Appendix J – Costs Memorandum

Memorandum

01 March 2019

To	Melbourne Water Corporation		
Copy to	Fishermans Bend Task Force		
From	Ryan Brotchie	Tel	+61 3 8687 8827
Subject	Preliminary cost estimates for ICP	Job no.	3136555

1 Introduction

This memorandum presents preliminary cost estimates for the 'Water Sensitive' or 'Hybrid' drainage infrastructure for Fishermans Bend, for input to the Infrastructure Contributions Plan (ICP).

2 Scope

This cost estimate presents the infrastructure quantity and cost estimates for drainage infrastructure that is required within the drainage catchments at Fishermans Bend. This includes **upgrades of existing underground drainage pipes** in certain catchments, and **distributed flood storages within streetscapes and public open space** in other catchments**.** The distributed storages refers to the use of linear parks, tree pits and public open spaces as flood storages, as an alternative to underground pipe upgrades in certain (but not all) locations.

A range of other drainage infrastructure is also required, including new pumps, new pipes (required to transfer flows laterally to the new pump stations), a levee, rainwater tanks at buildings, as well as traditional minor drainage infrastructure. Some of these components, but not all, are being costed by GHD as part of the *Water Sensitive Drainage Strategy* work. Refer memorandum *Draft Costing Framework for Differential Costing* (GHD to Melbourne Water Corporation, 29th Oct 2018) for more details.

3 Document Version

This memorandum provides more detailed information than was provided in the earlier version (dated 13th February 2019). There are no material changes.

The version provided on 13th February 2019 revised the original provided on 19th December 2018. The key changes from the earlier document included:

- Removal of $5.4M of costs for the upgrade of existing underground drainage pipes in the Todd Rd Drain catchment, as these upgrades provided minimal flood mitigation benefit.
- Re-categorisation $3.1M of costs for underground pipe infrastructure north of Montague Precinct, in the Cargo Ln PS East catchment, from "new pipes" (associated with the pump stations) to "upgrade of existing pipes" (due increase hydraulic capacity).

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- Clearer presentation of the proposed approach and associated costs within each sub-catchment.

4 Catchments with Distributed Storages or Existing Pipe Upgrades

Table 1 below shows the current agreed approach to drainage, as presented at the Drainage Sub-Committee Meeting on the 6th December 2018.

Table 1 Catchment by Catchment Drainage Approach

Drainage Approach	Sub Catchment
HYBRID (STORAGE)	River Esplanade PS
	Salmon St Drain
	Salmon St PS
	Hall St PS
	Poolman St Drain
	Butchers Ln Drain
BASELINE (PIPE UPGRADES)	Cargo Ln PS East / Wurundjeri Way
	Cargo Ln PS
BASELINE (NO UPGRADES REQUIRED)	Todd Rd Drain
	Todd Rd PS
	Sabre Drive PS
	Westgate Lakes

The catchment boundaries are shown in the map below (which represents the water sensitive drainage strategy

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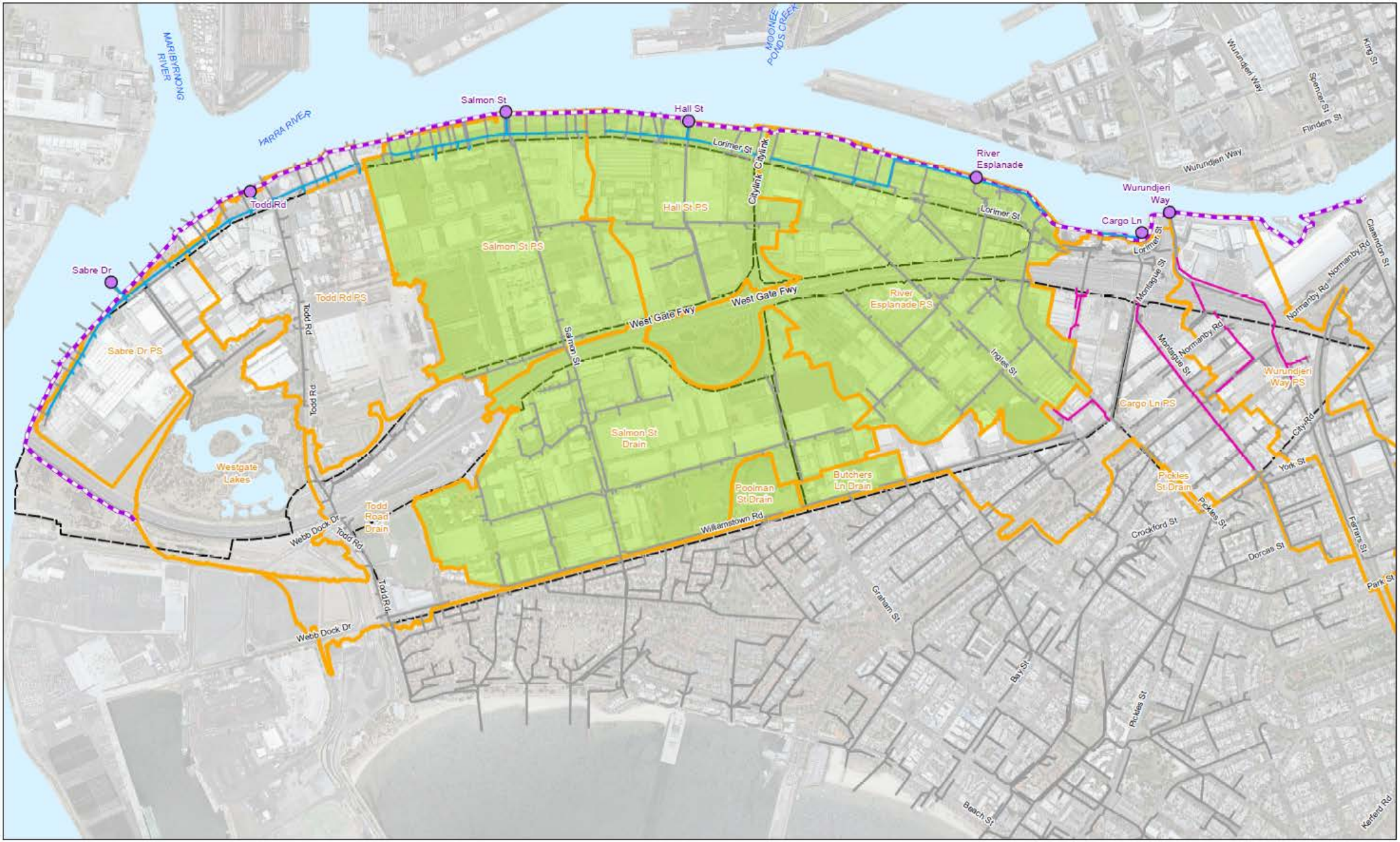

Paper Size A3

0 62.5 125 250 375 500

Metres

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

N

LEGEND

- Proposed Pump Stations
- Proposed Levee
- Existing Pipes
- Precinct Boundaries

Proposed Pipes

- Duplicate / Upgrade
- New

Proposed Catchment Approach

- Baseline
- Distributed Storage

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FISHERMANS BEND WATER SENSITIVE DRAINAGE & FLOOD STRATEGY

Job Number	31-36555
Revision	A
Date	05/04/2019

Proposed Drainage Infrastructure

Figure 11

G:\31\36555\GIS\Maps\Working\3136555_Fishermans_Bend_ASL.mxd

Data source: DELWP, VicMap, CIP Imagery (Jan 2017), Precinct Boundaries, 2018; CoPP/CoMMWC, Existing Drainage Network, 2018; Created by: splaird

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5 Excavation Costs for Storages

5.1 Cost Rate

A **cost rate of $340/m^3 (ex GST)** has been adopted uniformly across the whole of the study area. This reflects the contamination rate for offsite disposal that has been proposed for use in the ICP for Fishermans Bend (Source: Table 8, Memorandum to Todd Berry, DELWP, *Contamination Cost Information to Support Infrastructure Contribution Plan, Fishermans Bend Redevelopment,* 2 December 2018, prepared by Golder).

A separate site specific contamination rate, per m^2, may apply to storages in public parks and open spaces. However it has been assumed that these site specific investigations would need to be undertaken separately anyway, and so have not been included to avoided any duplication.

5.2 Disposal Volume Quantities

The table below shows the required storage volumes for each of the catchments that, based on current strategic intent (but subject to further planning work to confirm), will have distributed storages rather than pipe upgrades. The **"Total Disposal Volume" includes a further 20% contingency** to allow for the potential need to excavate additional material.

Table 2 Quantity of Contaminated Soil Offsite Disposal required for Storages

Catchment	Employment Precinct?	Functional storage volumes required in streetscape or open space (m^3)	Total Disposal Volume (m^3)
Butchers Ln Drain	Other	413	**495**
Poolman St Drain	Other	1,575	**1,890**
River Esplanade PS	Other	2,987	**3,585**
Salmon St Drain	Other	12,515	**15,018**
Salmon St PS	Employment	2,936	**3,523**
Hall St PS	Employment	4,198	**5,037**
Grand Total		24,624	**29,548**

5.3 Streetscape and Open Space Storage Volume Requirements

The location of the storage volumes within each catchment will be the subject of further planning.

Work to date has identified, at a high level, the quantity of storage that could feasibly be designed into the linear parks and tree-pits within streetscapes, and if required, the additional storage volume that is

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required within public open space to achieve the necessary storage requirements. This is summarised in Table 3.

Table 3 Storage required in Streetscape vs. Open Space

Catchment	Required Storage (m3)	Feasible Storage above 1.4m AHD (m3)	Streetscape Storage Assumed (ML)	% of Feasible Streetscape Storage that is needed to meet requirement (%)	Open Space Storage Assumed (ML)
River Esplanade PS	2,987	17,162	2,987	17%	0
Salmon St Drain	12,515	13,730	12,515	91%	0
Butchers Ln Drain	413	727	413	57%	0
Poolman St Drain	1,575	345	345	>100%	1,231
Salmon St PS	2,936	Not known	Not known	Not known	Not known
Hall St PS	4,198	Not known	Not known	Not known	Not known

Distribution by Precinct – Streetscape Storage

The spatial distribution of the storage volumes within each catchment will be the subject of further planning. However, if the streetscape storage was distributed evenly across the catchment (in accordance with the assumptions for each street typology) then there would be a breakdown across precincts as shown in Table 4.

Table 4 Streetscape Storage Breakdown by Precinct

Catchment	Lorimer	Montague	Sandridge	Wirraway	Grand Total
Butchers Ln Drain			100%		100%
Poolman St Drain				100%	100%
River Esplanade PS	24%		76%		100%
Salmon St Drain			20%	80%	100%

Distribution by Precinct – Open Space Storage

The additional storage required in the Poolman St Drain catchment is expected to be provided within the JL Murphy Reserve within the Wirrway Precinct.

5.4 Streetscape Storage Assumptions

The “feasible storage volume”, expressed as m^3 of storage per linear metre of streetscape, for each of the street typologies for each local government is summarised in Table 5 below.

Typically the tree pit storages are assumed to have the following characteristics, unless noted otherwise:

- Spaced at 10m intervals (allows for gaps at intersections)

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- Depth = 0.3m
- Length = 1.5m
- Width = Varies

The key assumptions for the linear park storage are:

- Width = Varies, up to 12m
- Depth = 0.5m (except where otherwise noted for CoM typologies)

Table 5 Feasible Street Storage Volumes by Street Typology

CoPP

Street typology	Linear park width (m)	Lines of trees (no)	Tree pit detention (m3/m)	Total storage (m3/m)	Notes
1. Arterial Road (30m)	0	3	1.23	1.23	Continuous swale/raingarden in central median
2. Arterial Road with tram (30m)	0	3	0.52	0.52	See Section
3. Plummer / Fennell Street civic boulevard (36m)	0	4	1.06	1.06	See Section
4. Buckhurst Street civic boulevard (30m)	12	3	0.17	6.17	Assumed 10m spacing and 4m long rain gardens
5. Collector Street with bus (30m)	0	2	0.72	0.72	See Section
6. Collector / Local Street with 12m linear park (30m)	12	3	0.05	6.05	Tree pits vary in width from 1m to 1.4m
7. Collector / Local Street with on-street car parking (30-34m). No linear park specified	9	4	0.60	5.10	See Section
8. Local Street with 12m linear park (34m)	12	4	0.35	6.35	Assumed 10m spacing and 1.5m long tree pits
9.1 Local Street with 12m linear park and recreational cycling path (34m)	12	4	0.46	6.46	Alternating between raingardens and tree pits
9.2 Local Street with 12m linear park and recreational cycling path (30m)	12	3	0.07	6.07	Alternating between raingardens and tree pits
10. Local Street (22m)	0	3	0.54	0.54	Alternating between raingardens and tree pits
11. Local Street no separated cycle path (20m)	0	3	0.79	0.79	Unspecified length between car parks
12.1 Local Street (15m)	0	3	0.47	0.47	Assumed 1.5mx1.5m tree pits
12.2 Local Street (12m)	0	3	0.45	0.45	Assumed a width of 1.7m
12.3 Local Street (24m)	12	2	0.45	6.45	Included linear park
12.4 Local Street (13m)	0	3	0.00	0.00	No water storage
12.5 Local Street (10m)	0	0	0.00	0.00	No water storage
13. Blue St (6 m)	0	0	0.00	0.00	Assumed (see calculation below)

CoM

Street typology	Linear park width (m)	Lines of trees (no)	Tree pit detention (m3/m)	Total storage (m3/m)	Notes/Assumptions
1.Arterial Street	0	2	0.29	0.29	Spacing assumed to be 10m and tree pits 1.5m x 1.5m
2.Collector Street	6	3	0.14	3.14	Spacing assumed to be 10m and tree pits 1.5m x 1.5m
3.Neighbourhood Street	6	2	0.09	3.09	Spacing assumed to be 10m and tree pits 1.5m x 1.5m
4.Local Street	0	1	0.09	0.09	Spacing assumed to be 10m and tree pits 1.5m x 1.5m
5.Service Acess	2.5	1	0.00	0.75	Assumed 2.5m wide linear park at depth of 0.3m
6.Laneway - 9m	1	1	0.00	0.30	Assumed 1m wide linear park at depth of 0.3m
7.Laneway - 6m	0	0	0.00	0.00	No trees or linear park
8.Civic Boulevard - Treatment 1 - Lorimer Street	0	3	0.12	0.12	Spacing assumed to be 10m and tree pits 1.5m x 1.5m
9.Civic Boulevard - Treatment 2 - with open space	2.5	3	0.24	1.49	Spacing assumed to be 10m and tree pits 1.5m x 1.5m
10.Civic Boulevard - Treatment 3 - with vehicular	6.5	3	0.24	3.49	Spacing assumed to be 10m and tree pits 1.5m x 1.5m

Refer to the attached spreadsheet ("3136555_Street_Typology_Storage.xlsx") for the calculations of tree pit and linear park storage for each street typology.

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5.5 Costs

The costs for the offsite disposal of contaminated soil for the storages in each catchment is summarised in the table below.

Table 6 Costs of Contaminated Soil Offsite Disposal required for Storages

Catchment	Employment Precinct?	Total Disposal Volume (m^3)	Cost ($M)
Butchers Ln Drain	Other	495	**0.17**
Poolman St Drain	Other	1,890	**1.71**
River Esplanade PS	Other	3,585	**0.64**
Salmon St Drain	Other	15,018	**1.22**
Salmon St PS	Employment	3,523	**5.10**
Hall St PS	Employment	5,037	**1.20**
Grand Total		29,548	**10.05**

5.5.1 Other potential costs

Other associated costs with constructing the storages, including batters, edge treatments, concrete steps, urban design features, etc. have not been allowed for. These costs are assumed to be captured as part of the typical streetscape (i.e. regardless of whether there is storage in the streetscape or not) and being quantified/costed by other parties (if applicable).

5.5.2 Contingency

There is no contingency applied to the above costs. It is noted that contingencies are included in the cost rate provided by Golder for contaminated soil disposal.

However, there is a large degree of uncertainty associated with this approach. It is novel, and it is possible that additional unanticipated costs will be identified as detailed planning proceeds. A large contingency is recommended to be applied to the above costs.

5.5.3 Avoided Costs

The use of the distributed storages approach is estimated to avoid $30.19M in upgrade of existing underground drainage pipes in four sub-catchments (in addition to reduction in size/cost of pump stations). This information is presented in Table 7 for context.

Table 7 Avoided existing pipe upgrades

Catchment	Avoided cost of existing pipe upgrades (in catchment) ($M)
Hall St PS	3.43
River Esplanade PS	9.29

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Salmon St Drain	13.16
Salmon St PS	4.31
Total	30.19

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6 Existing Drainage Pipe Upgrade Costs

The costs of the existing drainage pipe upgrades within each catchment have been reported below.

Table 8 Existing Drainage Pipe Upgrade Costs

Catchment	Existing pipe upgrades (in catchment) ($M)
Cargo Ln PS	8.92
Cargo Ln PS East (Wurundjeri Way)	7.27
Total	16.18

Table 9 Existing Drainage Pipe Upgrade Costs – Breakdown by Precinct & Catchment

	Existing pipe upgrades (in catchment) ($M)		
Precinct	Cargo Ln PS	Cargo Ln PS East	Total
External	0.36	2.00	2.36
Montague	5.67	5.26	10.93
Sandridge	2.89	0.00	2.89
Total	8.92	7.27	16.18

Some of these pipe upgrades are physically located immediately North of the Montague Precinct (and to lesser extent North of the Sandridge Precinct). Although outside the precincts, these upgrades are providing conveyance capacity to alleviate flooding within those precincts that is caused by stormwater runoff primarily (but not exclusively) generated from within those precincts. Noting that there is some upstream catchment area that sits outside of (to the South of) the precincts.

It is understood however that the proportion of the catchment that sits within/outside of the Fishermans Bend may be useful for the ICP, so this is provided in the next section.

6.1 Catchment Area Breakdown

The table below breaks down the catchment areas by precinct, and by areas outside of the precincts. Regarding the latter, these are sub-categorised as being upstream or downstream of the precinct (or Westgate Freeway).

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Table 10 Catchment Breakdown

Catchment	Precincts					Outside Precinct Boundaries			Grand Total
	Employment	Lorimer	Montague	Sandridge	Wirraway	Downstream	Upstream	Westgate Fwy	
Butchers Ln Drain	0%	0%	0%	97%	3%	0%	0%	0%	100%
Cargo Ln PS	0%	0%	31%	26%	0%	14%	29%	0%	100%
Cargo Ln PS East	0%	0%	53%	0%	0%	44%	3%	0%	100%
Hall St PS	76%	7%	0%	0%	0%	17%	0%	0%	100%
Poolman St Drain	0%	0%	0%	0%	100%	0%	0%	0%	100%
River Esplanade PS	0%	22%	0%	46%	0%	16%	0%	15%	100%
Sabre Drive PS	96%	0%	0%	0%	0%	4%	0%	0%	100%
Salmon St Drain	0%	0%	0%	13%	80%	0%	1%	5%	100%
Salmon St PS	85%	0%	0%	0%	0%	11%	4%	0%	100%
Todd Rd Drain	5%	0%	0%	0%	27%	24%	0%	44%	100%
Todd Rd PS	90%	0%	0%	0%	0%	10%	0%	0%	100%
Westgate Lakes	80%	0%	0%	0%	0%	0%	20%	0%	100%

A spreadsheet versions of this catchment breakdown has been provided (refer "3136555_Catchment_Area_By_Precinct.xlsx").

6.2 Cost Assumptions

The costs for drainage pipes are sourced from the Baseline Drainage Plan (GHD, 2018).

The cost rates applied are summarised in Table 11 below. Note that individual adjustments have not been made to reflect the unique local characteristics for each individual upgrade.

Table 11 Drainage infrastructure cost rates

Work Type	Base cost rate ($/unit)	Cost Factor (applied to base rate)
225 mm diameter pipe	900	3
300 mm diameter pipe	930	3
375 mm diameter pipe	930	3
450 mm diameter pipe	1000	3
500 mm diameter pipe	1000	3
525 mm diameter pipe	1075	3
600 mm diameter pipe	1150	3
650 mm diameter pipe	1180	3
675 mm diameter pipe	1200	3
750 mm diameter pipe	1250	3
825 mm diameter pipe	1300	3
900 mm diameter pipe	1350	3
1050 mm diameter pipe	1455	3
1200 mm diameter pipe	1575	3
1350 mm diameter pipe	1710	3
1450 mm diameter pipe	1710	3

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Work Type	Base cost rate ($/unit)	Cost Factor (applied to base rate)
1500 mm diameter pipe	1855	3
1650 mm diameter pipe	2160	3
1800 mm diameter pipe	2435	3
1950 mm diameter pipe	2555	3
2100 mm diameter pipe	3110	3
2250 mm diameter pipe	3340	3
2400 mm diameter pipe	4040	3
2700 mm diameter pipe	4590	3
3000 mm diameter pipe	5210	3
3125 mm diameter pipe	6000	3
3 X 1.5 m RCBC	2351	3
Junction pits, jacking pits & inlet/outlet structures	50000	1

The Baseline Drainage Plan (GHD, 2018) notes that:

- "*Hydraulically deficient pipes were upgraded or duplicated on main drainage branches where necessary. The pipe drainage has only been sized based on hydraulic considerations. No other considerations have been given in their design including potential conflicts with other services, issues with groundwater or contaminated land*."
- *"The pipe drainage costs were calculated using Melbourne Water's drainage scheme costing spreadsheet (2013) … In these calculations a cost factor of 3 was applied to the standard pipe rates, which reflects the additional costs of constructing drainage pipelines along major roads within busy central areas of Melbourne."*

Refer to the Baseline Drainage Plan (GHD, 2018) for the detailed assumptions associated with these cost estimates.

6.3 Contingency

The costs provided above are direct construction costs only. Further allowance/contingency is needed for additional preliminaries, design and delivery costs.

6.4 Assumptions and Limitations

- Refer to the Baseline Drainage Plan (GHD, 2018) for the detailed assumptions associated with these cost estimates.
- The pipe upgrade costs presented above are subject to change, pending provision of alternative cost estimates generated by Melbourne Water with input from KBR/John Holland.

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- The adoption of the distributed storages approach will be subject to further planning and consideration of various implementation considerations. If needed, there can be a reversion to the baseline drainage approach (upgrade of existing pipe infrastructure.
- As discussed earlier in the memorandum, there are further new pipe and new pump costs that are required and are not captured in the cost estimates above.

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7 Limitations

This memorandum must be read in conjunction with the scope and limitations outlined in the Fishermans Bend Water Sensitive Drainage and Flood Management (GHD for Melbourne Water Corporation, 2018).

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