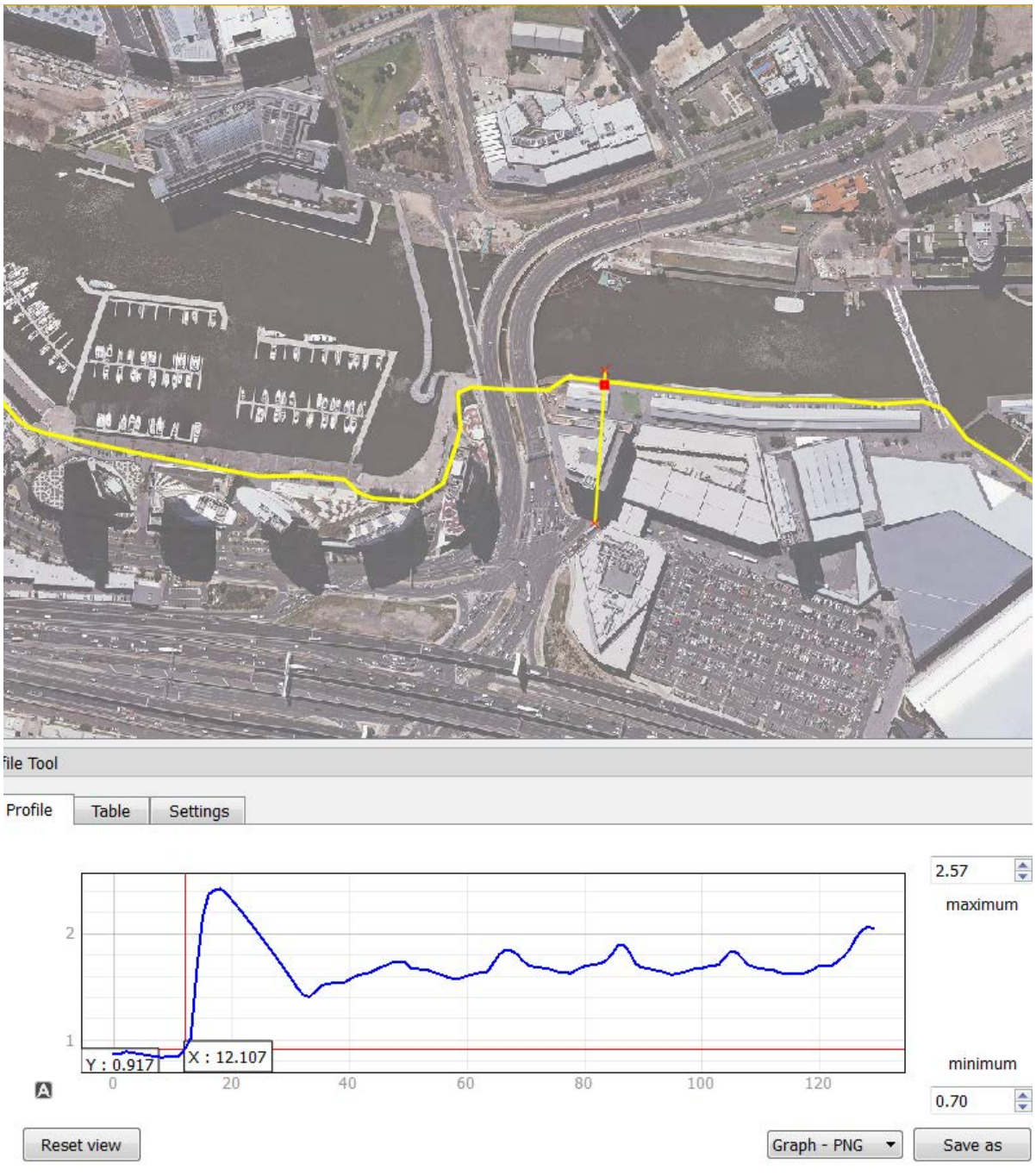

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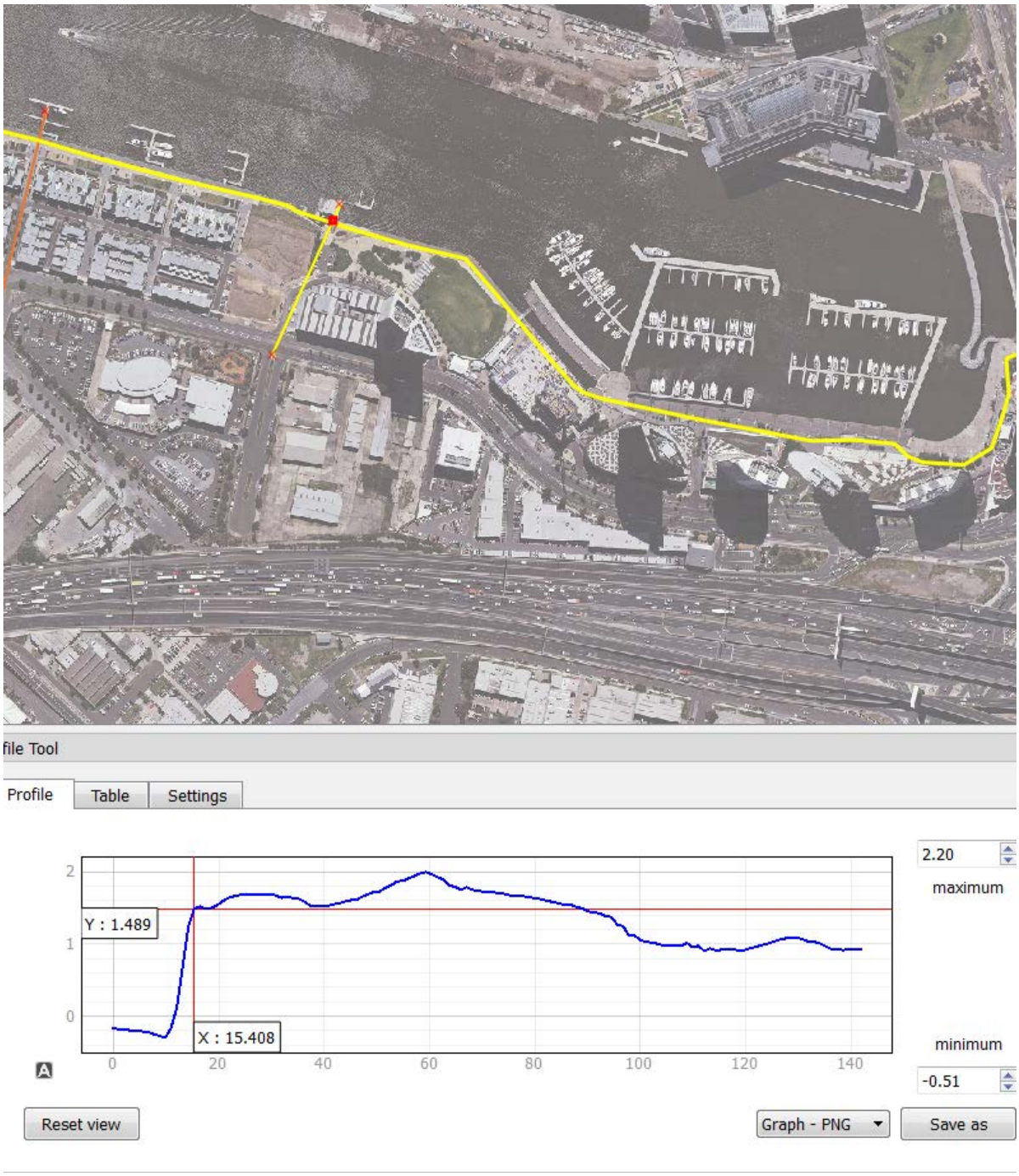

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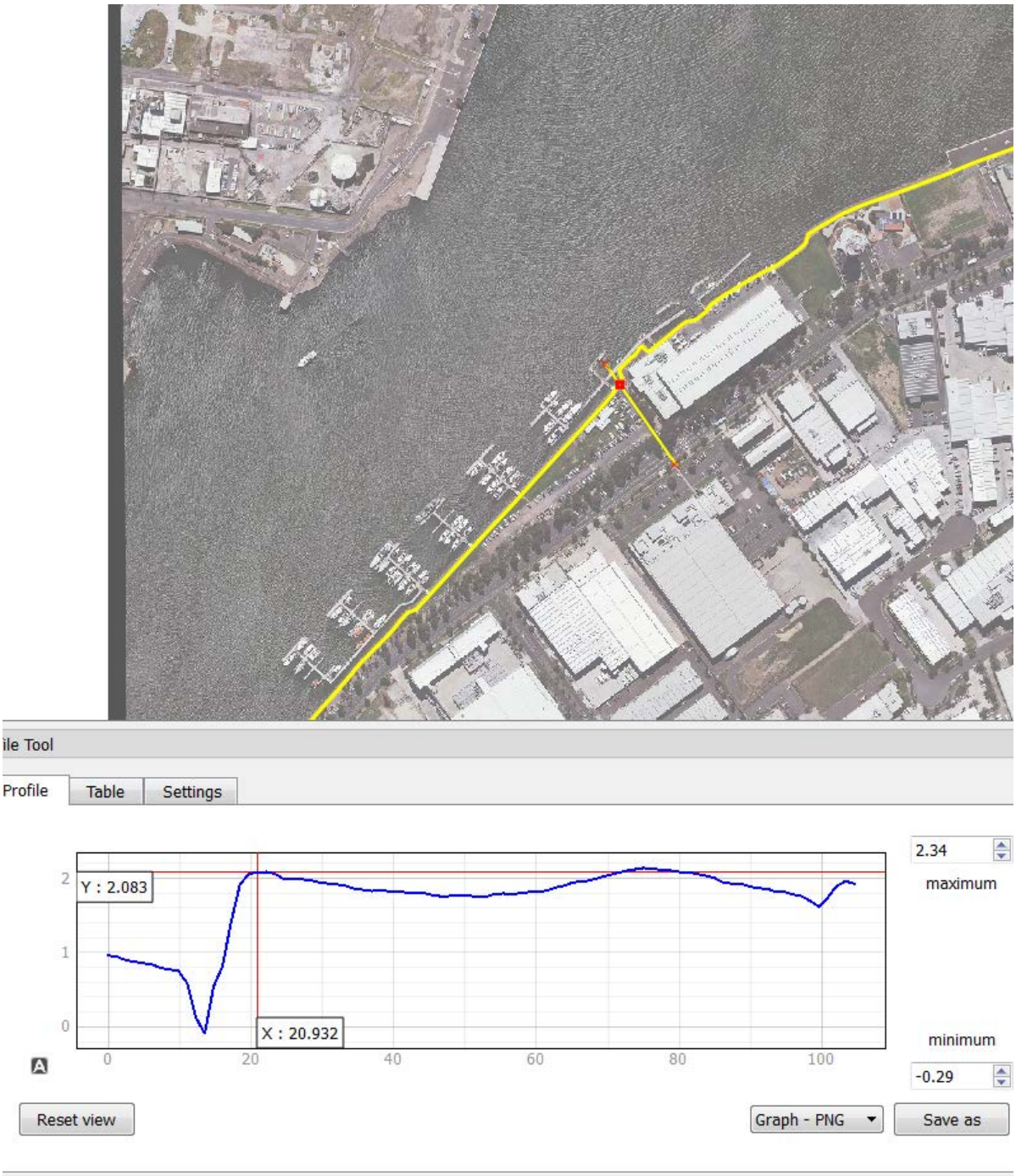

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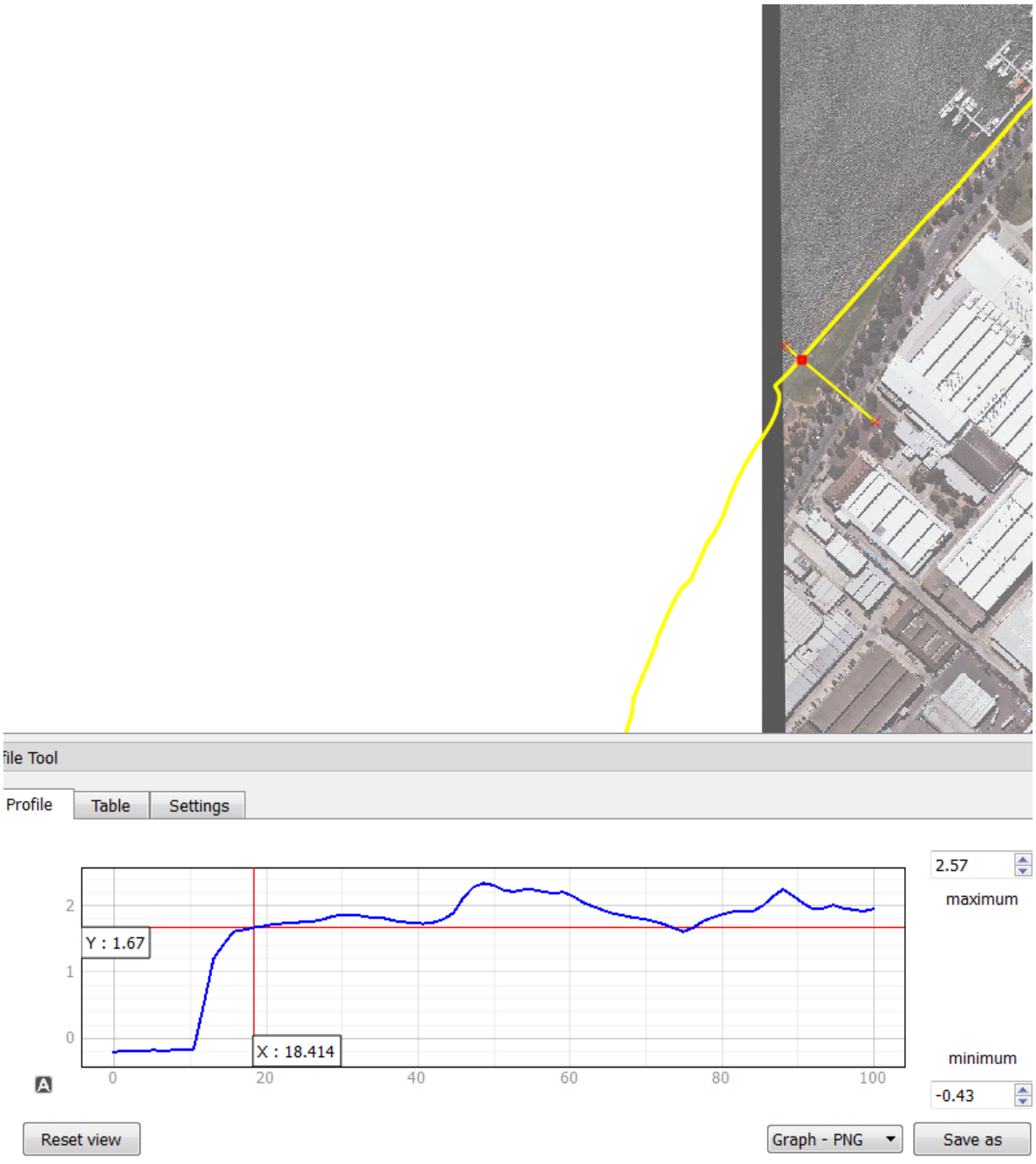

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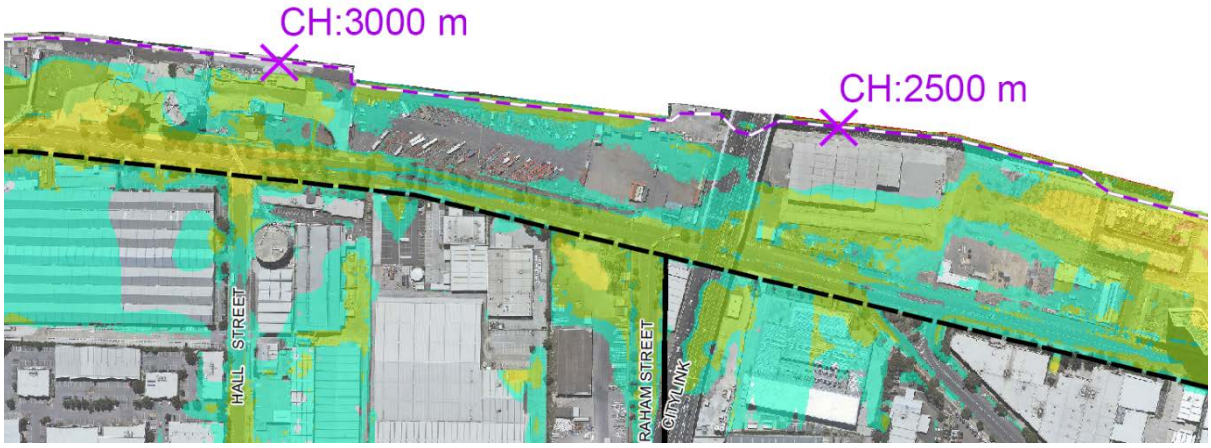
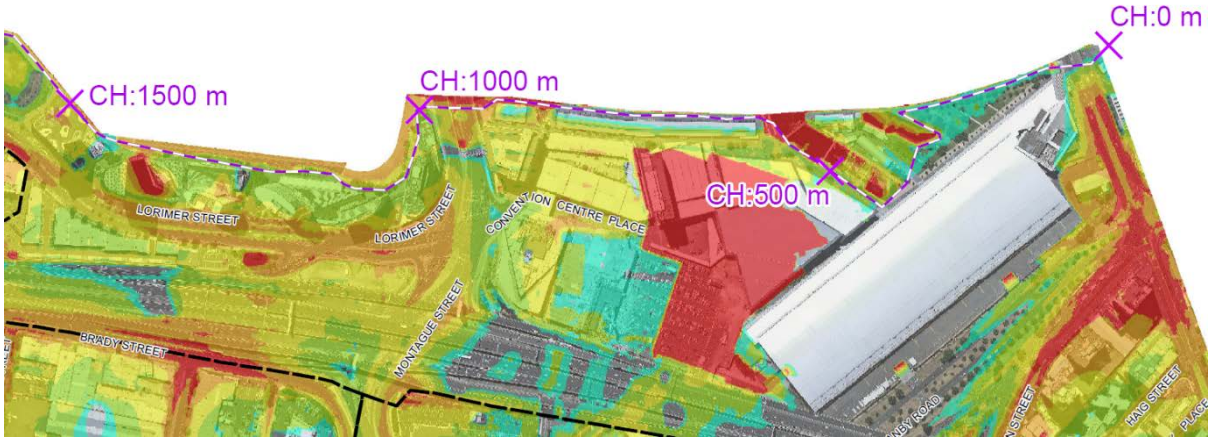
The following two examples show how the existing surface level (example 1) and existing built form (example 2) have higher elevations than at the water's edge.

Example 1 – Hall St to Graham Street



Example 2 – Convention Centre



This highlights how the levee route could be optimised based on the existing surface levels. However this is not a simple technical exercise to identify the highest surface levels. Rather, it requires careful consideration of the levee route, including how it passes through different areas of public and private land ownership and existing uses and the existing built form. Levees need to be continuous, and so the continuity of the levee between different sections also needs to be considered.

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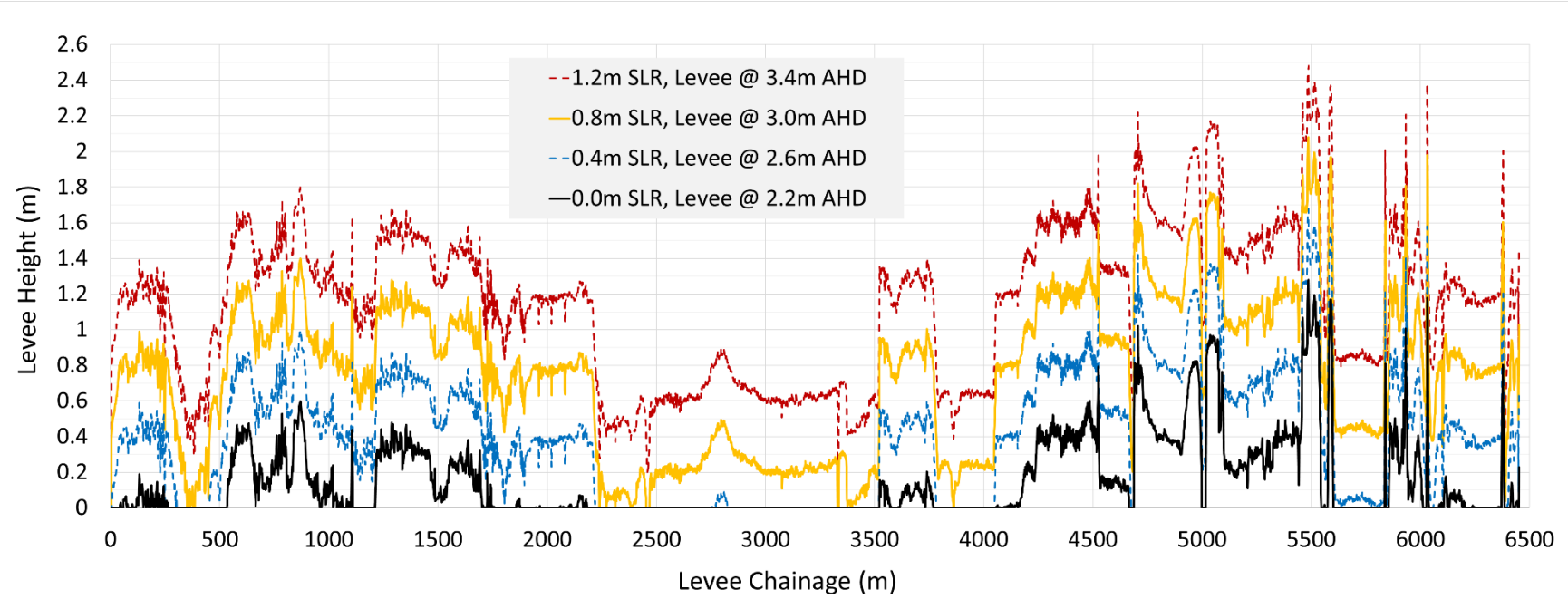
8 Levee Height

The figure below shows the required height of a levee around Fishermans Bend (assuming a route along the waters' edge), for different levee crest elevations (m AHD). Note that 2.2m AHD is Melbourne Water's current 1% AEP tide level of 1.6m AHD plus 0.6m freeboard, and 3.0m AHD is Melbourne Water's future 2100 1% AEP tide level of 2.4m AHD plus 0.6m freeboard. A range is provided due to the inherent uncertainty in the timing of sea level rise.



This figure shows that achieving the current level of protection (including freeboard requirement) with a levee crest at 2.2 m AHD would result in a levee approximately 3.2km long with a maximum height of 1.3m, and the future level of protection (including freeboard requirement) with a levee crest at 3.0m AHD would result in a levee approximately 6.4km long (effectively the entire length of Fishermans Bend) with a maximum height of 2.1m. It is important to highlight that the 600mm freeboard requirement is a significant choice that impacts the extent, height and therefore the form of the levee. Melbourne Water will need to ensure this requirement is discussed and understood by stakeholders.

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9 Levee Extent

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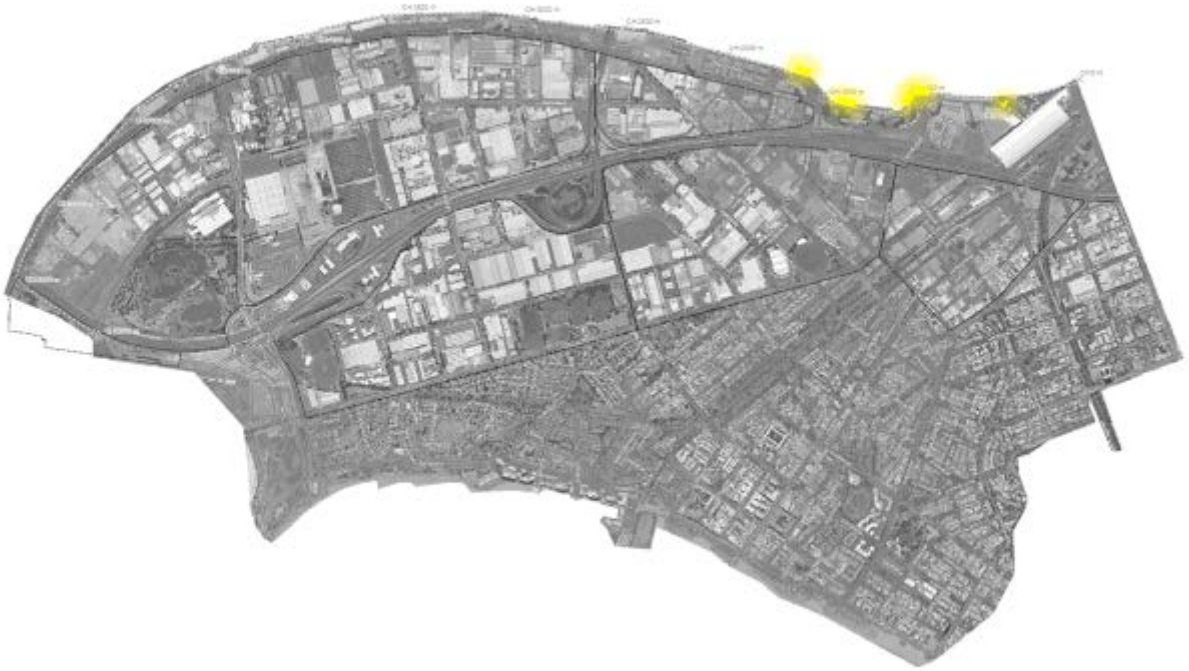
Levee	SLR	Freeboard
1.6 m AHD	0 m	0 mm



Length	Max Height	Ave Height	Timing
292 m	0.7 m	0.3 m	Today

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Levee	SLR	Freeboard
1.9 m AHD	0 m	300 mm

Length	Max Height	Ave Height	Timing
1431 m	1.0 m	0.2 m	Today

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Levee	SLR	Freeboard
2.2 m AHD	0 m	600 mm

Length	Max Height	Ave Height	Timing
3203 m	1.3 m	0.3 m	Today

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Levee	SLR	Freeboard
2.5 m AHD	0.3 m	600 mm

Length	Max Height	Ave Height	Timing
4396 m	1.6 m	0.5 m	2050 from 2040

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Levee	SLR	Freeboard
2.8 m AHD	0.6 m	600 mm

Length	Max Height	Ave Height	Timing
5790 m	1.9 m	0.6 m	2080 from 2060

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Levee	SLR	Freeboard
3.1 m AHD	0.9 m	600 mm

Length	Max Height	Ave Height	Timing
6434 m	2.2 m	0.8 m	2100 from 2075

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Levee	SLR	Freeboard
3.4 m AHD	1.2 m	600 mm

Length	Max Height	Ave Height	Timing
6449 m	2.5 m	1.1 m	Beyond 2100 from 2085

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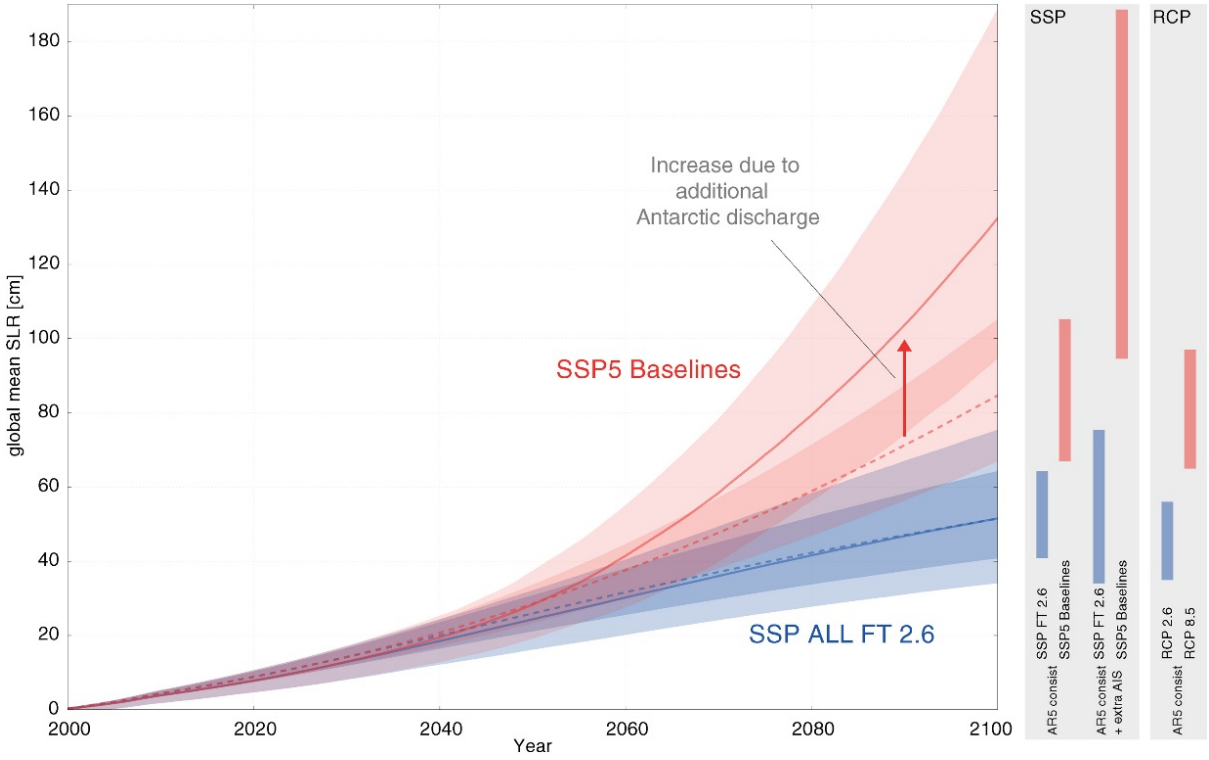
10 Timing

The timing of sea level rise is inherently uncertain. The figure below compares older global mean SLR projections using Representative Concentration Pathways (RCPs), and newer global mean SLR projections using Shared Socioeconomic Pathways (SSPs) with and without the increase in SLR due to the additional Antarctic discharge (a mechanism for ice discharge previously unaccounted for in the models). This demonstrates how the median 0.8m SLR projection for RCP 8.5 has increased to around 1.3m using SSP5 Baselines inclusive of the Antarctic ice discharge. The newer modelling also has much greater ranges of results (greater uncertainty).

Figure. 21st century global mean SLR projections with median and shaded 66% model ranges



Source: Figure 5 from Linking sea level rise and socioeconomic indicators under the Shared Socioeconomic Pathways Alexander Nauels et al 2017 Environ. Res. Lett. 12 114002 doi:10.1088/1748-9326/aa92b6

In simple terms, this graph shows that 0.4m of SLR could occur as early as 2050 and 0.8m of SLR could occur as early as 2070, and that by the end of the century SLR could be as high as 1.8m.

This highlights the critical importance of adaptation over time in response to this uncertainty when thinking about the levee, and not simply relying on designing to the current 0.8m SLR requirement.

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11 Issues and Risks

The following risks have been summarised for the levee, and the proposed responses identified. Further exploration of some of the issues are then presented in the sub-sections following.

Table 1 Issues and Risks

Risk or Issue	Description	Response
Levee Height Uncertainty	The appropriate levee height is relates the future rate of sea level rise, whether or not freeboard is required, and the level of service (standard of protection) to be provided.	As per DELWP's Levee Management provide a starting position that a 600mm freeboard should be provided for public urban levees, subject to guidance otherwise from the relevant authority (in this case Melbourne Water). A 600mm freeboard should be assumed until MW provides clear guidance otherwise and this is agreed with relevant stakeholders. The levee height and standard of protection should be considered in the context of a broader risk assessment at Fishermans Bend. *Sea level rise is discussed below.*
Sea level rise higher than predicted	Sea level rise (SLR) increases beyond 0.8m by 2100. A levee designed for 2.25m AHD, and no freeboard, may result in a levee failure (by over-topping) from more regular events. Velocities would be relatively low, but may be high in some areas if this results in a levee breach.	An adaptive pathways approach is used in the design of the levee. This would commit to providing protection up to 0.8m SLR by 2100. Initial works could be delayed or staged over time. Additionally, options to construct an even higher levee to protect against levels above 0.8m SLR should be kept open. Whilst not committing to a levee of this height, this might require preparatory actions to be taken now or in the short term (e.g. setting aside land, flexibility in design such as stronger foundations, and modifiable urban design) to preserve the ability to construct or adapt a levee in the future if needed. This requires further planning now.
Coastal (tidal) event occurs that is higher than the levee crest	Peak tidal water level is higher than the predicted 1:100 level (e.g. through storm surge) resulting in over-topping of the levee failure.	An allowance for freeboard can mitigate this risk, to an extent.

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Risk or Issue	Description	Response
Yarra River flood flows are higher than current designated flood level	Melbourne Water's designated flood level may change in the near term for the Lower Yarra River (upstream of Wurundjeri Way), dependant on the outcomes of an underway MW flood study. This could result in a risk that part of the levee is too low and is overtopped. This has implications for Fishermans Bend (and other areas), including the extent and height of the levee, and updating planning controls (e.g. LSIO and floor level requirements).	An agreed approach to manage the levee design and planning controls once the final Yarra River flood level is determined in 2019 is required. Allow for flexibility to accommodate the outcomes of this future work.
Uncertainties in Levee Design, Extent and Cost	In the context of the above uncertainty, the height, location/route, form/type, cross section, land take requirement and cost of levee are not yet determined. The need for some more significant landscaping is a key risk, as is the potential need for freeboard or a higher level in certain locations due to existing flood risk from Lower Yarra Flooding. The extent and therefore cost of the Levee is difficult to estimate.	Detailed discussions with all related parties are required to develop levee concept(s) to enable these issues to be worked through. Although the construction of a levee may be deferred to the future, it is important to develop the long term plan now. Further work will be required following this strategy relating to the planning of the levee, including concept development of an optimal route, consideration of urban design/landscaping and existing land ownership/use. Need to allow for a flexible process to adjust the scope, budget and funding (or recover additional costs) if needed in the future.

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12 Costs

There is too much uncertainty to provide a meaningful cost estimate for the levee. Further work is needed to develop a full concept for the levee, along an identified alignment, with defined height and form of the levee in each segment, to enable costing to be done.

However, for high level information purposes, a cost estimate has been prepared using the costing basis agreed with Melbourne Water for the Baseline Drainage Plan (GHD for Melbourne Water, 2018). This is using a nominal rate of \$1000 / m^3, assuming a nominal 1m wide concrete levee. This results in a cost of \$4.85m for a continuous levee along the water's edge at 3.0m AHD. The cost estimate makes no allowance for land purchase, or the potential significant additional cost of incorporation of the flood levee within new future development.

13 Ability to Implement

As part of any further work on the levee, it will be important to include consideration of the existing land use zonings, land ownership, existing uses, of the land along the possible routes the levee may take. This will be necessary to consider the way in which the levee can be delivered and identify what limitations/constraints exist.

14 Recommendations

It is strongly recommended that more detailed work is undertaken on the planning of the levee, including concept development of an optimal route(s) with consideration of urban design/landscaping and existing land ownership and use. This will enable costing and other implementation planning issues to be explored properly.

Detailed discussions with all related parties will be required to progress the levee concept(s) to enable these issues to be worked through. Although the construction of a levee in certain areas of Fishermans Bend may be deferred to the future, it will be important to develop the long term plan now. This will consider what preparatory actions need to be taken now, how it will be staged over time, and how it can be adapted to changing circumstances in the future

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