West Lakes Stormwater Management Plan

Consultation Summary Report

City of Charles Sturt

1 February 2022
Ref: 20190818R005Rev0

tonkin

Building exceptional
outcomes together

Document History and Status

Rev	Description	Author	Reviewed	Approved	Date
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Contents

Project: West Lakes Stormwater Management Plan | Consultation Summary Report
Client: City of Charles Sturt
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Figures

1 Introduction to the SMP process

What is a Stormwater Management Plan?

The Stormwater Management Authority (SMA), through the implementation of the *Local Government (Stormwater Management) Amendment Act 2007*, is charged with the responsibility of working with councils to facilitate stormwater management planning and to allocate state funding to projects in collaboration with Councils and other funding bodies. Its establishment was a key element of an agreement between the South Australian Government and Local Government Association on the management of stormwater within the state. The agreement outlines the responsibilities for stormwater management and aims to support catchment scale stormwater planning to ensure adequate consideration of flood mitigation, water quality and reuse opportunities.

A key element of the SMA's Strategic Plan is to identify the need for, and then drive the development of Stormwater Management Plans across South Australia. A Stormwater Management Plan (SMP) is a strategic planning document which aims to address existing stormwater problems within a catchment, or catchments, and identify opportunities for providing a range of benefits through a multi-objective planning process. This multi-objective planning includes consideration of flood risk, protection of water quality and opportunities for stormwater reuse.

Why is an SMP being prepared?

Flooding is a known issue within the West Lakes catchment. Floodplain mapping of the various sub-catchments which make up the study area was undertaken between 2005 and 2012. The modelling showed that inundation of private property is likely to occur during heavy rainfall events. This is consistent with historical reports of flooding received by Council.

With increasing levels of infill development occurring within the catchment and a projected increase in rainfall intensity associated with climate change, flooding of private property within the study area will likely become more frequent and more extensive.

The SMP provides the framework for a coordinated and multi-objective approach to the management of stormwater on a whole of catchment basis. Building on the previous work, it considers future catchment conditions (at a timeframe consistent with the design life of stormwater infrastructure) and aims to address stormwater related issues and identify opportunities that provide a range of benefits, including flood mitigation, beneficial reuse and improved water quality, amenity and biodiversity.

What does an SMP aim to achieve

The intent of a stormwater management plan is to set out strategies, actions and programs that can be implemented to provide a long-term, sustainable approach towards stormwater management.

An SMP seeks to ensure that stormwater management is addressed on a total catchment basis with buy-in from all relevant stakeholders including various local government authorities and state government agencies responsible for the catchment working together to develop, implement and fund a coordinated and multi-objective approach to the management of stormwater for the area.

The plan will not only be used as a basis for developing budgets for the works, but may also help secure other funding from the works from external stakeholders including the capital works funding from the SMA.

How is an SMP developed?

The SMP has been developed in accordance with the SMA's Stormwater Management Planning Guidelines (2007), which provides a framework to ensure consistency in the planning and implementation of projects and measures across the state.

The guidelines state that the SMP must:

- Identify the objectives and outcomes for management of stormwater in the catchment, as defined by Council and the NRM Board.

- Clearly define the area covered by the plan.
- Describe all known existing stormwater assets within the catchment.
- Through the use of modelling, historical records and technical investigations, identify stormwater management problems and opportunities, including flooding risk, water quality and reuse potential.
- Based on the outcomes of the investigations, identify strategies (structural and non-structural) to meet the specified management objectives for the catchment.
- Determine capital and maintenance (including recurring) costs associated with the management strategies and how those costs will be apportioned between councils and government agencies if relevant.
- Assess the benefits to be gained by implementation of the proposed management strategies.
- Prioritise the proposed strategies and identify a timeframe for implementation.
- Assign responsibility for implementing the strategies and meeting any costs.
- Provide a plan for communication / consultation of the strategy.

The process to date has included a large amount of data collection and analysis, followed by detailed computer modelling to predict the risk of flooding under future catchment conditions. These models have been used to produce flood inundation maps within the catchment, as well as estimating the likely pollutant loads that are discharged to West Lakes.

Results of the modelling and analysis have enabled a list of management strategies to be developed. These strategies have been tested for effectiveness and the costs for implementation have been estimated.

Further details of the work undertaken to date, the outcomes, and the next steps are provided in the following sections.

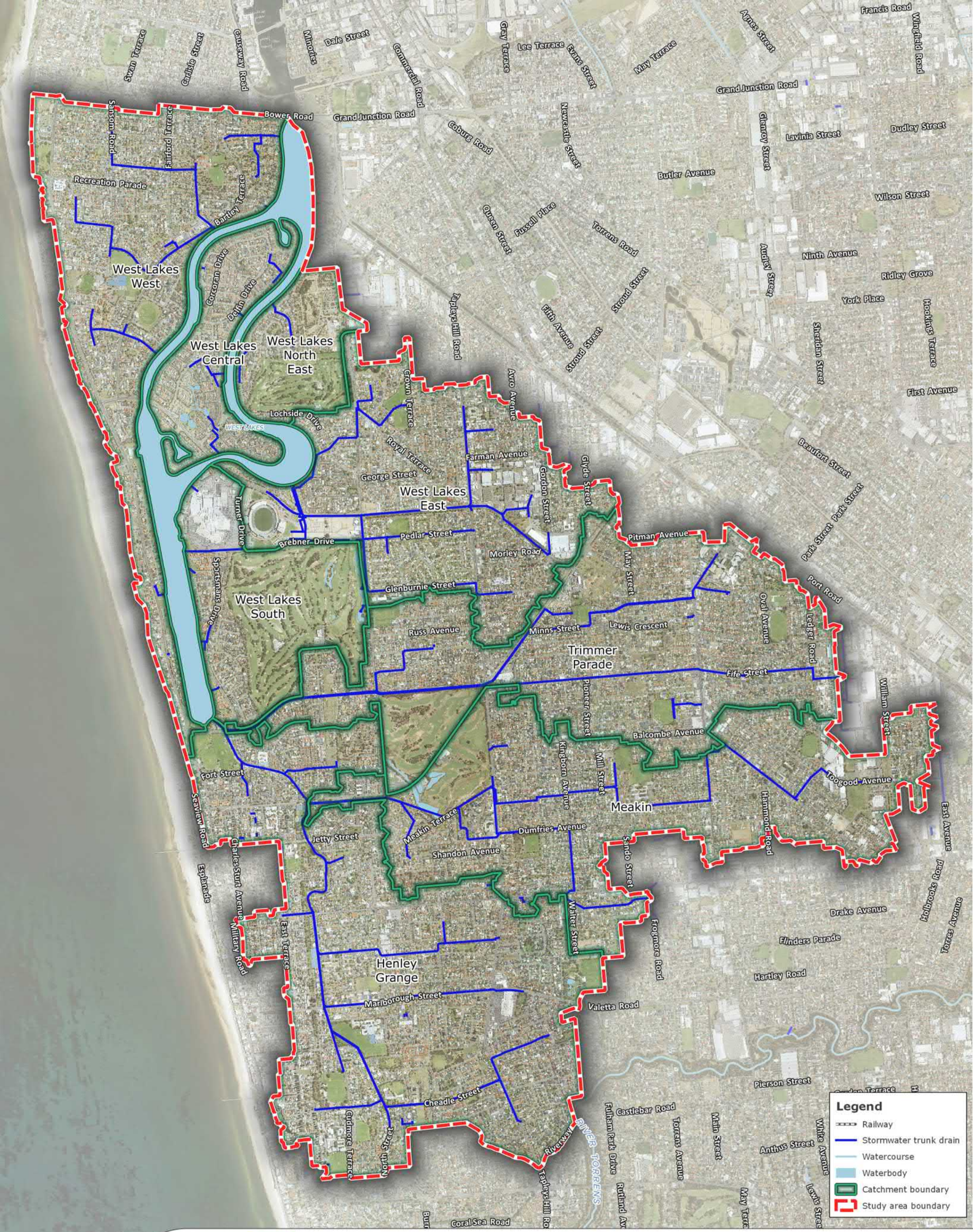
2 The study area

The study area for the West Lakes SMP consists of eight sub-catchments which discharge to West Lakes ('the Lake'). The study area, which is shown in Figure 1, has a total area of approximately 25 km^2 and extends along the coast from Semaphore Park in the north to Henley Beach in the south and towards Port Road to the east. The study area is located entirely within the City of Charles Sturt.

The study area is predominantly residential in nature, and most of the area is heavily developed. An extensive underground drainage network services the catchment, conveying stormwater runoff to multiple discharge points within the Lake, either directly or via an open channel.

There are currently 24 gross pollutant traps/debris collectors, along with a number of Council and privately owned wetlands which provide a level of stormwater quality improvement prior to discharge in the lake. The Waterproofing the West Scheme provides recycled water for the irrigation of some reserves within the study area.

Reflecting the long design life of stormwater infrastructure, the SMP considers the likely state of the catchment in 2070. Based on the provisions in the newly released Planning and Design Code, and projections of future climate, the modelling underpinning the SMP adopts an assumption that residential blocks will be 85% impervious, and there will be a 10% increase in rainfall intensity, with a 0.5 m rise in sea level.


West Lakes West
West Lakes Central
West Lakes North East
West Lakes East
West Lakes South
Trimmer Parade
Meakin
Henley Grange
Swan Terrace
Carlisle Street
Causeway Road
Minories
Dale Street
Commercial Road
Gray Terrace
Lee Terrace
Evans Street
May Terrace
Agnes Street
Francis Road
Wingfield Road
Grand Junction Road
Sansom Road
Fairford Terrace
Bower Road
Recreation Parade
Bartley Terrace
Coburg Road
Newcastle Street
Glenroy Street
Lavinia Street
Dudley Street
Butler Avenue
Wilson Street
Queen Street
Fussell Place
Torrens Road
Audley Street
Ninth Avenue
Ridley Grove
York Place
Hookings Terrace
Sheridan Street
First Avenue
Tapleys Hill Road
Fifth Avenue
Stroud Street
Corcoran Drive
Delfin Drive
Crown Terrace
Avro Avenue
Lochside Drive
Royal Terrace
Farman Avenue
George Street
Glyde Street
Gordon Street
Beaufort Street
Park Street
Turner Drive
Brebner Drive
Pedlar Street
Morley Road
Pitman Avenue
Sportsmans Drive
Glenburnie Street
May Street
Port Road
Oval Avenue
Ledger Road
Russ Avenue
Minns Street
Lewis Crescent
Fife Street
William Street
Pioneer Street
Balcombe Avenue
Kingborn Avenue
Mill Street
Toogood Avenue
Hammond Road
East Avenue
Holbrooks Road
Fort Street
Seaview Road
Jetty Street
Meakin Terrace
Dumfries Avenue
Shandon Avenue
Sando Street
Esplanade
Charles Sturt Avenue
Military Road
East Terrace
Walter Street
Frogmore Road
Drake Avenue
Flinders Parade
Hartley Road
Torres Avenue
Marlborough Street
Valetta Road
Cheadle Street
Gudmore Terrace
North Street
Riverway
Tapleys Hill Road
RIVER TORRENS
Fulham Park Drive
Castlebar Road
Torrens Avenue
Main Street
Anthus Street
White Avenue
Pierson Street
Rutland Avenue
May Terrace
Lewis Street
Coral Sea Road
Legend
Railway
Stormwater trunk drain
Watercourse
Waterbody
Catchment boundary
Study area boundary
0
1,000
2,000
3,000 m
N
tonkin
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Filename: 20190818GQ002
Revision: Rev A
Date: 2021-10-27
Drawn: MM
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Watercourses from Data SA, 2018
Roads and railways from Data SA, 2019
CITY OF CHARLES STURT
WEST LAKES STORMWATER MANAGEMENT PLAN
STUDY AREA
Figure 1

3 Identification of flooding

One of the primary objectives of the SMP is the identification of issues associated with flooding within the study area. To achieve this, flood modelling and mapping was undertaken using industry best-practice methods and software. The modelling was used to develop a set of flood maps that show the extent and depth of flooding for a range of floods. Each flood event is described by the probability of the flood event occurring in any year, known as the Annual Exceedance Probability (AEP). For example, a large flood calculated to have a 1% chance of occurring in any one year is described as the 1% AEP event.

The flood maps identify the risk of flooding across the catchment. This then feeds into the development of flood mitigation strategies. The maps can also be used to inform planning and development.

The flood maps for the 20% AEP flood event and 1% AEP event are shown in Figure 2 and Figure 3 respectively. Typically, underground stormwater networks are designed to convey flows for events up to the 20% AEP event. The modelling of the West Lakes catchment indicates that in some areas, the underground network has insufficient capacity for the frequent events (up to and including the 20% AEP event). This results in stormwater ponding and/or flowing within the road reserve, with ingress of floodwaters into private property in some locations. It is estimated that 585 properties would experience some inundation, with 43 residential properties subject to above floor inundation in the 20% AEP event.

Results of the 1% AEP event show widespread areas of inundation across the catchment, with almost 900 residential properties subject to above floor flooding. Given the assumed level of development and increases in rainfall intensity associated with climate change, this level of inundation would be expected, and it is unlikely to be practicable to upgrade the stormwater systems to provide flood protection to all private property.

The identification of key flood prone areas, which underpins the development of flood mitigation options in this SMP, has therefore been based on the identification of areas of significant flooding of private property that occurs in events more frequent than the 1% AEP event.

Review of the flood modelling identified 11 flooding hotspots, which then became the focus for the development of flood mitigation measures. The modelling shows that the most widespread area of modelled inundation within the study area is within the area surrounding Meakin Terrace and Leven Avenue. Information provided by Council indicates that this is consistent with historical events, with flooding in this area reported during the heavy rainfall events that occurred in 2016.

4 Flood mitigation measures

The SMP identifies a range of structural and non-structural strategies to reduce the frequency and severity of flood impacts within the study area. An overview of the structural mitigation measures detailed within the SMP is provided in Figure 4. Further details of the measures that are recommended to be implemented within the next ten years are provided in the following sections.

It should be noted that the focus of the SMP is to identify key drainage upgrades and development controls, and it does not seek to address all drainage issues across the study area. It is expected that the flood maps will be used by Council in the future to identify the need for additional, smaller-scale stormwater improvement works.

Modelling indicates that implementation of the identified structural measures could reduce the number of properties with flood inundation from 585 to 339 in a 20% AEP event and from 3728 to 3061 in a 1% AEP event. The number of residential properties subject to above floor flooding would be reduced from 43 to 6 in a 20% AEP event and from 896 to 581 in a 1% AEP event. Implementation of the works could result in a reduction in financial flood damage costs from $4.9 million to $2.8 million per year (i.e. up to $2.1 million reduction in damages (on average) every year). The total cost of the structural works is estimated to be $84 million.

Post-mitigation flood maps for the 20% AEP flood event and 1% AEP event are shown in Figure 5 and Figure 6 respectively.

Stage 1 of Gleneagles Reserve Underground Tank (Highest priority)

Underground detention within Gleneagles Reserve has been identified as a high priority measure, intended to mitigate flooding in the area surrounding Meakin Terrace and Leven Avenue. Underground detention, as opposed to an open basin has been recommended due to the high levels of use of the reserve.

A total storage volume of 30,000 m^3 is proposed for the ultimate state of development, however it is recommended that the storage be constructed in a staged approach, as the climate and levels of development in the upstream catchment dictate. Modelling shows that the tank provides a significant reduction in the flooding of private property downstream.

During the detailed design process, opportunities to incorporate infiltration or storage and reuse for irrigation purposes may be considered.

Nedford Reserve detention basin (High priority)

Ponding of runoff within York Avenue adjacent to Ford Crescent is estimated to exceed 300 mm in the 20% AEP event. To reduce this flooding it is proposed that an open detention basin be constructed in Nedford Reserve. The modelling indicates that a basin with a surface area of approximately 1,300 m^2 is required. This would occupy slightly less than half the area of the reserve.

Opportunities for landscaping with a variety of native species should be considered during the design process. This will contribute to greening of the study area in addition to improved biodiversity. The results of the modelling for the 20% AEP event (Figure 2) show that the basin provides a significant reduction in flood depths (reduction of 150 mm – 200 mm) within York Avenue and Nedford Crescent.

Beatrice Avenue and Trimmer Parade Pipe Upgrades (High priority)

Flooding within the area surrounding Beatrice Avenue is a known issue, which has been confirmed by the flood mapping undertaken as part of the development of this SMP. The area is currently served by a local drainage network which connects to the Trimmer Parade trunk drain. In order to alleviate the flooding within this area, improving the capacity of this existing drainage network is required.

During the development of the SMP, a number of options looking at localised upgrades were assessed, however it was determined that the effectiveness of these upgrades was limited by the downstream capacity of the Trimmer Parade trunk drain. Pipe upgrades within Trimmer Parade (as far west as Stephen Terrace) are required to provide a suitable level of flood protection to private property within the Beatrice Avenue area. In addition to the duplication of pipes, additional inlet pits will be required in some locations. Opportunities to incorporate water sensitive urban design elements should also be considered as part of the detailed design of the works.

Crittenden Road to Grange Lakes pipe upgrades (Medium priority)

The area in the vicinity of the Findon Road and Crittenden Road intersection has a documented history of flooding, which was confirmed by the flood mapping developed as part of the SMP. This area is serviced by two separate drainage systems. The upstream end of the Trimmer Parage system drains Findon Road in a northerly direction. This system diverts runoff into the existing underground storage within Don Klaebe Reserve before heading west along Trimmer Parade. Upgrades of this system are not proposed. The second drainage network commences within Crittenden Road and conveys runoff from the eastern portion of the catchment in a southerly direction along Findon Road, before heading in a westerly direction to a direct outlet to Grange Lakes. The modelling indicates that the primary issue contributing to the flooding is the limited capacity of the downstream trunk drainage system, and hence a large-scale upgrade of the trunk drainage system as far downstream as Grange Lakes (a total distance of approximately 5.5 km) is required to provide a measurable reduction in flooding in the vicinity of Crittenden Road and Findon Road.

Non-structural measures (High priority)

In addition to the structural flood mitigation strategies described in the preceding sections, there are a number of non-structural strategies that should be considered for reducing the impacts of flooding within the West Lakes catchment. Non-structural strategies generally require low capital investments (compared to the structural strategies) and can be effective for reducing the impacts of flooding on the community.

The non-structural measures recommended for the West Lakes SMP include education and awareness and the incorporation of the flood map outputs into the Planning and Design Code.

5 Water quality improvement and reuse

Stormwater from urban areas has been directly linked to negative impacts on the environments of the Adelaide Coastal Waters which, by definition, includes the Port River.

Stormwater from the study area flow into West Lakes, which is flushed daily with sea water. Flows through West Lakes (predominantly tidal flushing) are estimated to be in the order of 600 ML/day (i.e. 219,000 ML/a). By comparison, water quality modelling undertaken as part of the SMP development estimates that the annual average volumes of stormwater discharging into the Lake are only 3,500 ML/a.

Given the lack of natural habitat in West Lakes, and the strong dilution of stormwater with seawater prior to discharge into the Port River, it is considered that the primary risks associated with stormwater discharges into the Lake are impacts on recreational users, particularly following a rainfall event, accumulation of heavy metals and microplastics in marine species in the Lake (which may be consumed by humans), contribution of suspended solid and nutrient loads to the Port River and coastal environments.

The SMP identifies a number of opportunities to improve water quality, promote beneficial reuse of stormwater and increase biodiversity, while reducing the impacts of urban runoff on the Coastal Waters.

The high priority measures that are recommended include:

- Installation of additional gross pollutant traps at outlet points which are not currently treated, to further reduce the residual load of gross pollutants that are discharged.
- Construction of street scale infiltration and bio-filtration measures (such as raingardens and tree pits). These measures can be incorporated into planned capital works. They reduce the volumes of flows and associated loads of sediments and nutrients discharged to receiving waters. They also contribute to urban greening with associated improved aesthetics and offsetting of urban heat island effects.
- A study to identify the primary cause of the extreme concentrations of microplastics on the beaches in West Lakes.
- Implementation of strict sediment controls for developments within the study area.

As previously discussed, the Waterproofing the West (WPW) scheme currently supplies non-potable water to a number of reserves within the study area. To increase the extent of beneficial reuse within the study area, it is recommended that Council should investigate how small-scale projects which promote the beneficial reuse of water within the study area can be promoted as a high priority action. Opportunities to augment the existing WPW scheme should be considered as a medium priority action.

6 Asset management

One of the objectives of the SMP is to ensure that sustainable management of stormwater infrastructure, including maintenance, is undertaken. As part of a sustainable approach to stormwater management, Council should ensure that it has asset maintenance plans for all infrastructure.

Planning should be undertaken to identify gaps in existing asset management plans, and in particular knowledge about the state of key existing infrastructure as a high priority action.

7 How to contribute to the SMP process

The SMP is currently in draft form and is open for public consultation. A full copy of the draft SMP and flood maps can be accessed at Council's website www.yoursaycharlessturt.com.au.

As part of the process of finalising the SMP, input is sought from the public and other stakeholders to understand the level of support for the proposed measures and associated priorities assigned by the SMP and to understand whether there are any other suggestions.

Alternatively, comments can be emailed to eng-consultation@charlessturt.sa.gov.au by Tuesday 15 March 2022.

Disclaimer

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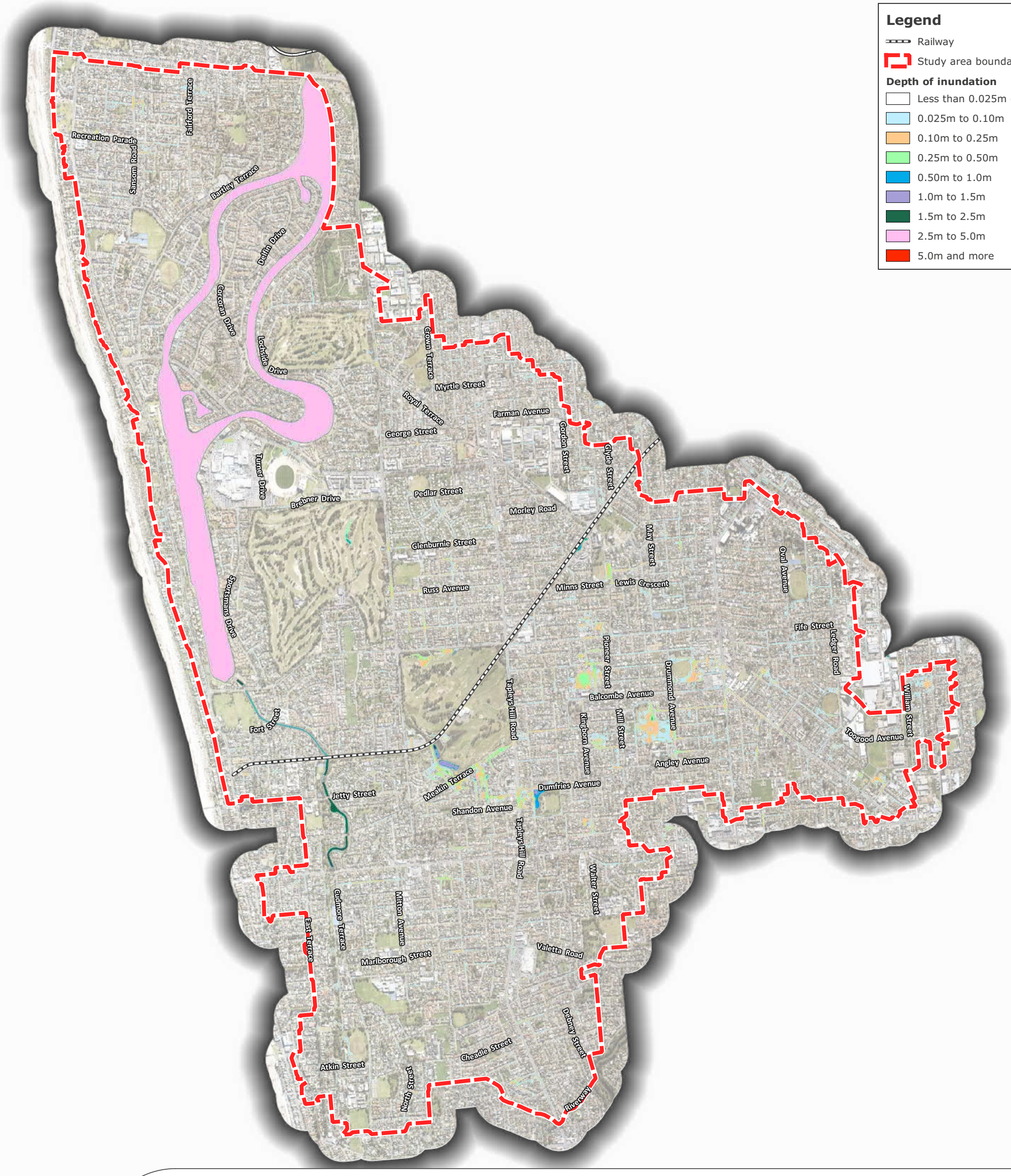

Legend

- Railway
- Study area boundary

Depth of inundation

- Less than 0.025m (not shown)
- 0.025m to 0.10m
- 0.10m to 0.25m
- 0.25m to 0.50m
- 0.50m to 1.0m
- 1.0m to 1.5m
- 1.5m to 2.5m
- 2.5m to 5.0m
- 5.0m and more

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CITY OF CHARLES STURT

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Drawn: MM

Data Acknowledgement:
Aerial imagery from City of Charles Sturt, 2019
Roads and railways from Data SA, 2018

N

WEST LAKES STORMWATER MANAGEMENT PLAN
20% AEP FLOOD INUNDATION MAP

Figure 2

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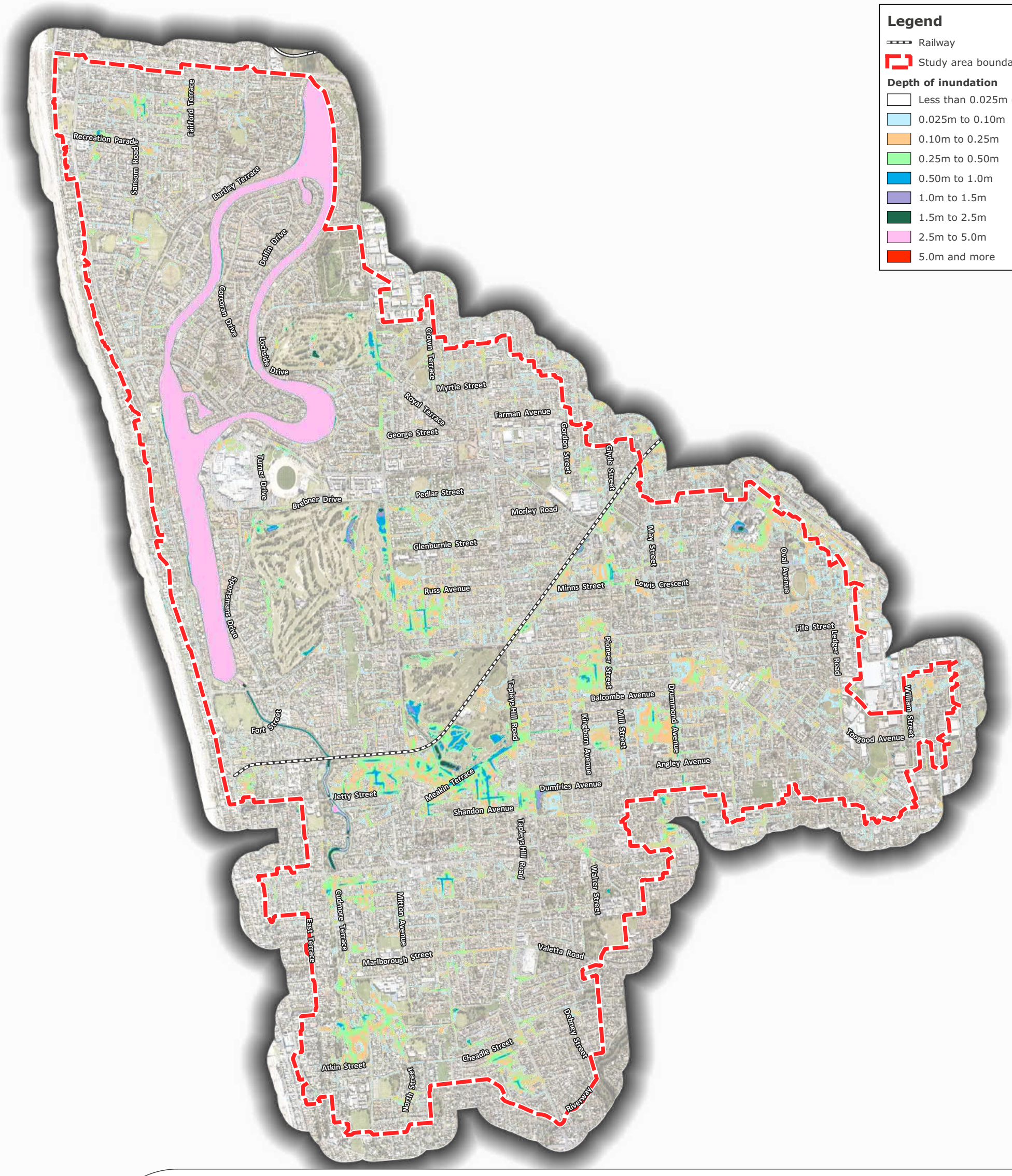

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CITY OF CHARLES STURT

WEST LAKES STORMWATER MANAGEMENT PLAN
1% AEP FLOOD INUNDATION MAP

Figure 3

ID	Report section	Description
1	6.1.1	Gleneagles Reserve underground tank
2	6.1.2	Findon Road / Crittenden Road pipe upgrades
3	6.1.3	Beatrice Avenue / Trimmer Parade pipe upgrades
4	6.1.4	Matheson Reserve underground tank
5	6.1.5	Frank Mitchell Reserve underground tank
6	6.1.6	Nedford Reserve detention basin
7	6.1.7	Golfers Avenue pipe and pump upgrades
8	6.1.8	Sansom Road pipe upgrades
9	6.1.9	Recreation Parade detention basin
10	6.1.10	Market Corner pipe upgrades
11	6.1.11	Holland Street pipe upgrades
12	6.1.12	Main Street pipe upgrades

Legend
- Mitigation strategy
- Pump station
- Pipe (existing)
- Pipe (new)
- Study area boundary

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CITY OF CHARLES STURT

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Drawn: MM

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WEST LAKES STORMWATER MANAGEMENT PLAN
OVERVIEW OF STRUCTURAL MITIGATION STRATEGIES

Figure 4

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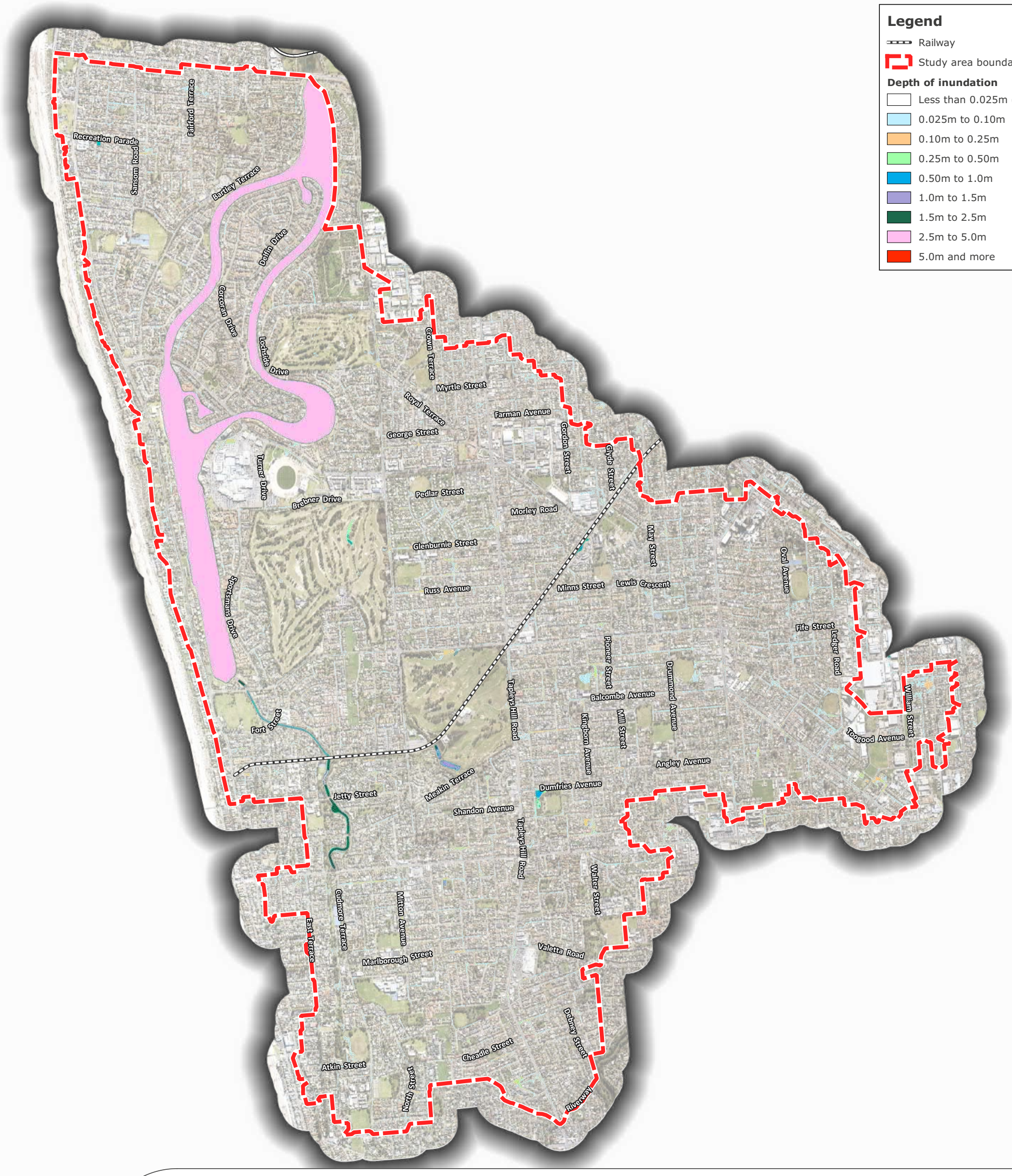

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WEST LAKES STORMWATER MANAGEMENT PLAN
20% AEP FLOOD INUNDATION MAP
MITIGATION SCENARIO

Figure 5

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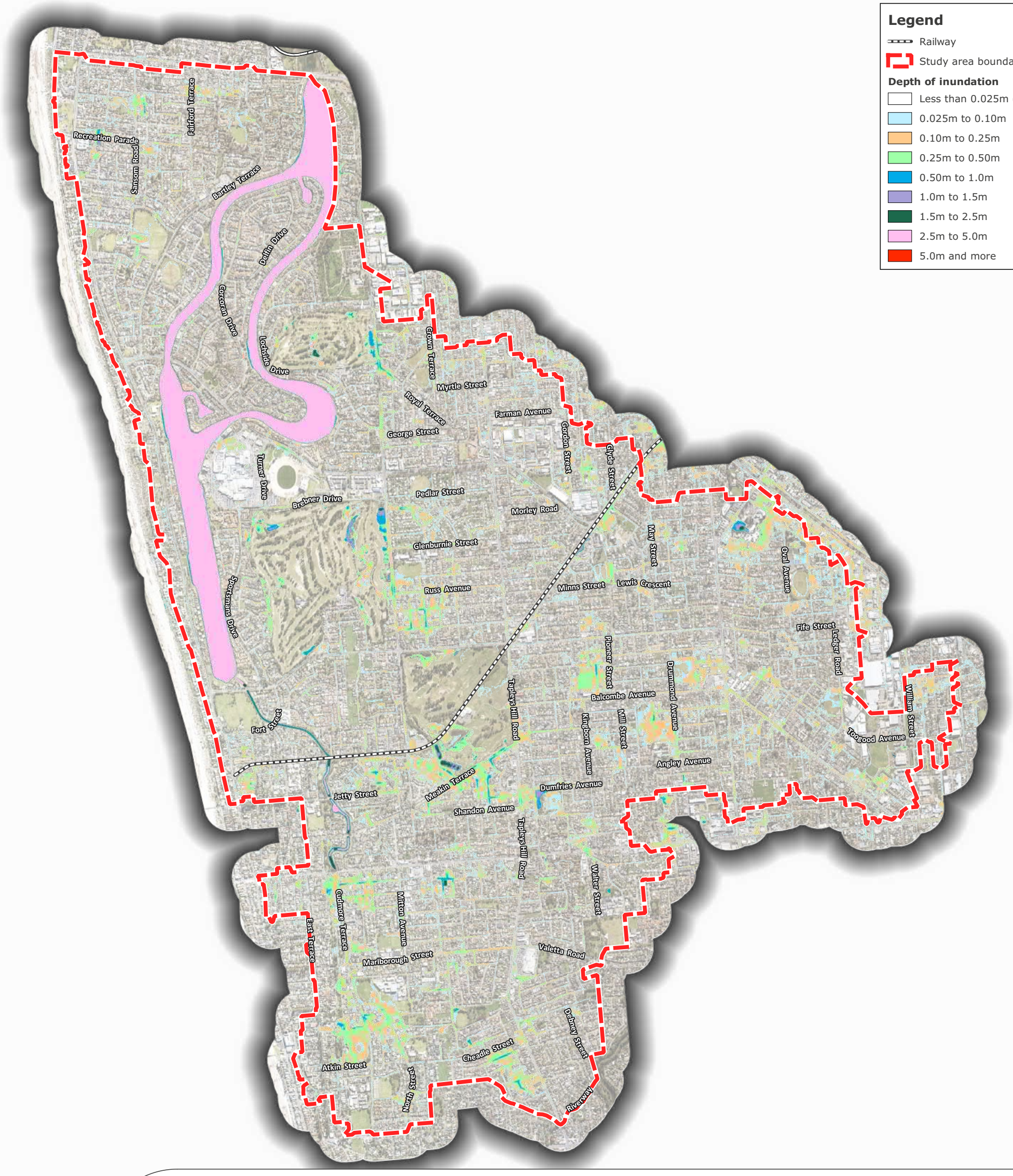

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- 2.5m to 5.0m
- 5.0m and more

0 1,000 2,000 3,000 m

CITY OF CHARLES STURT

tonkin

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Aerial imagery from City of Charles Sturt, 2019
Roads and railways from Data SA, 2018

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WEST LAKES STORMWATER MANAGEMENT PLAN
1% AEP FLOOD INUNDATION MAP
MITIGATION SCENARIO

Figure 6