Transport for NSW

Central Precinct Renewal Program

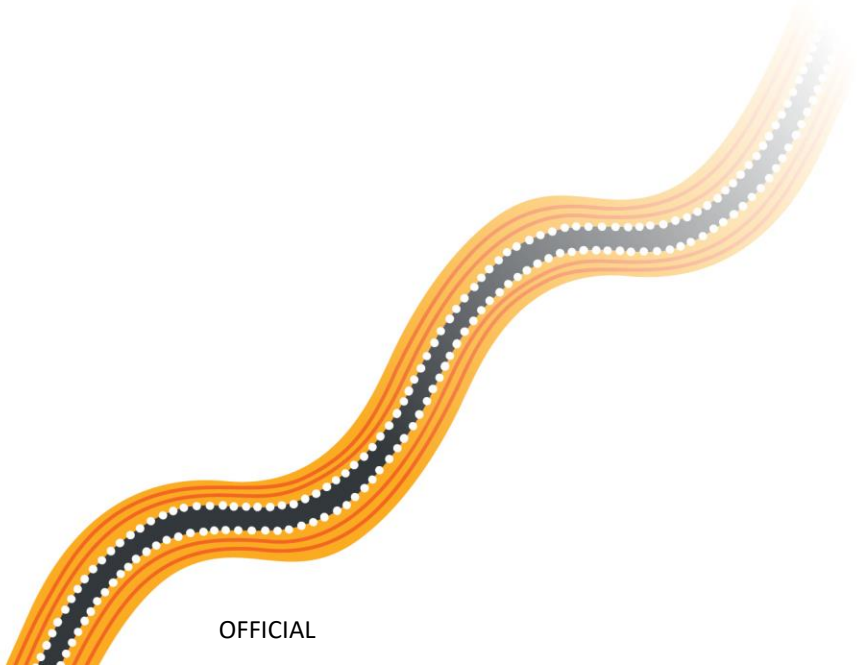
Water Quality, Flooding and Stormwater Addendum Report

September 2023 transport.nsw.gov.au

NSW GOVERNMENT

Acknowledgement of Country

We respectfully acknowledge the Traditional Custodians of the Central Precinct, the Gadigal and recognise the importance of the place to Aboriginal people and their continuing connection to Country and culture. We pay our respect to Elders past, present and emerging.



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Document control

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Approved by	Transport for NSW
Branch	IP Development
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Versions

Version	Amendment notes
1.0	Issued to TfNSW for Review
2.0	Issued to TfNSW for Review – Standard text included
3.0	Issued to TfNSW for Review – Standard text updated
4.0	Final
5.0	Final – reissue incorporating additional DPE feedback
6.0	Final – minor revisions

1. Introduction

Arcadis was engaged by Transport for NSW to prepare the Water Quality, Flooding and Stormwater Report as part of the Central State Significant Precinct (SSP) Study. The Central SSP Study and supporting documents were made available for public comment from 22 August to 4 October 2022. During the exhibition period, community members and stakeholders were invited to provide their comments and feedback on the rezoning proposal. Arcadis has prepared this addendum report to respond to the relevant feedback received concerning this report.

The purpose of this report is to:

- Summarise feedback received from the public exhibition of the SSP Study, specifically relating to the Water Quality, Flooding and Stormwater Report
- Respond to key technical matters raised during the public exhibition to inform the Response to Submissions Report for Central Precinct
- Assess the proposed changes to the revised scheme for Central Precinct
- Provide additional recommendations (where required) for the proposed planning framework for Central Precinct

This addendum is intended to be read in conjunction with the exhibited Water Quality, Flooding and Stormwater Report.

2. The exhibited SSP Study

The Central SSP Study and supporting documents were made available for public comment from 22 August to 4 October 2022. During the exhibition period, community members and stakeholders were invited to provide their comments and feedback on the rezoning proposal.

2.1 The exhibited proposal

The exhibited rezoning proposal included a Place Strategy, Urban Design Framework, Public Domain Strategy, draft Design Guide, Explanation of Intended Effect and supporting technical studies, which seek to enable the delivery of:

- approximately 269,500 square metres of commercial gross floor area GFA.
- approximately 22,850 square metres of retail GFA
- approximately 47,250 square metres of education/ tech GFA
- approximately 14,300 square metres of community/cultural GFA
- approximately 84,900 square metres of residential GFA
- approximately 53,600 square metres of hotel GFA.
- approximately 22,500 square metres of student accommodation GFA.
- 15% of new dwellings to be provided as affordable housing
- over two hectares of new and improved publicly accessible spaces, including:
  - Central Square, a new approximately 7,000 square metre publicly accessible square located at the George Street and Pitt Street junction
  - Central Green, a new approximately 6,000 square metre publicly accessible park located immediately south of the Sydney Terminal building
  - Mortuary Station Gardens, an approximately 4,470 square metre publicly accessible plaza (excluding the Mortuary Station building) located at Mortuary Station
  - Sydney Terminal building western rooftop, a 970 square metre publicly accessible space above the Terminal building roof
  - upgrades to Eddy Avenue Plaza and Ibero-American Plaza.
- an integrated network of streets, laneways and other movement corridors, including:
  - Central Avenue, as Central Precinct's new main street
  - Devonshire Link, as Central Precinct's main east-west linking street
  - a north-south link as an intimately scaled, active laneway
  - a supporting network of other open-to-the-sky laneways generally running east-west through the Precinct
  - a number of through-block links to provide further permeability for pedestrians
  - an eastern colonnade having a generous, double-storey height
  - three new active transport over-rail bridges
  - a revitalised Goods Line.

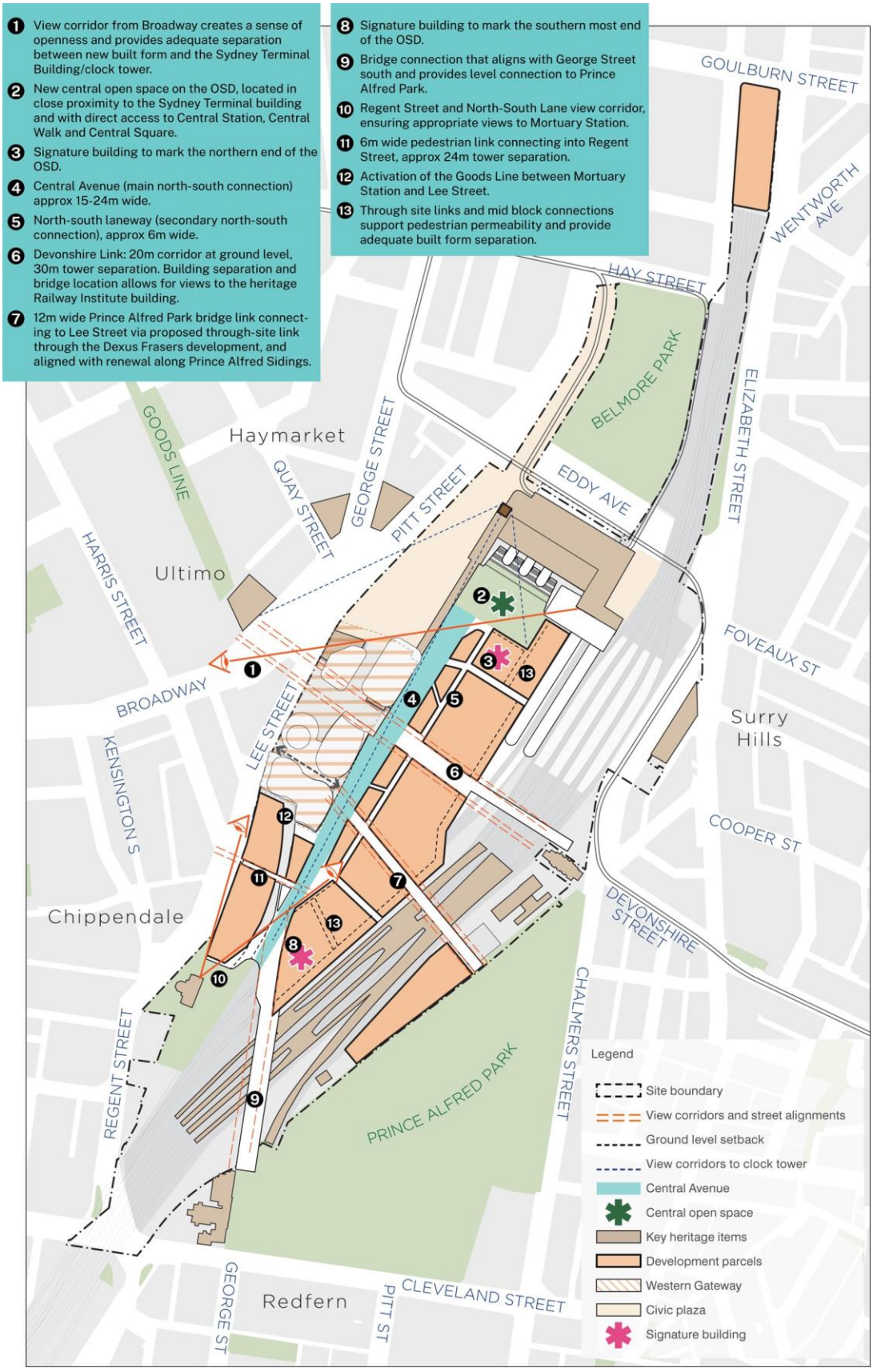


Figure 1: Exhibited Urban Design Framework

Source: Architectus, 2022

3. Feedback relating to Water Quality, Flooding and Stormwater received during exhibition

A total of 368 submissions were received from individuals, local council, government agencies, industry bodies, non-government organisations and interest groups. Table 1 below provides an overview of the feedback relating to Water Quality, Flooding and Stormwater based on our review of the submissions.

Table 1 Summary of feedback from public exhibition relating to Water Quality, Flooding and Stormwater.

Theme	Summary of feedback
Integrated Water Cycle Management Approach	General support for the use of water sensitive urban design, water reuse and water positive precinct as mentioned in the SSP studies.
	Concern there is insufficient Design Guide controls to deliver precinct-wide water management goals in a consistent and integrated fashion.
Flood Impacts	Concern Design Guide controls are not sufficient to prevent cumulative flood impacts off-site resulting from the staged development.
	Concern regarding flood level increases to existing basements currently above the Probable Maximum Flood (PMF) event level.
Flood Planning Levels and Flood Mapping	Concern regarding the range of flood events considered in the flood modelling including climate change
	Request for mapping of the flood planning area and flood function
	Concern regarding appropriate flood planning levels for basement entries.
Goods Line	Concern regarding the suitability of the Goods Line and appropriate Zoning.
Shelter-in-place	Request for shelter-in-place provisions.

4. Responses to key issues raised

4.1 Concerns about Design Guide controls related to an Integrated Water Cycle Management Approach

Issue

An Integrated Water Cycle Management approach has been recommended in the Central SSP Utilities and Infrastructure Servicing Report, Environmental Sustainability, Climate Change and Water Management Report and Water Quality, Flooding and Stormwater Report.

The Design Guide includes guidance notes related to the development of an Integrated Water Management Strategy under 14.1 Water positivity (item 7), 14.2 Local drainage management (item 1) and 14.4 Stormwater quality (item 1).

The City of Sydney Council has raised concerns that the Design Guide controls are not sufficient to deliver the precinct-wide water management goals in a consistent and integrated fashion. Council provides recommendations for modifications to the Design Guide including the requirement for a precinct-wide Integrated Water Management Strategy.

Response

Revisions to the Design Guide are recommended to better align with the intent of the SSP study recommendations. Recommended wording is provided in Section 7.1.

In agreement with Council's recommendation, we propose the requirements related to Integrated Water Cycle Management be compiled and further refined as a new standalone subsection in the Design Guide (as Section 14.1). Much of the proposed wording for this section aligns with Council recommendations.

The objective of the Integrated Water Cycle Management approach is to build resilience in Sydney's water supply by encouraging the use of recycled water, optimising stormwater management and maximising efficiency in the use of potable water. Noting flooding mitigation will primarily be addressed under the flood planning Design Guide controls.

It's recommended that a precinct-wide Integrated Water Cycle Management Strategy is initially developed at a high-level. This strategy can be further refined as the design development of the precinct and sub-precincts progresses. For all new developments, a detailed Integrated Water Cycle Management Plan is to be developed that demonstrates alignment with the precinct-wide Integrated Water Cycle Management Strategy.

4.2 Concerns about flood impacts

Issue

The City of Sydney Council feedback has raised concerns that the Design Guide controls are not sufficient to prevent detrimental changes to off-site flooding. Specifically, Council notes cumulative flood impacts related to the development staging and Probable Maximum Flood (PMF) event increases on existing flood protected basements. Council provides recommendations for modifications to the Design Guide in response to their concerns.

The Department of Planning and Environment's Environment and Heritage Group (EHG) have raised concerns regarding flood impacts illustrated in the SSP study. EHG request further proof of concept of mitigation measures to reduce the flood impacts predicted.

Response

As shown in the Central SSP Water Quality, Flooding and Stormwater Report, the peak flood level impacts are in isolated locations and not widespread across the Central Precinct. In general, the flood impacts are exacerbating existing flood issues at select locations. The magnitude of the impact on peak flood levels is generally less than 0.1 metres in the 1% Annual Exceedance Probability (AEP) event and less than 0.5 metres in the Probable Maximum Flood (PMF) at the vast majority of locations.

Given the extent, level and nature of the flood impacts identified as well as the Design Guide requirements we do not consider it warranted to undertake further refinement of the precinct design or flood mitigation strategy to reduce these flood impacts at this stage of the planning process. Throughout the design of the precinct ongoing flood assessment and approval will be required in line with the Design Guide requirements. The design process will provide the opportunity to minimise flood impacts through design and incorporate flood mitigation measures as required.

Revisions to the Design Guide Section 14.3 Flood planning are recommended to respond to the feedback received. Recommended wording is provided in Section 7.1.

It is recommended that a detailed site-specific flood study is prepared for all developments. It is through this assessment that any flood impacts will be further investigated and potential mitigation measures such as on-site detention will be determined. An additional guidance note has been added to ensure cumulative flood impacts are specifically addressed in the required flood study.

Reference to +/-0.05m has been removed from the peak flood levels note. Specifying this value is likely to lead to confusion particularly when considering cumulative flood impacts. This level of detail is also beyond what is typically defined in the planning framework.

Specific reference is also made to the City of Sydney's Interim Floodplain Management Policy 2014 which should be used to define appropriate flood planning level criteria.

Additional Design Guide guidance notes have also been added in relation to the following to address specific feedback:

- PMF flood increases on existing basements
- Opportunities to reduce existing flood risk where mitigation is required
- Climate change Representative Concentration Pathway (RCP) 8.5 timeframe specified as 2090

4.3 Concerns about flood planning levels and flood mapping

Issue

The Department of Planning and Environment sought independent flooding advice from Rhelm. The documented advice issued to TfNSW recommends the consideration of a wider range of flood events, including climate change, and for the SSP study to include mapping of the flood planning area and flood function.

The Rhelm advice also comments on floor level requirements for basement car park entries suggesting that flood proofing up to the PMF may be appropriate.

Response

Revisions to the Design Guide are recommended to better align with the intent of the SSP study recommendations. Recommended wording is provided in Section 7.1. The Design Guide revisions include the requirement for all developments to prepare a detailed site-specific flood study with the Design Guide specifying the range of flood events to be considered under present climate conditions, as well as a future climate change scenario. Specific reference has been added for flood planning levels to adhere to the City of Sydney Council's Interim Floodplain Management Policy 2014 (Council's Policy). The Design Guide revisions are sufficiently robust to ensure the adequate consideration of a wide range of flood events.

With regards to the flood planning area, this is defined as the land below the flood planning level which is subject to flood related development controls. Council's Policy defines the flood planning level based on an Annual Exceedance Probability (AEP) and freeboard value which both vary based on the type of flooding (mainsteam/local drainage or outside the floodplain) and the proposed land use. The flood planning level can vary from 0.3m above the surrounding surface to the 1% AEP plus 500mm freeboard or the PMF flood level. Within Council's Policy flood controls are not limited to a flood extent and apply to all properties. A single flood planning level has therefore not been mapped as part of the SSP study. Note the City of Sydney has previously attempted to map a flood planning area based on the 1% AEP plus 500mm freeboard applied and found this encompassed the majority of the Blackwattle Bay catchment.

Flood function mapping for the existing and proposed conditions for the PMF event are provided below in **Figure 2** and **Figure 3**.

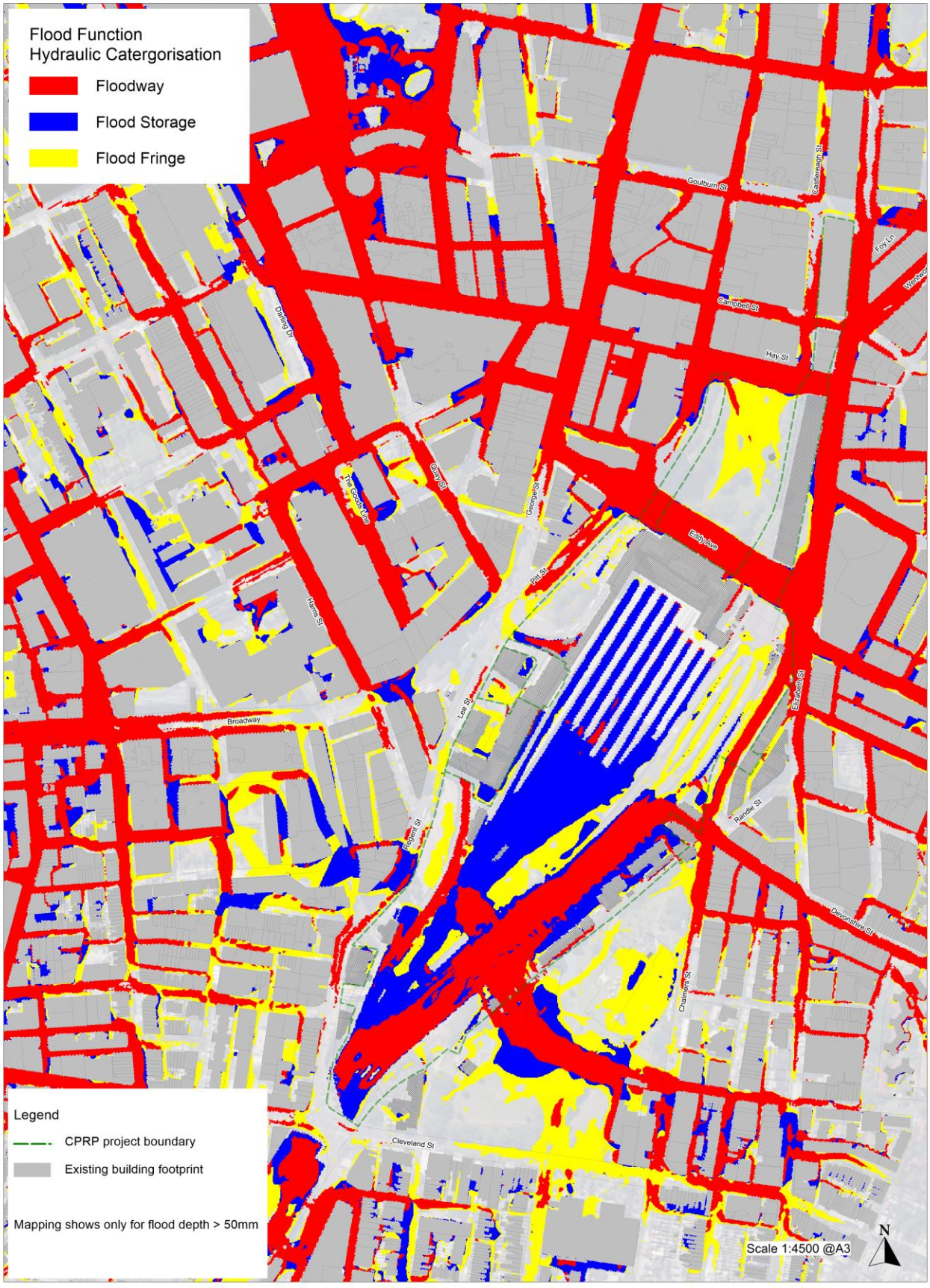


Figure 2: Existing Conditions Flood Function for the PMF event

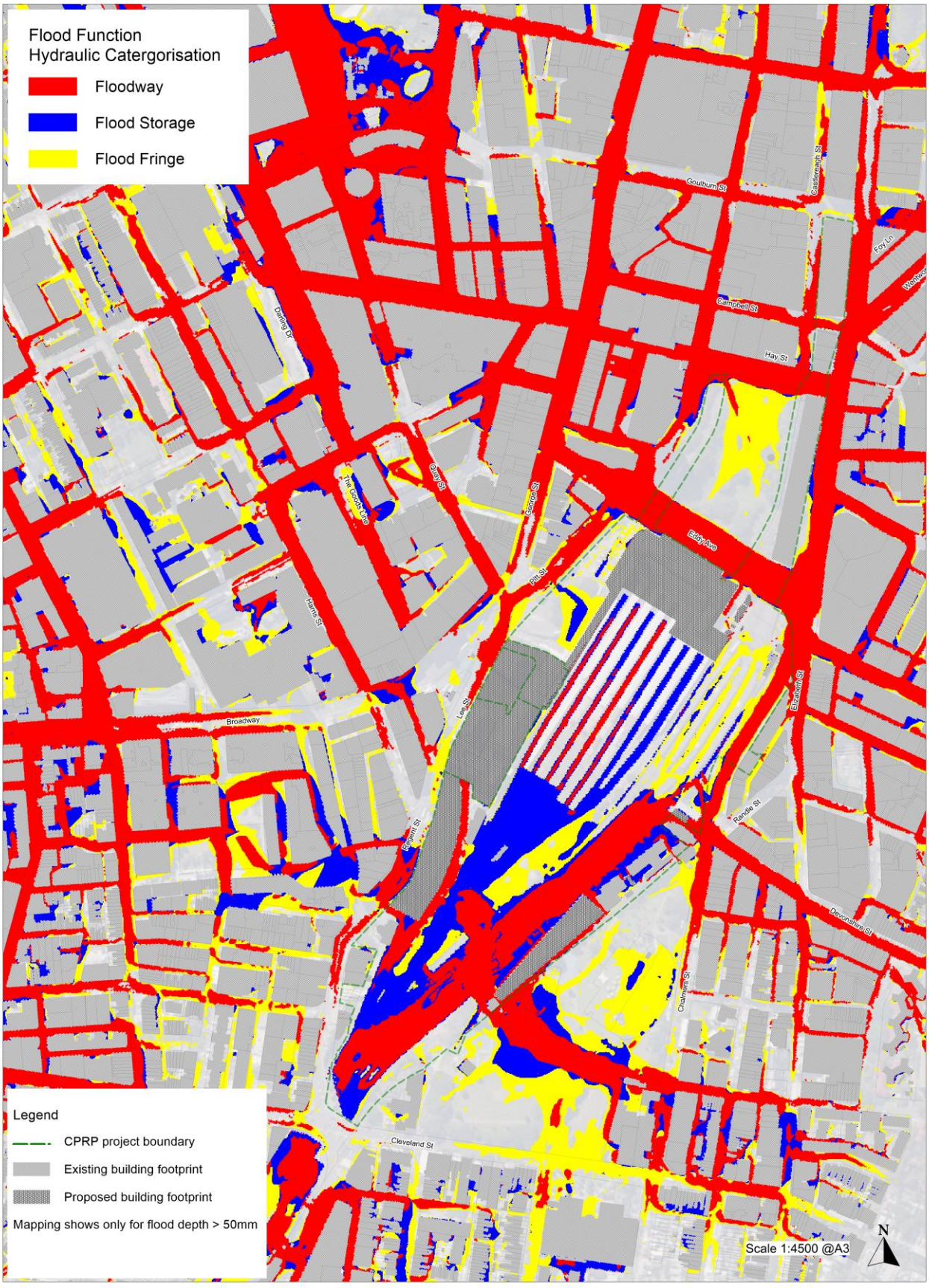


Figure 3: Proposed Conditions Flood Function for the PMF event

The flood function has been defined based on the following hydraulic categories:

- Floodway: Velocity x Depth > 0.25m^2/s AND Velocity >0.25m/s OR Velocity > 1m/s
- Flood Storage: Land outside the floodway where Depth > 0.2m
- Flood Fringe: Land outside the floodway where Depth < 0.2m

These hydraulic categories align with the City of Sydney Blackwattle Bay Catchment Floodplain Risk Management Study and Plan (WMA Water, 2015) and Darling Harbour Catchment Floodplain Risk Management Study and Plan (WMA Water, 2016) which cover the Central Precinct.

Note that the Design Guide requirements and Council's Policy do not apply development controls based on flood function categories (e.g. flood fringe, flood storage and floodway).

With regards to basement entries, Council's Policy requires a flood planning level of the 1% AEP plus 500mm freeboard or the PMF, whichever is the higher elevation. The requirement applies to the below ground garage/car park level and all possible ingress points to the car park such as vehicle entrances and exits, ventilation ducts, windows, light wells, lift shaft openings, risers and stairwells.

4.4 Concern regards the Goods Line

Issue

The Department of Planning and Environment sought independent flooding advice from Rhelm. The documented advice issued to TfNSW raises concern regarding the future use of the Goods Line tunnel as a pedestrian link given that it acts as an overland flow path in rare and extreme flood events.

Response

The design of the Goods Line connection will need to adequately address flood risk. Additional major trunk drainage upgrades in the immediate area may be required to reduce the frequency and hazard of overland flows in pedestrian areas. Safety measures will be required in response to residual flood risks. These may include the provision of reliable access for pedestrians to safe refuge, hazard signage and flood warning measures.

The Design Guide requires that flood risk and pedestrian safety from overland flows are suitably addressed across the precinct in the following guidance notes:

Section 14.2 Local drainage management, guidance notes:

- Item 1 – *As part of an Integrated Water Management Strategy (as required by Guidance 14.1(7), a Local Drainage Management Plan prepared by a suitably qualified engineer with experience in drainage design that addresses:*

  (g) how pedestrian safety is to be ensured
- Item 6 – *Major drainage systems are to be designed so that ensures that public safety is not compromised.*

Section 14.3 Flood planning, guidance notes:

- Item 1 – *Development is to manage and mitigate flood risk and must not exacerbate the potential for flood damage or hazard to:*
    a) *development within Central Precinct*
    b) *to the public domain (including publicly accessible spaces)*
    c) *surrounding development upstream and downstream.*

Revisions to the Design Guide Section 14.2 Local drainage management are recommended to respond to the feedback received. Recommended wording is provided in Section 7.1.

4.5 Shelter-in-place provisions

Issue

The Department of Planning and Environment sought independent flooding advice from Rhelm. The documented advice issued to TfNSW notes flood emergency response provisions are lacking in the Design Guide and recommends the consideration of shelter-in-place provisions.

Response

The majority of flooding within the Central Precinct and the surrounding Blackwattle Bay and Darling Harbour catchments is characterised as overland flow and "flash" flooding given its relatively short critical duration of 2 hours or less.

The City of Sydney Blackwattle Bay and Darling Harbour Floodplain Risk Management Studies and Plans outline Council's proposed flood emergency response. Given the short duration of flooding, these studies state that evacuation is not generally recommended, and the preferred approach is for people to remain within properties. Shelter-in-place is the movement of occupants to a building or the occupants remaining in a location that provides vertical refuge on the site or near the site above the PMF level before their property becomes flood-affected. The council studies recommend that the suitability of a shelter-in-place strategy be considered in consultation with the State Emergency Services for the preparation of a Local Flood Plan.

Whilst the City of Sydney Council's Interim Floodplain Management Policy 2014 (Council's Policy) provides a means of implementing the catchment Floodplain Risk Management Plans, it does not provide any provisions for shelter-in-place or further requirements relating to emergency response management. In accordance with the Department of Planning and Environment Draft Shelter-in-place Guideline (2023), shelter-in-place requires refuge above the PMF flood level to be considered.

Revisions to the Design Guide Section 14.3 Flood planning are recommended to respond to the feedback received. Recommended wording is provided in Section 7.1.

An additional reference to Council's policy has been added to the Design Guide to ensure it is used to determine appropriate flood planning levels. A requirement for the preparation of a flood emergency management response plan has been added. Additional guidance relating to shelter-in-place and building below the PMF level has also been added.

5. The revised proposal

Based on the feedback received during the public exhibition of the Central Precinct rezoning proposal, a revised proposal has been prepared for the consideration of Department of Planning (DPE) as part of its assessment. The revised proposal includes an updated Urban Design Framework and Public Domain Strategy, which establishes the updated Reference Masterplan and has informed updates to the proposed planning framework for Central Precinct. The updated Reference Masterplan comprises:

- approximately 263,000 square metres of commercial gross floor area (GFA).
- approximately 24,450 square metres of retail GFA
- approximately 46,000 square metres of education/ tech GFA
- approximately 14,800square metres of community/ cultural GFA
- approximately 82,350 square metres of residential GFA
- approximately 53,000 square metres of hotel GFA.
- approximately 20,700 square metres of student accommodation GFA.
- 30% of new dwellings to be provided as affordable housing
- over two hectares of new and improved publicly accessible spaces, including:
  - Central Square, a new approximately 7,000 square metre publicly accessible open space located at the junction of George Street and Pitt Streets at street level
  - Central Green, a new approximately 6,200 square metre publicly accessible open space located immediately south of the Sydney Terminal building at deck level, including the Sydney Terminal building western rooftop
  - Devonshire Square, an approximately 3,700 square metre publicly accessible plaza at the junction of Central Avenue and the Devonshire link
  - Southern Plaza, an approximately 4700 square metre publicly accessible plaza at the junction of Central Avenue and the George Street Bridge
  - Mortuary Station Gardens, an approximately 6,500 square metre (excluding the Mortuary Station building) publicly accessible plaza located at street level at the junction of the Mortuary Station and the Goods Line
  - upgrades to Eddy Avenue Plaza and Ibero-American Plaza.
- an integrated network of streets, laneways and other movement corridors, including:
  - Central Avenue, as Central Precinct's new main street
  - Devonshire Link, as Central Precinct's main east-west sequence
  - a north-south link as an intimately scaled, active laneway
  - a supporting network of other open-to-the-sky laneways generally running east-west through the Precinct
  - through-block links to provide further permeability for pedestrians
  - three active transport over-rail bridges
  - a revitalised Goods Line as an active transport corridor.

The key features of the updated Reference Masterplan, include:

- A network of new and enhanced public spaces linked together by green connections. This will include:
  - A new Central Square that will deliver on the vision for a new public square at Central Station, as one of three major public spaces within the Sydney CBD connected by a people-friendly spine along George Street
  - A Central Green (Dune Gardens) at the north of Central Precinct will create a new civic park extension of the Sydney Terminal building and a new vantage point for Central Sydney
  - A new civic space (Devonshire Square) at the proposed entry/exit point to Central Walk from the OSD, giving access to all platforms within Central Station.
  - Mortuary Station Gardens at Mortuary Station will be a key public domain interface between Chippendale and the over-station development and a public link to the Goods Line
  - A reconfigured Southern Plaza at the southern end of the OSD deck will provide a new arrival and meeting space when coming from Redfern and a key connection to Redfern when coming from the city
  - Henry Deane Plaza which will prioritise the pedestrian experience, improving connectivity and pedestrian legibility within the Western Gateway sub-precinct and provide clear, direct links to and from Central Station and its surrounds
  - Eddy Avenue Plaza will transform into a more civic environment with improved amenity and an enhanced interface with the Sydney Terminal building.
- A new network of circulation spaces that are legible and provide for public access and use of the place. This will include:
  - Central Avenue, with a consistent minimum width of 18 metres located to provide long views of the Sydney Terminal Building clocktower. Central Avenue will be a place for people to dwell and move through while linking together a sequence of publicly accessible spaces on the OSD deck, including the Central Green, Devonshire Square and the Southern Plaza
  - A minimum 6-metre wide north-south laneway providing an additional intimate and active link between the sequence of publicly accessible spaces on the OSD deck, and opportunities for smaller courtyard experiences
  - Three new over-rail connections to enhance pedestrian and bicycle access to and from Surry Hills, Prince Alfred Park, Redfern and Chippendale and circulation to and through the Central Precinct
  - The extension of public access along the Goods Line offering a new connection to Darling Harbour from Mortuary Station Gardens
  - New vertical transportation locations throughout the precinct provide accessible vertical connections to the OSD.

The revised proposed land allocation for Central Precinct is described in **Table 1** below.

Table 1: Breakdown of allocation of land within Central Precinct

Land allocation	Proposed
Open-air rail corridor (Infrastructure)	89,781 sqm
Western Gateway	16,638 sqm
Developable area (Total)	131,593 sqm
Public Space (Including open space, squares, plazas, movement zones, streets and links)	71,603 sqm /54.4 % of Developable area
Building area	59,990 sqm / 45.6 % of Developable area
Central SSP total area	**238,012 sqm (23.8 ha)**

The revised Indicative Reference Master Plan for Central Precinct is illustrated in **Figure 4** below.

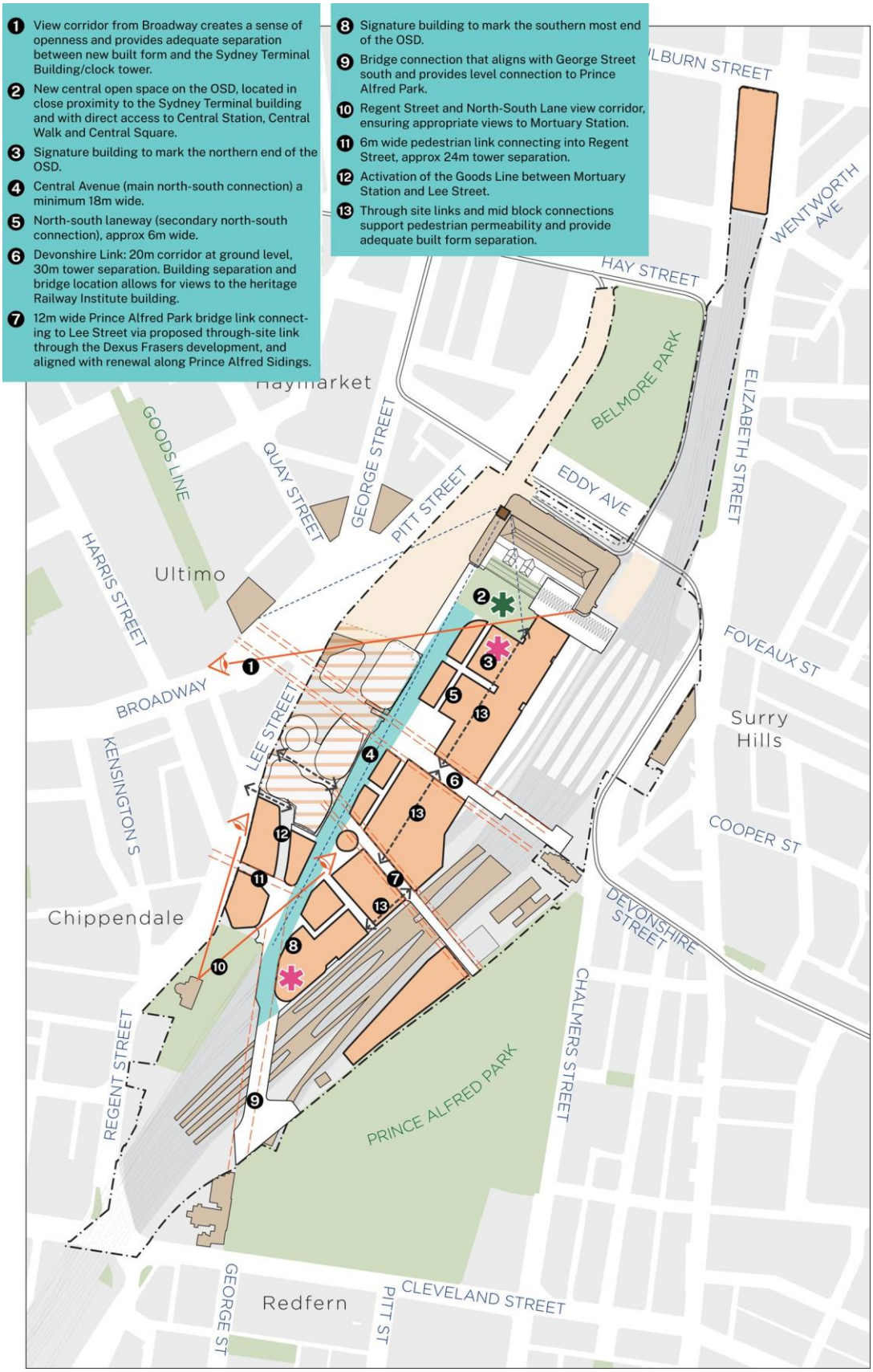


Figure 4: Revised Urban Design Framework

Source: Architectus, 2023

5.1 Key changes from the exhibited proposal

The feedback on the exhibited rezoning proposal has informed subsequent amendments to the Reference Masterplan. A summary of the key changes adopted as part of the revised Reference Masterplan are described below:

- **Improved interface between Terminal and OSD:** The interface relationship between the OSD deck and the Terminal Building has been further rationalised to improve the function of the station as a major interchange and better respect the heritage of Central Railway Station. The following changes have been made:
  - a reduced spatial extent of the stairs between the OSD deck and the Terminal to now be a consolidated vertical connection (stairs, lift and escalators) to the north-eastern edge of Central Green
  - an expanded concourse level with greater access to daylight and new opportunities for landscaping that will improve the passenger experience on the platforms and in the concourse, compared to the exhibited proposal
  - incorporating an interpretation of the platform canopies to deliver a heritage-responsive and weather-protected connection.
- **Consistent 18-metre-wide Central Avenue:** A consistent width of 18 metres has been provided for Central Avenue. The future role and function of this link has been revised from an avenue between the north and south of the OSD deck to now becoming a connector of a sequence of public spaces on the OSD deck.
- **Additional mid-block through-site links:** The introduction of additional mid-block connections to reinforce breaking up the podiums on the OSD deck level into interconnected smaller building forms.
- **Removal of the Eastern Colonnade:** The eastern colonnade has been removed from the revised Reference Masterplan.
- **Reconfiguration of Central Green:** The layout of Central Green has been adjusted to be a squarer geometry compared to the exhibited proposal. The primary movement path through Central Green is now focused toward the southern and eastern edges of this open space. The indicative design of Central Green has also been adjusted to improve its relationship with the Terminal Building through the incorporation of seating and greater landscaping at the northern edge of the park.
- **An enlarged Mortuary Station Gardens:** The reduction of the podium building envelope of the Regent Street Sidings building brought about through changes to the bus layover and basement entry /exit pathways provide for an enlarged public space at Mortuary Station Gardens by 2,030 square metres to a total area of 6,500 square metres. The increase in the size of this public space also presents the opportunity to retain the existing fig tree at Mortuary Station and provide a new playground that is accessible to the broader community.
- **Devonshire Square:** A new square of approximately 3,700 square metres has been included into the revised Reference masterplan at the junction of Central Avenue and the Devonshire link, which will provide a new civic space at the entry point to the proposed extended Central Walk. (Central Walk will provide access to all of the rail platforms in Central).
- **Southern Plaza:** A new reconfigured civic space of approximately 4,700 square metres at the southern end of Central Avenue, providing a new arrival and meeting space when coming from the south. Within the Southern Plaza, there is the potential for a marker building that is designed with a Connecting with Country focus.

- **Regent Street Sidings:** The podium envelope at Regent Street Sidings has been further rationalised to improve the integration between the OSD deck level and Regent Street Sidings, the Goods Line and Mortuary Station Gardens. This has been through the following changes:
  - undergrounding the bus layover into the basement to enable the reduction of the podium footprint
  - consolidating basement entry/exit into a single location for loading, residential parking and bus layover
  - locating basement entry/exit at a signalised intersection
  - increase the opportunity to activate the Goods Line and Mortuary Station Gardens
  - extending the OSD deck level to integrate with the podium rooftop of Regent Street Sidings.
- **Increased green cover:** An increase to the overall green cover in the precinct has been adopted as part of the revised Reference Masterplan.
- **Enhanced east-west view lines:** The indicative building envelopes on the OSD deck have been refined in location and shape to increase the separation of tower forms and enhance east-west view lines.
- **Reduction in overall GFA:** Based on refinements to the Reference Masterplan, the overall proposed GFA of Central Precinct has reduced by approximately 10,600 square metres.

6. Assessment

The revised Reference Master Plan has been reviewed considering the assessment undertaken as part of the Water Quality, Flooding and Stormwater Report, the concept Stormwater Management Plan and report recommendations.

While there have been some changes to the Reference Master Plan, these have not had a meaningful impact on the recommendations or conclusions of the Water Quality, Flooding and Stormwater Report.

The changes to the Reference Master Plan built-form extent at ground level will impact the flood assessment undertaken. As these have been reductions in the built-form extent they are not expected to worsen the flood impacts as presented in the Water Quality, Flooding and Stormwater Report. Given that a detailed flood assessment of potential impacts is required for all development as part of the Design Guide, and that further design development will be undertaken prior to development applications, no further reassessment of flood impacts is recommended at this stage.

No additional recommendations are proposed based on the revised Reference Master Plan outside of the Design Guide recommendations provided in Section 7 which respond to the submissions received during the public exhibition of the SSP study.

7. Recommendations

7.1 Design Guide

Based on the responses to key issues raised (Section 4) and assessment of the revised scheme (Section 6) the following modifications to the Design Guide are recommended.

As mentioned in Section 4.1, the recommended additional Integrated Water Cycle Management subsection wording is provided below:

14.0 Integrated Water Cycle Management

Objectives

a) *Manage and balance urban water elements (potable water, wastewater, and stormwater) through integrated water cycle management.*

b) *Design and delivery of infrastructure, servicing and development shall be driven by an integrated water cycle management approach to build resilience in Sydney's water supply by encouraging the use of recycled water, optimising stormwater management and maximising efficiency in the use of potable water.*

c) *Ensure integrated water cycle management is safe, practicable and provides the best environmental outcomes.*

d) *To facilitate coordinated delivery of an integrated water cycle management approach across development stages.*

Guidance

1) *A precinct-wide Integrated Water Cycle Management Strategy shall be prepared that illustrates how the precinct will be designed to maximise water efficiency and reuse, improve stormwater quality, support green infrastructure and urban cooling. The strategy is to:*

    - *include provision of dual plumbed water systems to enable utilisation of the recycled water network for permitted non-potable uses which may include flushing, irrigation and certain industrial purposes.*
    - *identify how rainwater and / or stormwater will be collected, conveyed, stored, harvested and reused across the precinct to maximise sustainable water reuse.*
    - *consider how the stormwater infrastructure will be delivered given the individual development stages.*
    - *identify opportunities for water sensitive urban design, including green walls and roofs, to be optimally integrated across the public and private domains.*
    - *define stormwater quality treatment targets for each sub-precinct based on their unique opportunities and constraints.*
    - *consider how the water sensitive urban design will be delivered given the individual development stages.*

- *consider how the development will be designed to enable future connection to the George Street recycled water scheme network.*
- *consider both sewer mining and provision for export of treated water to the George St recycled water scheme network (either in conjunction or separately).*
- *consider how recycled water supply will be delivered given the individual development stages.*

2) *The primary aim of the precinct-wide Integrated Water Cycle Management Strategy is to demonstrate the high-level strategy across the precinct. The strategy document can be further revised and refined as the precinct development evolves.*

3) *For all new developments, a detailed Integrated Water Cycle Management Plan is to be developed that demonstrates alignment with the precinct-wide Integrated Water Cycle Management Strategy.*

As mentioned in Sections 4.2, 4.4 and 4.5 the additional and revised wording for local drainage management and flood planning are provided below in red:

14.2 Local drainage management

Guidance

2) *Drainage systems are to be designed for:*

   d) *Remainder of the Central Precinct:*

      i. *stormwater flows up to the 5% annual exceedance probability event are conveyed by a minor drainage system*
      ii. *stormwater flows above the 5% annual exceedance probability event are conveyed by a major drainage*
      iii. *public domain and roadway drainage designed to meet City of Sydney Council Sydney Streets Technical Specifications 2019 A4 Stormwater Drainage Design*

14.3 Flood planning

Guidance

1) *Development is to manage and mitigate flood risk and must not exacerbate the potential for flood damage or hazard to:*

   a) *development within Central Precinct*

   b) *to the public domain (including publicly accessible spaces)*

   c) *surrounding development upstream and downstream.*

2) *For all developments a detailed site-specific flood study is to be prepared by a suitably qualified and experienced engineer that addresses:*

   a) *whether on-site detention is required to avoid:*

      i. *peak flood level increases in the downstream network for the present day climate conditions 20% AEP, 5% AEP or 1% AEP design rainfall*

events for the full range of standard duration design rainfall events from 10 mins to 3 hours.

ii. where connected to the City of Sydney Council drainage network, increases in the downstream peak flow rate of more than 10%.

b) flood impacts, including determining under present day climate conditions, any change as a result of the development, in:

i. peak flood levels
ii. flood extents
iii. flood risk areas
iv. flood hazard categories

c) cumulative flood impacts under present day climate conditions. In addition to assessing the impact of the individual development, the flood study is to assess the combined impact of all other approved developments across the wider precinct to ensure the cumulative impacts of the development are considered.

d) present day climate conditions 20% AEP, 5% AEP, 1% AEP and PMF design rainfall events for the full range of standard duration design rainfall events from 10 mins to 6 hours.

e) the impact of the proposed development with a Representative Concentration Pathway (RCP) 8.5 in 2090 climate scenario is to be undertaken to inform flood planning levels.

f) consideration of the PMF flood level impacts on existing basement car parks. For existing basement car park entries located above the PMF flood level, should PMF flood impacts remove the flood immunity potential mitigation measures are to be proposed.

g) the existing condition flood model is to be refined based on recent detailed ground survey that defines flow paths, storage areas and hydraulic controls.

3) The City of Sydney Council's Interim Floodplain Management Policy 2014 it to be used to determine appropriate flood planning levels across the precinct. Adopted flood planning levels are to be outlined in the prepared flood study.

4) A flood emergency management response plan is to be developed in consultation with the City of Sydney Council and State Emergency Services. For residential and commercial development where a shelter-in-place strategy is proposed provision of easily accessible habitable areas above the PMF level is to be provided.

5) For areas below the PMF flood level, all buildings must be constructed with flood compatible materials and designed to withstand the impact of floodwater, debris and buoyancy.

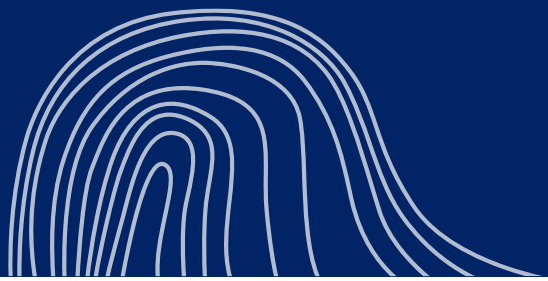
6) Explore opportunities to reduce existing flood risk where flood mitigation is required. Consider potential impacts of the City of Sydney Flood Risk Management Plans and proposed stormwater infrastructure capital works which may impact flood conditions.

8. Conclusion

Arcadis has undertaken a review of the feedback received from the Central State Significant Precinct (SSP) Study public exhibition as relevant to the Water Quality, Flooding and Stormwater Report.

Based on this review additional revisions to the Design Guide are recommended to better align with the intent of the SSP study recommendations and address stakeholder concerns raised by the City of Sydney Council and the Department of Planning and Environment.

The revised Reference Master Plan has also been reviewed. No modifications or additions to the Water Quality, Flooding and Stormwater Report recommendations or conclusions are noted based on this review.



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