

IPG Master Plan

475 Badgerys Creek Road,
Bradfield

Civil Infrastructure Report Technical Assurance Panel (WSA-MP01)

CLIENT/ Ingham Property Group

DATE/ 21/06/2024

CODE/ 19-663

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1. Project Overview

The Ingham Property Group (IPG) site is located at 475 Badgerys Creek Road, Bradfield and referred in the report as the Site or Estate. It has an approximate site area of 184 ha. The Site forms part of the Aerotropolis Core Precinct within the Western Sydney Aerotropolis and is predominately zoned for Enterprise (ENT) use under the State Environmental Planning Policy (Precincts – Western Parkland City) 2021 (WPC SEPP).

IPG is currently undertaking the Master Plan pathway with the Technical Assurance Panel (TAP), which is an optional design process established under the WPC SEPP to amend the Aerotropolis Precinct Plan as it applies to the site. IPG is in the process of preparing a Master Plan, as part of a co-design process with the TAP, for the site which will be formally lodged to the Department of Planning, Housing and Infrastructure (DPHI) in accordance with the Western Sydney Aerotropolis Master Plan Guidelines.

The IPG Master Plan was informed by a detailed assessment of the site-specific considerations through preliminary site investigations. The Master Plan breaks down the general application of the Enterprise zone across the site and provides a more granular approach to land use planning with considerations made to the opportunities and constraints of the site. The structure plan is made up of four key land uses which include enterprise and light industry, business and enterprise, and employment zone centres.

IPG has engaged AT&L to prepare Civil Engineering concept plans, supported by a Civil Infrastructure Report to inform the civil works, soil and water management strategies and utility services infrastructure necessary for the master plan and co-design process.

1.1. Site Description

The Site is located at 475 Badgerys Creek Road, Bradfield, legally known as Lots 99 and 100 in DP 1287207 and comprises a total area of 184 hectares along Badgerys Creek Road, centrally located within the new Western Parkland City. Lot 99 comprises the Endeavour Energy zone substation and Lot 100 comprises the remainder of the site.

The site largely consists of grassland and is largely clear of vegetation as it is currently used for agricultural purposes. There is also a private access road network within the site which had previously connected to the now demolished sheds and ancillary structures scattered across the site. The site is suitable for development and is free of contamination, as confirmed by environmental testing and site investigations.

The site is situated within the Western Sydney Aerotropolis, with a direct interface with the Western Sydney International Airport (WSI). The site is bound by two significant riparian corridors which define Western Sydney, with South Creek to the east and Badgerys Creek to the north-west. The immediate surroundings of the site are characterised by large rural landholdings used predominately for agricultural and light manufacturing purposes, all of which will be redeveloped in accordance with the Aerotropolis Precinct Plan vision.

The extent and location of the site is presented in Figure 1.

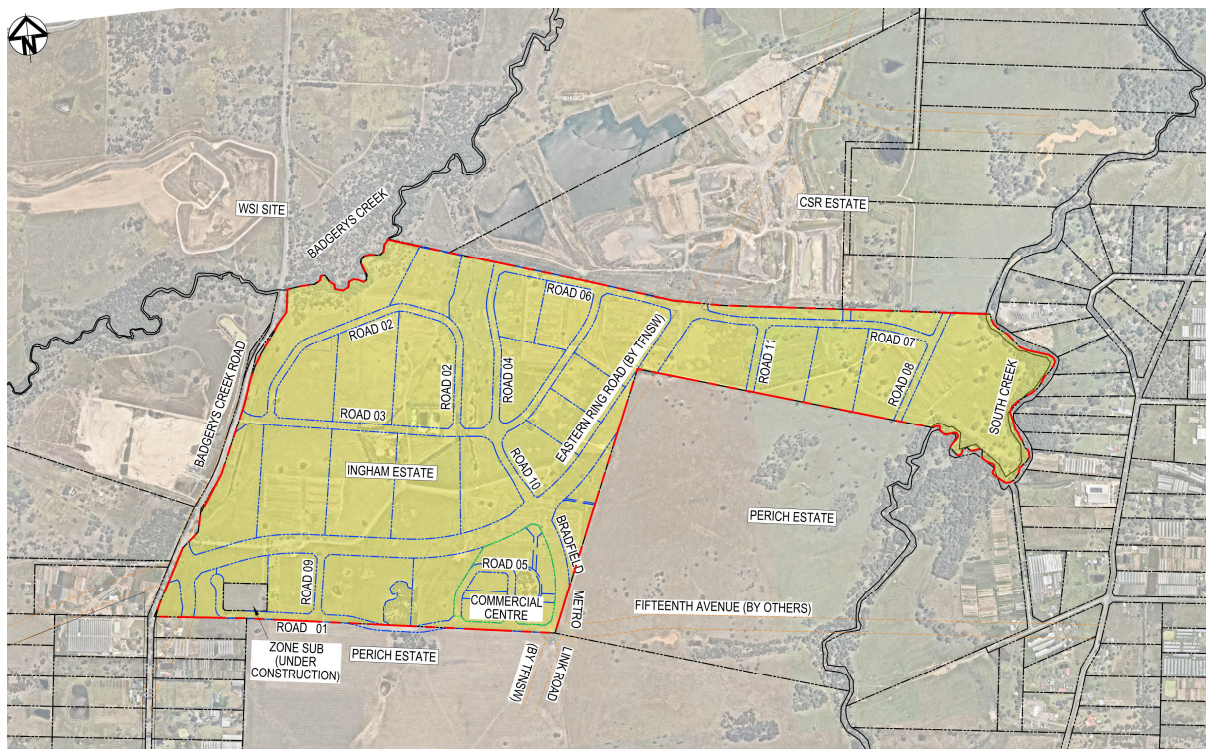


Figure 1: Site Extent and Subdivision Layout

1.2. Project Description

The majority of the proposed development comprises a warehouse and logistics estate with a small portion of commercial and retail development proposed around a commercial centre on the southeast corner of the site along the future Bradfield Metro Link Road (BMLR).

A Master Plan Approval is sought for the entire development area, as presented in *Figure 1*, and comprising of site preparation and civil infrastructure works required to facilitate the development of the Site in accordance with the proposed Concept Plan. This includes:

- Staged delivery of the estate aligned with infrastructure and utility services delivery.
- Site preparation, and earthworks.
 - ▶ Clearing and grubbing – including slashing, removal of existing trees and vegetation, infill of manmade waterbodies and removal of grass and roots within the top layer of soil.
 - ▶ Bulk earthworks across the Site, including cut and fill, road grading and boxing, benching and stabilisation (banks, batters and/or retaining walls).
- Road Infrastructure
 - ▶ Staged construction of the local road network and connection to the existing Badgerys Creek Road and future primary arterial roads for primary Site access.
 - ▶ Subject to TfNSW's timing in delivering the primary arterial roads, interim intersections and access roads are proposed in advance of the ultimate road configurations to Badgerys Creek Road (BCR), the Eastern Ring Road (ERR) and BMLR.
- Stormwater infrastructure.
 - ▶ Staged construction of regional and local stormwater drainage infrastructure as well as Water Sensitive Urban Design (WSUD) initiatives including stormwater quality management measures and runoff volume reduction infrastructure.
 - ▶ Construction of WSUD basins, as required for each construction stage, including bio-retention, wetland, stormwater harvesting/storage and detention basins.

- Utilities and Services
 - ▶ Staged construction of lead in services, utility reticulation and other service infrastructure to provide potable water, recycled water, sewer, electricity, and telecommunications services to the Site.
 - ▶ Temporary servicing infrastructure that may be required in advance of the permanent trunk servicing solutions. This may include Sewer Interim Operating Systems, subject to the relevant service authority's approvals.
- Environmental Management
 - ▶ Installation and maintenance of temporary and permanent erosion and sediment control measures, stormwater quality management measures, and ground stabilisation works across the site.
 - ▶ Staged remediation, rehabilitation/restoration of land and riparian corridors across the site following construction.
- Landscape Works
 - ▶ Staged construction of landscape works within the road verges, open space areas, riparian corridors, and drainage reserves within the development.
- Land Subdivision
 - ▶ Staged subdivision to create road, drainage and open space reserves and development lot boundaries.

An overall estate concept plan showing the proposed development is presented in Figure 2.

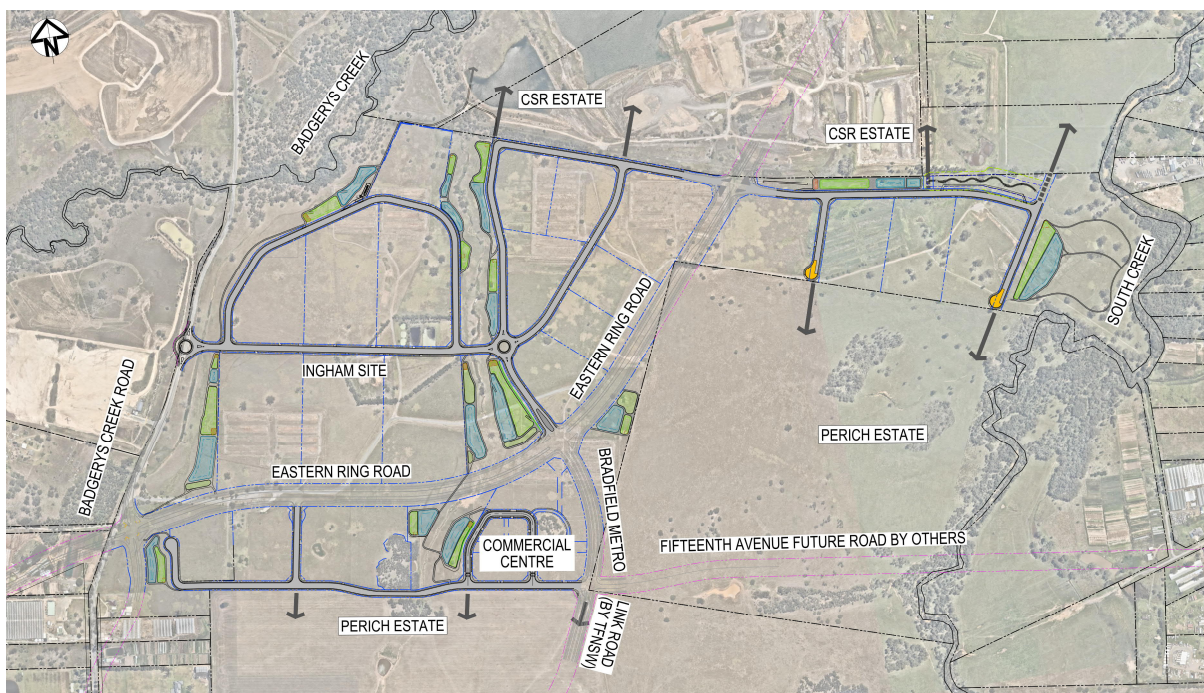


Figure 2: Overall Estate Concept Plan

1.3. Supporting Documentation

The following documentation is referred to throughout and should be read in conjunction with this report:

- a) Civil Engineering concept plans (AT&L, May 2024)
- b) Integrated Water Cycle Management Plan (IDC, March 2024)
- c) Geotechnical Site Investigation Report (Stantec, September 2022)

2. Statutory and Development Control Requirements

2.1. Statutory Planning Controls

As mentioned in Section 1, the Site is predominantly zoned for *ENT – Enterprise* zone under the *WPC SEPP 2021*. It is therefore subject to controls outlined within the *Western Sydney Aerotropolis Development Control Plan Phase 2, 2022 (WSA DCP)*.

2.2. Development Control Plans

2.2.1. Western Sydney Aerotropolis Development Control Plan Phase 2, 2022

The final version of the Western Sydney Aerotropolis Development Control Plan Phase 2 (WSA DCP or DCP) was adopted in November 2022 setting the precinct planning principles, objectives, and performance outcomes intended for the various precincts around the Aerotropolis to allow precinct planning and individual lot developments to progress.

2.2.2. Western Sydney Aerotropolis Precinct Plan, 2023

The current version (May 2023) of the Western Sydney Aerotropolis Precinct Plan (WSA PP) has been adopted and is in force under the provisions of the WPC SEPP. The Precinct Plan provides the place-based objectives and requirements to guide developments in the Aerotropolis in a consistent and sustainable manner over time.

2.2.3. Connecting with Country Framework, 2023

This framework provides guidance in planning, design and delivering built environments to achieve good practice outcomes that recognise and respect the cultural and heritage values in responding to Country for lands in the Aerotropolis.

2.3. Other Relevant Standards, Policies and Guidelines

The current versions of the following standards, specifications, policies and guidelines, relevant to the proposed development of the Site, were also used in the infrastructure planning and engineering design development for the Site:

- Australian Standards
 - AS/NZS 2890 Parking facilities (Parts 1-6)
 - AS/NZS 3500.3 Plumbing and drainage Part 3: Stormwater Drainage
 - AS 3798 Guidelines on Earthworks for Commercial and Residential Developments
- Austroads
 - Guide to Road Design
- Commonwealth of Australia (Geoscience Australia)
 - Australian Rainfall and Runoff, 2019 (AR&R 2019)
- Department of Planning & Environment
 - Western Sydney Aerotropolis Development Control Plan Phase 2 (WSA DCP)
 - Western Sydney Aerotropolis Precinct Plan (WSA PP)
 - Technical Guidance for Achieving Wianamatta-South Creek Stormwater Management Targets
 - Wianamatta-South Creek Stormwater Management Targets

- MUSIC Modelling Toolkit – Wianamatta
 - Recognise Country, Guidelines for Development in the Aerotropolis
- Department of Primary Industries (Office of Water)
 - Guidelines for Riparian Corridors on Waterfront Land
- International Erosion Control Association (IECA)
 - Best Practice Erosion and Sediment Control
- Landcom
 - Managing Urban Stormwater – Soils and Construction
- Liverpool City Council
 - Development Design Specifications (Parts D1 – D9)
 - Handbook for Drainage Design Criteria
 - On-Site Stormwater Detention Standard
- Sydney Water
 - Draft Stormwater Infrastructure Design Guideline
- Transport for NSW
 - Relevant supplements to Austroads' Guide to Road Design
 - Western City Road Transport Network Development Program, Initial Assumption Book
 - Guidelines-for-Bus-Capable-Infrastructure-in-Greenfield-Sites
 - R44 Earthworks
- Western Sydney Planning Partnership
 - Western Sydney Street Design Guidelines
 - Western Sydney Engineering Design Manual

3. Site Characteristics

3.1. Land Use

As mentioned, the Site is predominantly zoned for *ENT – Enterprise* zone which allows for commercial and industrial development for sectors that will benefit from the proximity to the WSI airport and Bradfield City. This includes logistics and distribution centres, data centres, aircraft and airline support and maintenance, etc.

The Site also includes land zoned ENZ – Environment and Recreation mainly located along the Badgerys Creek and South Creek riparian corridors to the north-west and east respectively. Roads, paths and stormwater infrastructure may be constructed within ENZ lands. However, development is restricted to environmental or recreational uses only.

A future corridor for the planned ERR crosses the site from the southwest corner and approximately midway along the northern boundary. This corridor is 60m wide and has been zoned MIC – SEPP (Major Infrastructure Corridors) 2020 through the site. This corridor is located outside the extent of the proposed initial Stages 1 & 2.

3.2. Site Geology

A desktop study and geotechnical investigation has been prepared for the Site by Stantec. This study identified the majority of the site is underlain by the Bringelly Shale Formation with Alluvium deposit along the creeks on the western and eastern ends.

Several salinity tests were carried out around the site, all of which indicated that the Site has non saline soils.

Geotechnical site investigations undertaken by Stantec did not encounter any groundwater from the boreholes and test pits taken across the Site. Groundwater is not expected to be encountered during the bulk earthworks phase and construction of civil infrastructure. Minor groundwater inflows into deep trenches and excavations (e.g., stormwater or sewer works) may be encountered while perched water tables drain immediately after rain events.

3.3. Existing Topography and Catchments

3.3.1. Topography

The western portion of the Site has moderate to gentle falls from approx. RL 73m at the Southeast corner to approx. RL 54m at the Northwest corner towards Badgerys Creek. This portion of the site contains two unnamed watercourses. One watercourse runs South-North along the western boundary and is referred to as the "western watercourse". The other runs South-North from the adjoining property to the south (Perich Estate) and through the middle of the western portion of the Site and is referred to as the "central watercourse". These watercourses connect to Badgerys Creek at the northwestern corner of the site.

The smaller eastern portion, referred to as the "pan-handle", has moderate to steep falls from approx. RL 72m at the western end to RL 45m at the eastern end, towards South Creek. The panhandle also contains an unnamed watercourse, referred to as the "eastern watercourse" which crosses from the Perich Estate at the southern side of the pan-handle and runs mostly along the northern boundary, connecting to South Creek at the eastern end.

The three watercourses mentioned above can generally be described as gullies and depressed overland flow paths and are typically dry except during rain periods.

There are small ponds in the middle of the site next to a recently demolished building associated with the previous use. A small basin was also found at the southern end of the central water course. These ponds were used as part of the previous agricultural use but are too small to be considered as dams.

3.3.2. Existing Watercourses

As mentioned in the previous section there are three unnamed watercourses meandering through the site. These watercourses have been recognised by as sufficiently significant to be mapped by the NSW Spatial Service and given watercourse orders under the Strahler system by the NSW Office of Water.

The Strahler system is a method of classifying or ordering the hierarchy of natural channels from 1st to 4th order or greater. The hierarchy or order level establishes the width of riparian corridors (comprising the channel and a transition zone between the land and watercourse) and the types of activities, works and/or development allowed within this zone. Table 1 below summarises the riparian corridor widths corresponding a watercourse's Strahler order.

Table 1: Recommended Riparian Corridor (RC) Widths

Watercourse type	VRZ width (each side of watercourse)	Total RC width
1 st order	10 metres	20 m + channel width
2 nd order	20 metres	40 m + channel width
3 rd order	30 metres	60 m + channel width
4 th order and greater (includes estuaries, wetlands and any parts of rivers influenced by tidal waters)	40 metres	80 m + channel width

The three watercourses have been defined in large-scale topographic mapping (1:25,000 from NSW SIX Maps) from the Department of Customer Service (Spatial Services) and verified by detail survey within the IPG estate. Refer to Figure 3.

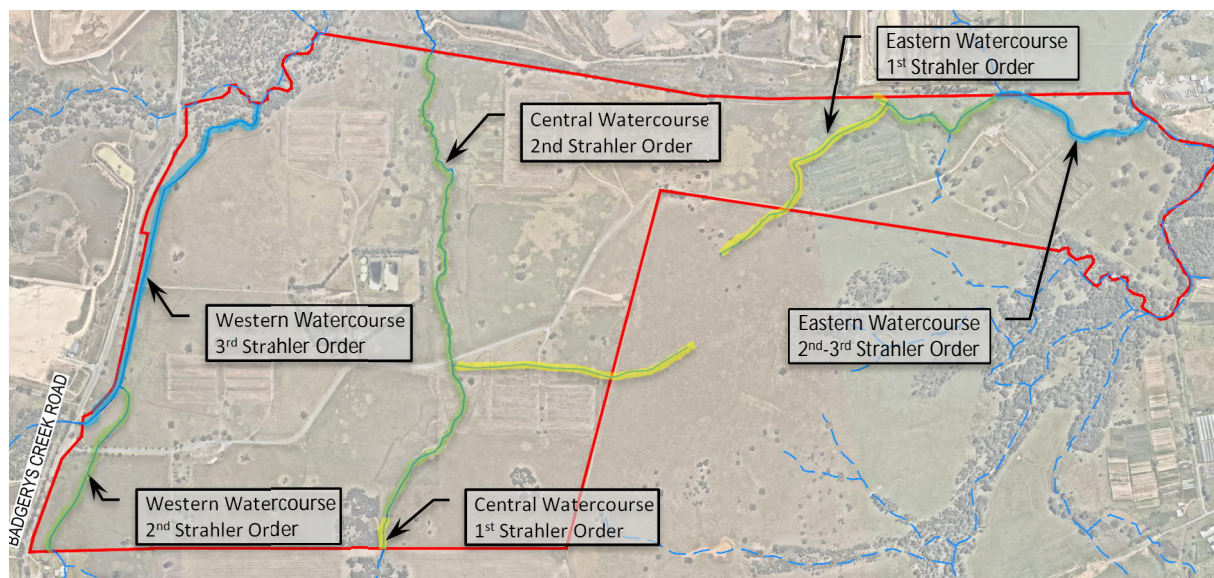


Figure 3: Map Showing Existing Watercourses

The western and central watercourses will largely be retained. Some proposed works consisting of stormwater infrastructure, road crossings and shared paths are expected to encroach into the outer 50% of the watercourses' riparian corridors. However, these works are allowed according to the Office of Water's Guidelines for Riparian Corridors on Waterfront Land.

It is proposed to replace the existing eastern watercourse with a naturalised open channel adjacent to Road 7 in response to the requirement for a riparian street at this location as mapped in the Precinct Plan. The proposed naturalised channel design properly defines the alignment and riparian corridor appropriate for its Strahler order. It replaces a gully that has been altered, eroded, and degraded over decades of farm and quarry activities. The existing gully cannot be retained as it is not well defined and discontinuous. It is also blocked and virtually flat in some sections.

These watercourses are proposed to be retained and rehabilitated in accordance with the requirements of the Office of Water's "Guidelines for Riparian Corridors on Waterfront Land" and the DPHI's "Technical Guidance for

Achieving Wianamatta-South Creek Stormwater Management Targets“. Details for the proposed rejuvenation of existing watercourses are contained within the landscape plans and the Vegetation Management Plan (VMP).

A detailed assessment of these watercourses is discussed in the Riparian Assessment (2024) report prepared by Eco Logical Australia.

3.3.3. Existing Stormwater Drainage Catchments

The Site is predominantly pervious. There are two ridges which break the site up into 3 major catchments. The western catchment drains into the western watercourse and discharges into Badgerys Creek. The Central catchment drains into the central watercourse which also ultimately discharges into Badgerys Creek. The eastern catchment (panhandle) drains into the eastern watercourse and discharges into South Creek. A pre-development catchment plan is presented in Figure 4.

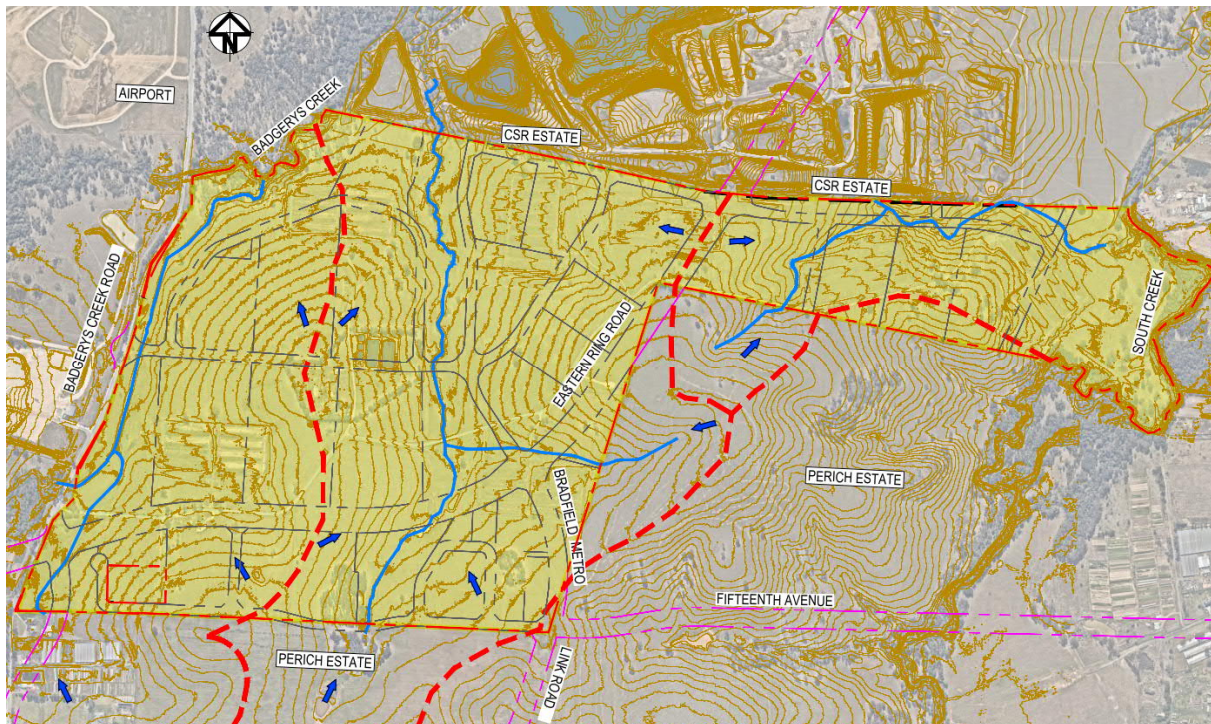


Figure 4: Catchment Extents Under Existing Conditions

3.3.4. Post-Development Stormwater Drainage Catchments

On completion, the Site will be split into 13 WSUD basin systems draining 17 sub-catchments.

Road and lot pad grading across the site have been designed to closely follow the natural topography. This, combined with the location of the existing watercourses, informed the formation of sub-catchments and the location of WSUD basins.

The post-development Basin Catchment Plan (drawing C2502), enclosed in Appendix A and presented in Figure 5 below shows the locations of WSUD basins together with their respective contributing catchments.

Stormwater infrastructure across the Site has been designed to enable the staged delivery of the estate.

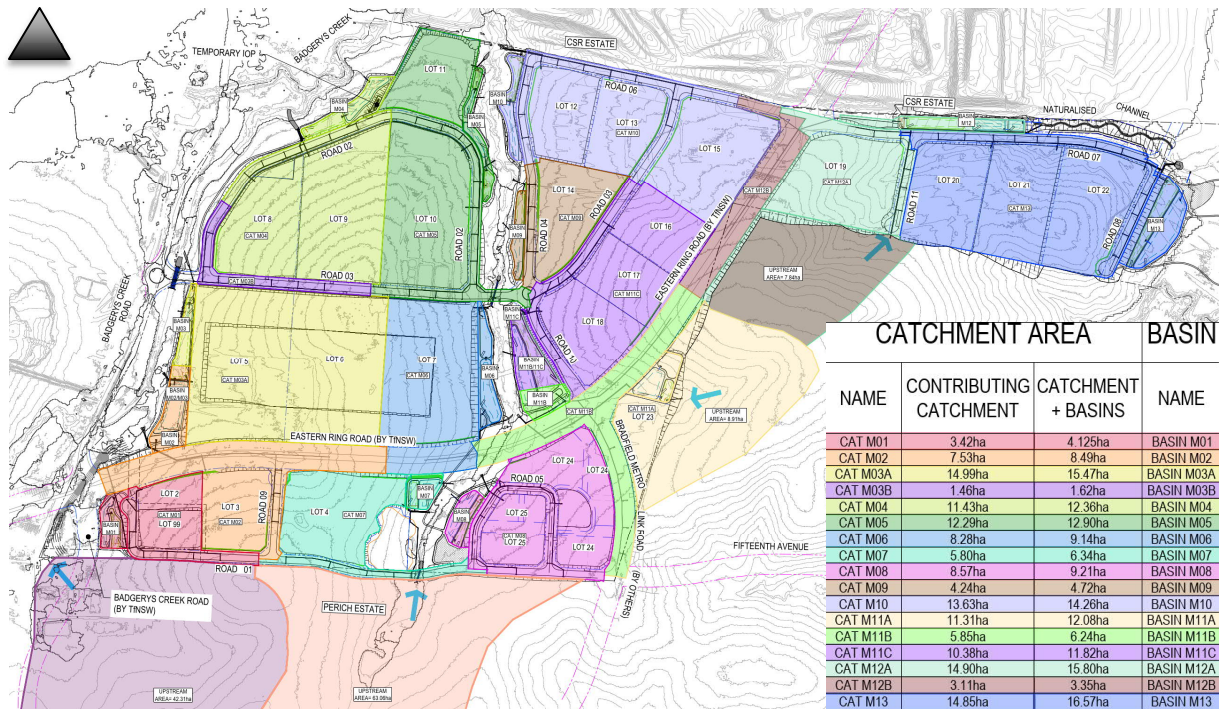


Figure 5: Post-Development Catchment Extents

3.3.5. External Stormwater Drainage Catchments

There are two large upstream catchments south of the IPG Estate and two smaller upstream catchments to the east of the ERR and BMLR. Majority of these catchments are within the Perich Estate but also includes smaller land holdings fronting Badgerys Creek Road.

Excess runoff from the two large southern catchments will drain through the IPG estate via the western and central watercourses. This flow regime will be retained throughout the IPG estate development.

The southern portion of the upstream catchment, east of the ERR and BMLR currently drains into the central watercourse via a natural depression. In the IPG Estate's post-development scenario, this catchment will drain into a WSUD basin system (Basin M11B) within the IPG Estate before discharging into the central watercourse.

Runoff from the northern portion of the upstream catchment, east of the ERR and BMLR currently drains into the eastern watercourse. This catchment will be intercepted and drain through the pan-handle's road drainage system before discharging into a WSUD basin system (Basin M12) within the IPG Estate before discharging into a naturalised channel which ultimately discharges into South Creek.

IPG's WSUD basins, road drainage systems and overland flows have been designed with sufficient capacity to accommodate runoff from these upstream catchments. Capped pipe stubs will be provided at the upstream boundaries in anticipation of future drainage connections from the Perich Estate.

Nonetheless, future developments within the Perich Estate are expected to provide their own local and regional stormwater drainage, WSUD and stormwater detention infrastructure prior to discharging runoff through the IPG Estate. This has been coordinated and agreed with representatives for the Perich Estate.

3.3.6. Catchment Diversion

The proposed development aims to minimise any catchment diversions between Badgerys Creek and South Creek. Whilst the proposed road grading and bulk earthworks have been designed to closely follow the natural topography, partial catchment diversions are still unavoidable due to the size and shape of lots, the road alignments and the general nature of the proposed development, a comparison of the pre-development and post-development catchment plans demonstrates that, on a regional basis, the overall catchment re-distribution

into Badgerys Creek and South Creek has been largely unchanged and will result in minimal difference to the existing regional catchment regime.

As mentioned in the previous section, catchments draining into the panhandle, including the upstream catchment from the Perich estate, will be intercepted and drain into the proposed road drainage systems in Roads 07, 08 and 11 before draining into WSUD basin systems, M12 and M13, and overflow into the naturalised channel and South Creek respectively.

Under pre-development conditions, three separate land holdings partly drain into this watercourse including:

- Lot 100 in DP 1287207 (IPG)
- Lot 1 DP417901 (Perich)
- Lot 3 DP1278780 (CSR)

Most of the original upstream catchment from the CSR parcel, through the course of their quarry and stockpiling activities, have significantly changed and no longer drain into this watercourse. CSR advised that their quarry rehabilitation works may not be able direct flows into the naturalised channel but will continue to drain their catchments into South Creek.

4. Bulk Earthworks

4.1. Cut and Fill Requirements

Bulk earthworks for the development have been designed to generally follow the natural topography as closely as possible. Roads and lot pads have been graded (rather than benched flat) to slope towards catchment drainage low points and to minimise overall cut and fill volumes as well as retaining walls. These measures were adopted in adherence with good soil management practices and Connection to Country principles.

Considering the type of businesses and operations expected around the Aerotropolis, earthworks for the Site essentially involves the formation of roads and lot pads to facilitate the development of large-scale industrial lots. The creation of large-scale industrial lots typically requires benched earthworks to achieve relatively level pads across each of the proposed lots across the estate.

The cut and fill requirements within the Site have been defined through multiple design iterations and careful consideration of the following:

- Adherence to good soil management practices and Connection to Country principles.
- The natural undulating topography within the Site will require some cut and fill to facilitate large format warehouse type developments and provide flexibility to cater for a wide range of industrial customer requirements.
- Connectivity to and interfaces with adjoining lands.
- Connectivity to Badgerys Creek Road, including allowance for the future upgrade of BCR and the future construction of the ERR and BMLR.
- Connectivity to and interfaces with future developments to the north and south of the Site.
- Minimise retaining walls fronting the main arterial and sub-arterial roads and minimising the extent of retaining walls fronting proposed local estate roads as much as possible.
- Avoiding extensive cut in bedrock sub-surface units.
- Achieving as close as possible to a balance of cut and fill to minimise the volume of material that needs to be imported or exported, allowing for management and re-use of topsoil.
- An estate-wide design solution that addresses water management requirements, including stormwater quantity and quality management, stormwater drainage (major and minor system), flooding and discharges.

It is recommended that the proposed earthworks design contained within AT&L's Civil Engineering Concept Plans (Refer Appendix A) provides the most contextually and economically appropriate design in consideration of the above requirements.

Refer to drawing C2051 for the proposed Cut and Fill Plan, drawings C2052 – C2056 for sections across the proposed earthworks, and drawings C2060 – C2084 for bulk earthworks plans across the development. A summary of the estimated cut and fill volumes across the development is presented in Table 2.

Table 2: Summary of Earthworks Volumes

ITEM	NET CUT VOLUME ³ (m ³)	NET FILL VOLUME (m ³)	BALANCE VOLUME (m ³)
Stripping of Topsoil			-152,320 (for re-use) ¹
IPG SITE ²	-1,006,384	984,695	-21,689 (export)
ERR & BMLR Corridors	-73,466	205,403	131,937 (import)
Total	-1,080,295	1185,011	104,716 (import)

¹ To be blended with site won material as fill or re-used for landscaping.

² Excluding ERR and BMLR.

³ Cut volume does not include trenching for stormwater and services or cut-back for retaining wall construction.

The volumes presented in Table 2 are based on the current design at the time of submission. Further detailed design of the infrastructure and on-lot works may alter these volumes. Negative balance indicates net cut and positive balance indicates net fill. It is assumed that topsoil from the Site will be reused within the Site for landscaping and by blending with general fill material.

The overall cut and fill volumes are expected to reduce to near balance after consideration of excavated natural materials from stormwater and services trenching or additional cut-back for retaining wall construction.

Any excess materials, particularly from the initial development stages, may be temporarily stockpiled and progressively used in later development stages to ensure balanced earthworks at completion of the development. Similarly, borrow pits from proposed cut areas may also be used to make up for any shortfall of fill in the initial stages. This ensures that soil is retained onsite as much as possible and any importation of fill is kept to a minimum.

All imported soil and pavement materials will comply with the requirements of the Import Fill Protocol and geotechnical specifications for the development. Topsoil stripping, blending and placement will be undertaken in accordance with the geotechnical engineering specification for the project.

4.2. Retaining Walls

Where possible, batter slopes will be provided to accommodate level changes. Where changes in level within the public domain are too large and would result in steep and unstable batters, retaining walls are to be constructed in accordance with the DCP requirements. It is proposed to use interlocking blocks such as Keystone or other similar retaining wall systems for most applications around the estate. In coordination with the Landscape Architect, special feature walls such as gabions, sandstone, panel walls, and other types of wall systems may also be used at specified locations.

Refer to Figure 6 to Figure 8 inclusive for general examples of retaining wall arrangements. Retaining wall typical sections are also presented on drawings C2016 to C2020.

These walls will be structurally designed and built to the manufacturers' specifications to suit the required heights and loading. All retaining walls >900mm high will have pedestrian barriers and vehicular safety barriers

for walls >600mm high (where necessary), in accordance with the Australian Standards and Austroads Guidelines.

All retaining walls will be constructed on a staged basis and as required to suit the on-lot development earthworks, public domain levels and stormwater basin works. Wherever possible, sloping surfaces and batters of up to 1 in 4 will be constructed instead of retaining walls.

Where boundary fill walls are proposed, the construction of the boundary walls may be delayed until such time as the adjacent lot is developed. If the boundary walls are delayed, a temporary batter will be constructed as an interim measure.

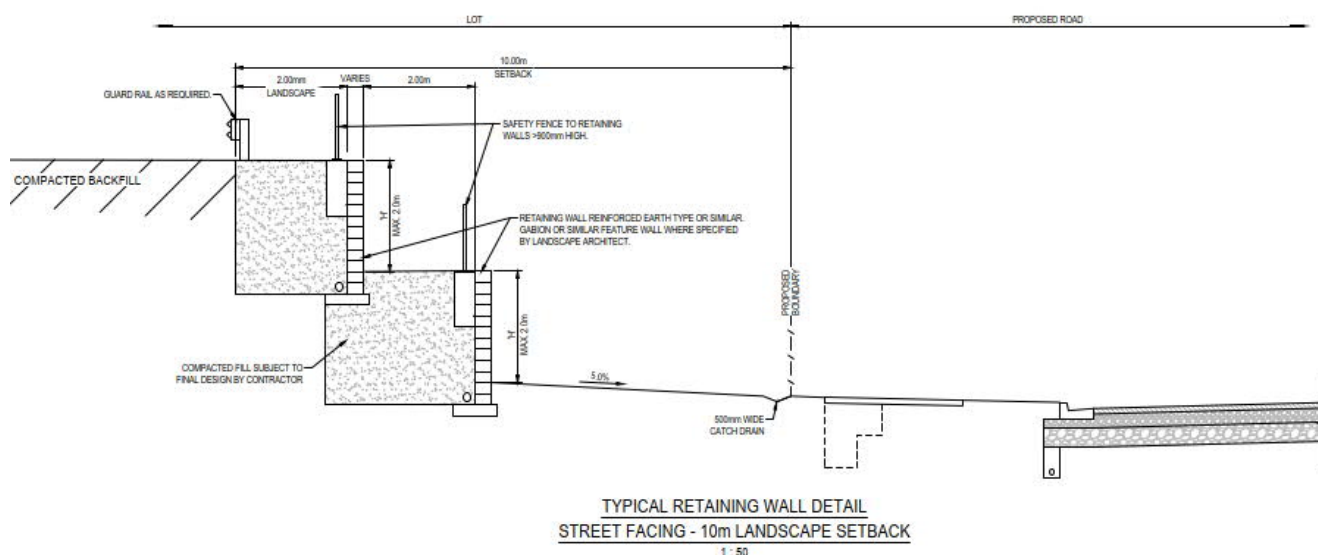


Figure 6: Typical Retaining Wall Section



Figure 7: Example of Retaining Walls Facing the Public Domain



Figure 8: Example of Retaining Walls Facing into Lots

4.3. Batter Design

All batters will be formed stable and vegetated. A typical 1 in 4 batter has been applied across the estate although flatter batters will be applied where space permits. Where necessary, a maximum batter of 1 in 3 may be applied around constrained and small localised areas only. Additional batter stabilisation measures will be provided for batters that are steeper than 1 in 4. 1 in 6 batters are proposed along all shared boundaries with the Perich estate, as requested by their representatives.

Any temporary batters constructed during the works will be in accordance with recommended maximum batter slopes as per the geotechnical investigation report and ongoing advice from the Level 1 geotechnical engineer. All temporary batters will be stabilised with appropriate methods and vegetated or protected from erosion where necessary.

5. Road Design

The proposed main roads and local road network have been designed and will be constructed in accordance with the current version of the following standards, specifications, policies, and guidelines:

- Australian Standards
 - AS/NZS 2890 Parking facilities (Parts 1-6)
 - AS 3798 Guidelines on Earthworks for Commercial and Residential Developments
- Austroads
 - Guide to Road Design (AGRD)
- Department of Planning & Environment
 - Western Sydney Aerotropolis Development Control Plan Phase 2 (WSA DCP)

- Western Sydney Aerotropolis Precinct Plan (WSA PP)
- Liverpool City Council
 - Development Design Specifications (Parts D1 – D9)
- Transport for NSW
 - Relevant supplements to Austroads' Guide to Road Design
 - Western City Road Transport Network Development Program, Initial Assumption Book
 - Guidelines-for-Bus-Capable-Infrastructure-in-Greenfield-Sites
 - R44 Earthworks
- Western Sydney Planning Partnership
 - Western Sydney Street Design Guidelines
 - Western Sydney Engineering Design Manual

5.1. Site Access

Vehicular access to the Site will initially be via Badgerys Creek Road (refer to Figure 9) particularly for Stages 1 and 2. Transport for NSW (TfNSW) is currently planning the delivery of the ERR between the Elizabeth Drive (to the north) and The Northern Road (to the south). Ultimately the ERR will become the main access for the development.

The development also proposes a network of shared paths and pedestrian footpaths along all roads and riparian corridors with connections to existing roads and future developments. The riparian corridors, ERR, BMLR and Roads 1, 6 and 7 have been designated as the main Active Transport Links across the site and are intended to provide connections between the main hubs across the Aerotropolis and surrounding areas.

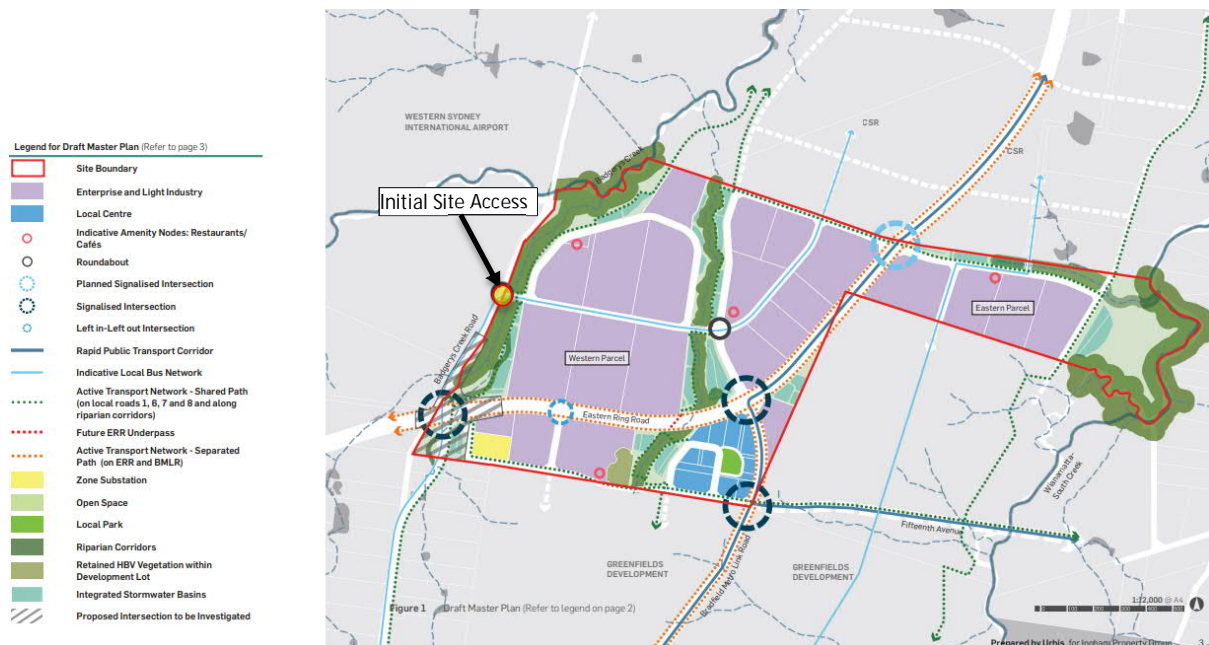


Figure 9: Site Access off Badgerys Creek Road

5.2. Main Roads

As shown in Figure 9, several main roads run through and adjacent to the proposed development including the Eastern Ring Road (primary arterial), Bradfield Metro Link Road (primary arterial – rapid bus), Fifteenth Avenue (primary arterial – rapid bus), and Badgerys Creek Road (collector/sub-arterial). The alignment of these roads,

particularly the ERR, had a direct influence on the overall master plan layout and the proposed local road network.

The main road corridor alignments have undergone multiple alignment options and extensive reviews and coordination with TfNSW across the various options. The corridor alignments shown in Figure 9 and the Civil Engineering concept plans in Appendix A have been designed in accordance with AGRD and the relevant TfNSW supplements to accommodate TfNSW's future road design for the ERR. These corridor alignments have been endorsed by TfNSW.

Typical sections for the primary arterial – rapid bus and primary arterial roads are provided in Figure 16 and Figure 17 respectively.

5.2.1. Primary Arterial Road (60m wide)

The ERR is designed in accordance with Figure 6 in the WSA DCP. This section was applied along the endorsed alignment to inform future road and intersection levels. It is assumed that TfNSW will deliver the ERR. A typical section is presented in Figure 17 below and in the Civil Engineering Concept Plans in Appendix A.

The endorsed corridor alignment maintains a 60m wide road reserve, in accordance with the WSA DCP, with a slight increase to the overall length by about 156m compared to the original precinct plan alignment. The re-aligned portion includes signalised intersections at the ERR-BCR, ERR-BMLR and ERR-Road 06-Road 07 intersections and a left-in / left out intersection at the ERR-Road 09 intersection.

The ERR-BCR intersection has also been re-aligned and relocated east of the original location in the Precinct Plan. This was done at the request of TfNSW to achieve a more desirable 80-degree angle between each leg of the intersection. Whilst the overall intersection corridor arrangement has been agreed with TfNSW, the intersection and its immediate surrounding area is currently set aside for further investigation and design development by TfNSW.

The proposed re-alignment has been coordinated with and is supported by CSR and Perich.

5.2.2. Primary Arterial Road – Rapid Bus (45m wide)

BMLR and Fifteenth Avenue are designed in accordance with Figure 7 in the WSA DCP. This section was applied along the endorsed alignment to inform future road and intersection levels. It is understood that TfNSW is currently responsible for planning these roads and assumed that either TfNSW and/or Council will deliver these roads. A typical section is presented in Figure 16 below and in the Civil Engineering Concept Plans in Appendix A.

The endorsed BMLR corridor alignment shifts the road into the IPG estate and moves the intersection with ERR to the southwest of the original Precinct Plan location. It maintains a 45m wide road reserve, in accordance with the WSA DCP, but is significantly shorter by 480m compared to the Precinct Plan alignment. The re-aligned portion includes signalised intersections at the ERR-BMLR and BMLR-Road 01 intersections.

The re-alignment extends 294m south into the Perich estate where it matches back to the original precinct plan alignment. The Perich estate's representative has been advised and supports the re-alignment.

The following are the types of main roads adopted in the concept design for the proposed development:

5.3. Local Road Network

The proposed street layout, hierarchy and typology was developed based on the road types and sections presented in the WSA DCP, the objectives set out in the Precinct Plan and with inputs from TfNSW's Initial Assumption Book. As mentioned in Section 5.2, the endorsed main road alignments also influenced the local road network layout.

The proposed local road network has been designed to service the intended land use around the estate, being large-format industrial and logistics facilities. Heavy vehicles are expected to comprise a significant proportion of the traffic around the site from small trucks to 19m semi-trailers, 26m B-Doubles, and 30m A-Doubles (PBS level 2B) with the road geometry being tested for vehicles up to 36.5m long B-Triples in accordance with the DCP

and TfNSW requirements. These vehicles are on average 2.5m wide and when navigating the local road network, can regularly occupy the whole travel lane width and require wider, large radii corners where the swept path can extend beyond the average travel lane width.

The following are the types of local roads adopted in the concept design for the proposed development:

5.3.1. Open Space Edge Road (19.5m wide)

A portion of Road 01 has been reduced from a Local Industrial Road to an Open Space Edge Road to fit through an existing gap between two clusters of trees (Casuarinas) and avoid encroaching the tree protection zones. This section of Open Space Edge Road is designed in accordance with Figure 14 in the WSA DCP. A typical section is presented in Figure 10 below and in the Civil Engineering Concept Plans in Appendix A.

5.3.2. Local Industrial Road (24m wide)

Roads 02, 04, 06, 07, 08 and 09 and part of Road 01 are designed generally in accordance with Figure 12 in the WSA DCP. A typical section is presented in Appendix A.

5.3.3. High Street Commercial Centre (25.0m wide)

Road 05 is designed generally in accordance with Figure 15 in the WSA DCP. A typical section is presented in Figure 12 below and in the Civil Engineering Concept Plans in Appendix A.

5.3.4. Collector Road (25.6m wide)

Roads 03, 10, and 11 are designed generally in accordance with Figure 13 in the WSA DCP. A typical section is presented in Figure 13 below and in the Civil Engineering Concept Plans in Appendix A.

5.3.5. Riparian Street (Local Industrial Road + 50-70m Riparian Corridor)

The eastern end of Road 07 is designed as a riparian street in accordance with Figure 3 in the WSA DCP and the Precinct Plan. It replaces the existing watercourse at this location. A typical section is presented in Figure 14 below and in the Civil Engineering Concept Plans in Appendix A.

5.3.6. Riparian Collector Road (Collector Road + 40m LRA)

The Western end of Road 07 is designed as collector road in accordance with Figure 13 in the WSA DCP and modified to incorporate Land Reservation Acquisition (LRA) areas for stormwater infrastructure on one side. This road provides a collector road connection to the ERR and a continuous collector road from Road 11 through to the future connection into the CSR Estate, whilst also extending the amenities of the riparian street along the whole length of Road 07. A typical section is presented in Figure 15 below and in the Civil Engineering Concept Plans in Appendix A.

The following is a summary of the general design criteria adopted in developing the road alignments for the main roads and local estate roads:

Table 3: General Road Design Criteria (Part 1)

Road Type	Open Space Edge Road ³	Local Industrial Road & Riparian Street ³	High Street Commercial ³
Road Reserve	19.5m	24.0m	25.0m
Design Speed (Operating speed)	60 km/h (50 km/h) (Ref: Note 4)	60 km/h (50 km/h) (Ref: Note 4)	60 km/h (50 km/h) (Ref: Note 4)
Pedestrian and Shared Path (Within Verge)	Footpath = 2.1m Shared Path = 3.1m	Footpath = 2.1m Shared Path = 3.1m	Footpath = 2x3.0m Cyclepath = 2x2.0m
Verge Width	Verge 1 – 4.0m Verge 2 – 5.0m	Verge 1 – 4.0m Verge 2 – 5.0m	Verge 1 – 7.0m Verge 2 – 7.0m

Road Type	Open Space Edge Road ³	Local Industrial Road & Riparian Street ³	High Street Commercial ³
Through Traffic Lanes	1x3.5m, 1x4.0m	2x3.5m (2x4.4m w/ parking lane)	2x3.3m
Kerbside Parking / Through Lanes	1x4.0m kerbside lane 1x3.0m parking lane	2x4.0m (or 2x3.1m parking lane)	2x2.2m (Flex Zone)
Median Width	N/A	N/A	N/A
Road Carriageway Width (Kerb to Kerb)	10.5m	15.0m	6.6m 11m (w/ Flex Zones)
Design Vehicle Check Vehicle	26m A-Double 35m B-Triple	26m A-Double 35m B-Triple	12.5m HRV 19m AV
Min. Curve Radii	15m (Corners) >/= 80m	15m (Corners) >/= 80m	15m (Corners) >/= 80m

Table 4: General Road Design Criteria (Part 2)

Road Type	Collector Road ³ & Riparian Collector Street	Primary-Arterial Road (Rapid Bus) ³	Primary-Arterial Road ³
Road Reserve	25.6m	45.0m	60.0m
Design Speed (Operating speed)	60 km/h (50 km/h) (Ref: Note 4)	15 th Ave = 80 km/h BMLR = 70 km/h (15 th Ave = 70 km/h) (BMLR = 60 km/h) (Ref: Note 2)	80 km/h (70 km/h) (Ref: Note 2)
Pedestrian and Shared Path (Within Verge)	Footpath = 2.1m Shared Path = 3.1m	2xCyclepaths = 2.0m 2xFootpaths = 2.0m	2xCyclepaths = 2.5m 2xFootpaths = 2.0m
Verge Width	Verge 1 – 5.6m Verge 2 – 4.6m	Verge 1 – 10.0m Verge 2 – 12.0m	Verge 1 – 15.0m Verge 2 – 18.0m
Through Traffic Lanes	2 x 3.5m	2x3.5m Bus lanes 2x3.5m	2x3.5m
Kerbside Parking / Through Lanes	2 x 4.2m	N/A 2x1.5m Shoulder	2x3.5m
Median Width	N/A	2x3.0m	13m
Road Carriageway Width (Kerb to Kerb)	15.4m	2x5.0m 1x7.0m Bus	2x7.0m
Design Vehicle Check Vehicle	26m A-Double 35m B-Triple	26m A-Double 35m B-Triple	26m A-Double 35m B-Triple
Min. Curve Radii	15m (Corners) >/= 80m	15 th Ave = 660m BMLR = 400m (Ref: Note 1)	660m (Ref: Note 1)

Notes:

¹ From TfNSW supplements to Austroads' Guide to Road Design

² From Western City Road Transport Network Development Program, Initial Assumption Book

³ From Western Sydney Aerotropolis Development Control Plan Phase 2

⁴ From Austroads' Guide to Road Design

Temporary cul-de-sacs and turning areas are proposed at the southern end of Roads 08 and 11 until such time that the local and collector roads can be extended into the adjacent sites. These cul-de-sacs will also be designed to accommodate the design and check vehicles stated above.

The following are typical sections of the main roads and local roads described above.

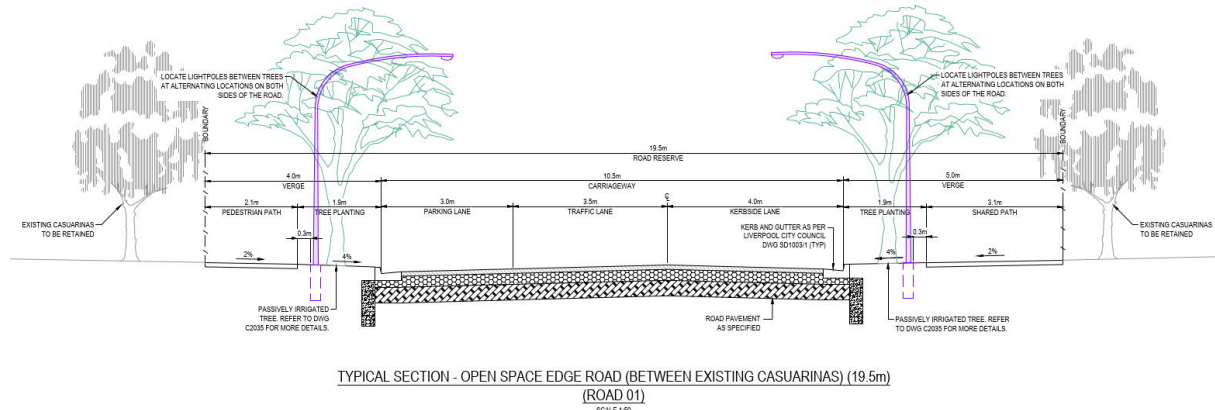


Figure 10: Open Space Edge Road (19.5)

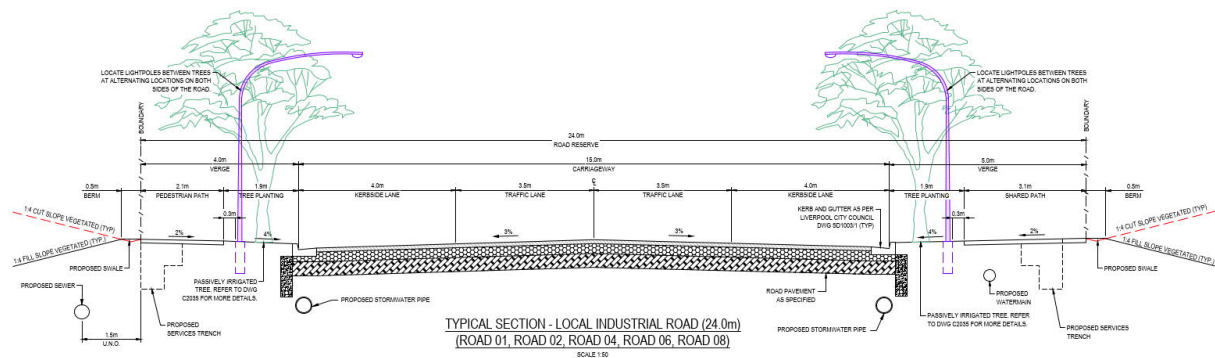


Figure 11: Local Industrial Road (24m)

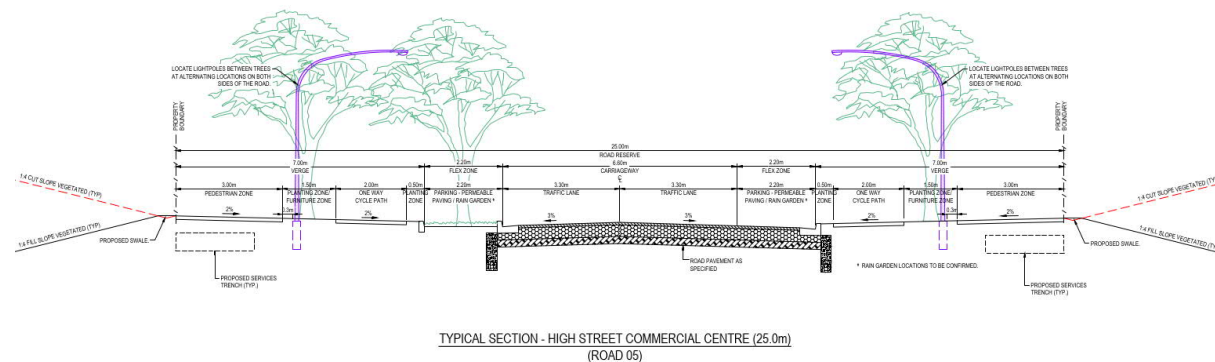


Figure 12: High Street Commercial Road (25m)



5.4. Pavements

Pavements for the proposed roads will be designed in accordance with the requirements of Austroads' Pavement Design Guide – A Guide to the Structural Design of Road Pavements and the geotechnical engineer's recommendations.

Pavements shall be constructed in accordance with the relevant TfNSW and Council Works Specifications.

6. Soil and Water Management

This section documents the potential impacts of the development on soil and water resources, and measures proposed to reduce and mitigate impacts during and after construction.

Detailed Soil and Water Management Plans (SWMP) shall be provided as part of the detailed design phase for each development stage. These will be prepared and certified by a Certified Professional in Erosion and Sediment Control (CPESC) in accordance with:

- Landcom's guideline titled: *Managing Urban Stormwater – Soils and Construction*
- IECA's Best Practice Erosion and Sediment Control, and
- DHPI's Wianamatta South Creek Stormwater Management Targets.

The SWMP shall be prepared to achieve the following key objectives:

- Acknowledging the activities on a construction site which may contribute to erosion, sedimentation, and water quality impacts.
- The implementation of industry best management practices to minimise adverse water quality and sedimentation impacts brought about through construction activities on waterbodies surrounding the work.
- Establishment of processes that effectively manage erosion, sedimentation, and water quality practices during the life of the project.

6.1.1. Sources of Pollution

The activities and aspects of the works that have potential to lead to erosion, sediment transport, siltation and contamination of natural waters include:

- Earthworks undertaken immediately prior to rainfall periods.
- Work areas that have not been stabilised.
- Extraction of construction water from waterways during low rainfall periods.
- Clearing of vegetation and the methods adopted, particularly in advance of construction works.
- Stripping of topsoil, particularly in advance of construction works.
- Bulk earthworks and construction of pavements.
- Works within drainage paths, including depressions and waterways.
- Stockpiling of excavated materials.
- Storage and transfer of oils, fuels, fertilisers, and chemicals.
- Maintenance of plant and equipment.
- Ineffective implementation of erosion and sediment control measures.
- Inadequate maintenance of environmental control measures; and
- Time taken for the rehabilitation / revegetation of disturbed areas.

6.1.2. Potential Impacts

The major potential impacts on the riparian environment relate to erosion of distributed areas or stockpiles and sediment transportation. Potential adverse impacts from erosion and sediment transportation can include:

- Loss of topsoil.
- Increased water turbidity.
- Decreased levels of dissolved oxygen.
- Changed salinity levels.
- Changed pH levels.
- Smothering of stream beds and aquatic vegetation.
- Reduction in aquatic habitat diversity.
- Increased maintenance costs.
- Decrease in waterway capacity leading to increased flood levels and durations.

6.2. Construction Phase Soil and Water Management Strategy

The following construction methodology will be adopted to minimise the impact of sedimentation due to construction works:

- Diversion of surface runoff from undisturbed areas away from disturbed areas and discharge via suitable scour protection.
- Provision of hay bale type flow diverters to catch drainage and divert to “clean” water drains.
- Diversion of sediment-laden water into temporary sediment control basins to capture the design storm volume and undertake flocculation (if required).
- Provision of construction traffic shaker grids and wash-down to prevent vehicles carrying soils beyond the Site.
- Provision of catch drains to carry sediment-laden water to sediment basins.
- Provision of silt fences to filter and retain sediments at source.
- Rapid stabilisation of disturbed and exposed ground surfaces with hydro-seeding areas where future construction and building works are not currently proposed.
- All temporary sediment basins will be located clear of the 1% AEP flood extents from local overland flow within the Site.
- Temporary sediment control basins will be provided within each lot. These basins shall not be removed until such time as at least 90% of all building and landscaping works within each lot has been completed.

6.3. Design of Erosion and Sediment Control Measures

Suitable erosion and sediment controls shall be provided by the Contractor and maintained throughout all stages of works, including at completion of the bulk earthworks.

All design, documentation, installation and maintenance of sediment and erosion controls will be in accordance with the requirements of:

- Department of Planning, Housing & Infrastructure
 - Western Sydney Aerotropolis Development Control Plan Phase 2 (WSA DCP)
 - Technical Guidance for Achieving Wianamatta-South Creek Stormwater Management Targets
 - Wianamatta-South Creek Stormwater Management Targets
 - MUSIC Modelling Toolkit – Wianamatta
- International Erosion Control Association (IECA)

- Best Practice Erosion and Sediment Control
- Landcom
 - Managing Urban Stormwater – Soils and Construction
- Liverpool City Council
 - Development Design Specifications (Parts D1 – D9)
 - Handbook for Drainage Design Criteria
 - Water Management Policy
 - On-Site Stormwater Detention Standard
- NSW Environment Protection Authority
 - Protection of the Environment Operations Act 1997

With the proposed development being larger than 2,500m², sediment basins will be required. The proposed regional wetlands and stormwater storage basins will be used temporarily as sediment basins during the bulk earthworks construction. For this approval, it has been assumed that some on-lot works will be completed simultaneously. Temporary on-lot sediment basins will also be provided to intercept silty and sediment laden runoff closer to the source. Ultimately, the final temporary sediment basin locations and sizes will be provided to suit development staging requirements and will be sized and maintained in accordance with the requirements of the above-mentioned authority documents.

6.4. Site Inspection and Maintenance

The inspection and maintenance requirements outlined in this section must be carried out while earthworks are being conducted, and all areas re-established.

The Contractor will be required to inspect the Site after every rainfall event and at least weekly, and will:

- Inspect and assess the effectiveness of the ESCP and identify any inadequacies that may arise during normal work activities or from a revised construction methodology.
- Construct additional erosion and sediment control works as necessary to ensure the desired protection is given to downstream lands and waterways.
- Ensure that drains operate properly and to affect any repairs.
- Remove spilled sand or other materials from hazard areas, including lands closer than 5 metres from areas of likely concentrated or high velocity flows especially waterways and paved areas.
- Remove trapped sediment whenever less than design capacity remains within the structure.
- Ensure rehabilitated lands have affectively reduced the erosion hazard and to initiate upgrading or repair as appropriate.
- Maintain erosion and sediment control measures in a fully functioning condition until all construction activity is completed and the Site has been rehabilitated.
- Remove temporary soil conservation structures as the last activity in the rehabilitation.
- Inspect the sediment basin during the following periods:
 - ▶ During construction to determine whether machinery, falling trees, or construction activity has damaged and components of the sediment basin. If damage has occurred, repair it.
 - ▶ After each runoff event, inspect the erosion damage at flow entry and exit points. If damage has occurred, make the necessary repairs.
 - ▶ At least weekly during the nominated wet season (if any), otherwise at least fortnightly; and
 - ▶ Prior to, and immediately after, periods of 'stop work' or Site shutdown.
- Clean out accumulated sediment when it reaches the marker board/post and restore the original volume. Place sediment in a disposal area or, if appropriate, mix with dry soil on the Site.

- Do not dispose of sediment in a manner that will create an erosion or pollution hazard.
- Check all visible pipe connections for leaks, and repair as necessary.
- Check all embankments for excessive settlement, slumping of the slopes or piping between the conduit and the embankment, make all necessary repairs.
- Remove trash and other debris from the basin and riser (if there is one present).
- Submerged inflow pipes must be inspected and de-silted (as required) after each inflow event.

6.5. Sediment Basin Maintenance

Management and maintenance of the proposed sediment basins, including the temporary on-lot basins and the proposed regional basins, will be the responsibility of the development proponent. In accordance with The Blue Book, the sediment basins will be managed and maintained until the works for which they were designed are completed and fully stabilised on more than 90% of the contributing catchment. Once the proposed regional basins can be decommissioned as sediment basins, the basins can then be re-configured into their permanent arrangement including Wetlands and/or bio-retention, storage basins, and their hydraulic outlet controls (discharge control / overflow pits) will be completed.

The proposed development Site contains 'Type F' soils, or soils that contain a significant proportion of fine grained (33% or more of finer than 0.02mm) and require a much longer residence time to settle.

Stormwater within the settling zone should be drained or pumped out within 5 days (design time), if the nominated water quality targets can be met, to the satisfaction of the superintendent. Flocculation should be employed where extended settling is likely to fail to meet the objectives within the 5-day period.

Flocculation is when flocculating agents are applied to the sediment basins causing the colloidal particles to clump into larger units or 'floc' that can either settle in a reasonable time or be filtered.

Refer to Appendix E4 of the Blue Book for flocculation methodologies and manufacturer's instructions for application rates, regarding the proposed sediment basins.

7. Stormwater Drainage

7.1. Design Standards

The proposed local and regional stormwater drainage systems have been designed and will be constructed in accordance with the current version of the following standards, specifications, policies and guidelines,

- Australian Standards
 - AS/NZS 3500.3 Plumbing and drainage Part 3: Stormwater Drainage
- Commonwealth of Australia (Geoscience Australia)
 - Australian Rainfall and Runoff, 2019 (AR&R 2019)
- Department of Planning, Housing & Infrastructure
 - Western Sydney Aerotropolis Development Control Plan Phase 2 (WSA DCP)
 - Western Sydney Aerotropolis Precinct Plan (WSA PP)
 - Technical Guidance for Achieving Wianamatta-South Creek Stormwater Management Targets
 - Wianamatta-South Creek Stormwater Management Targets
 - MUSIC Modelling Toolkit – Wianamatta
- Department of Primary Industries (Office of Water)

- Guidelines for Riparian Corridors on Waterfront Land
- International Erosion Control Association (IECA)
 - Best Practice Erosion and Sediment Control
- Landcom
 - Managing Urban Stormwater – Soils and Construction
- Liverpool City Council
 - Development Design Specifications (Parts D1 – D9)
 - Handbook for Drainage Design Criteria
 - Water Management Policy
 - On-Site Stormwater Detention Standard
- Sydney Water
 - Draft Stormwater Infrastructure Design Guideline
- Western Sydney Planning Partnership
 - Western Sydney Street Design Guidelines
 - Western Sydney Engineering Design Manual

7.2. Stormwater Management Strategy

The overall stormwater management strategy was prepared in coordination with Infrastructure and Development Consulting (IDC) and forms the basis of how stormwater runoff will be conveyed, treated, and harvested for re-use. IDC also prepared the Integrated Water Cycle Management Plan (IWCMP) to inform the stormwater quantity, quality, and flood management requirements for the Site.

Matters relating to stormwater quantity, quality and flood management are discussed in more detail in the IWCMP. This Civil Infrastructure Report provides details on stormwater conveyance and hydraulics of the inground (piped) drainage system, open channel and overland flow paths design and are discussed in the following sections.

The general strategy involves the collection and conveyance of stormwater runoff from the various lots and roads into the local drainage network consisting of inground pipes and pits, open channels, and overland flow paths before discharging into the regional stormwater drainage infrastructure which includes sediment ponds, bioretention basins, wetlands, and the Mean Annual Rainfall Volume (MARV) reduction basins – stormwater storage basins.

Flow diversion pits are proposed at the end of local drainage lines to divert high flows in excess of the wetland system's capacity into the existing water courses and naturalised channels downstream. Low flows are retained within the wetland system for further treatment before draining into the regional storage basins which are also designed to reduce the Mean Annual Rainfall Volume (MARV) discharging into the downstream waterways.

The regional WSUD and storage basins have been designed to achieve the Wianamatta-South Creek stormwater management targets without the need for on-lot or on-road WSUD measures.

Nonetheless, Gross Pollutant Traps (GPT) are being provided for each lot to filter out the “initial flush” flows and capture large particles and rubbish before discharging into the local pipe drainage and regional wetland systems. Tree pits along roads are proposed to incorporate passive irrigation measures which will help reduce runoff and capture some gross pollutants and nutrients. Additional on-lot initiatives may still be provided at the discretion of future owners/tenants with any performance benefits being counted as over, and above the minimum targets already met.

Figure 18 below shows a simplified flow chart of the proposed Stormwater Management Strategy.

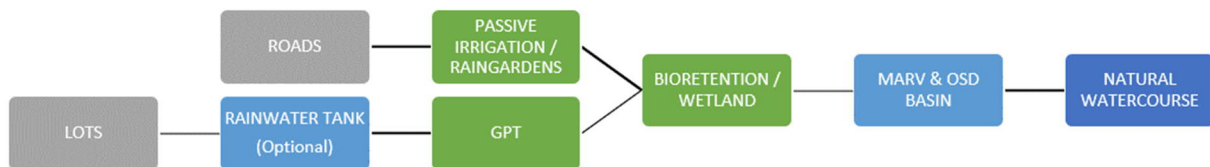


Figure 18: Drainage & WSUD Strategy

7.3. Proposed Local Stormwater Drainage

The proposed local stormwater drainage networks within the Site comprises a combination of inground piped drainage, open channels and overland flow paths designed to safely convey runoff flows from both minor and major storm events. The following design criteria have been adopted for both on-lot and public stormwater drainage systems:

- Major system (overland flow paths and open channels): 1% AEP
- Minor system (inground pit and pipe network): 10% AEP and 1% AEP for trapped catchments.
- Contributing catchment size $\leq 15\text{ha}$ to each regional basin discharge point.

The Time of Concentration for the Site were estimated in accordance with the AR&R with a minimum time of concentration of five (5) minutes for the smaller sub-catchments. The rainfall intensities used have been adopted from the Bureau of Meteorology's Design Rainfall Data System (2016).

The following stormwater drainage pipes and culverts shall be used:

- Under estate roads – rubber ring jointed steel reinforced concrete (375mm diameter and larger) or reinforced concrete box culverts (RCBC).
- On-lot pipes within the buildings – rubber ring jointed uPVC with manufactured bends and fittings.
- On-lot pipes in-ground and external to the buildings – rubber ring jointed steel reinforced concrete (375mm diameter and larger) and uPVC pipes (<375mm diameter).

Stormwater drainage from the roof and through the building including all connections into the rainwater tanks (optional) will be designed by the building hydraulic engineer. Detailed design drawings of the building hydraulics will be made available during submission of documents for CDC approval.

7.4. Trunk Drainage Infrastructure Zones

The WPC SEPP includes a Land Reservation Acquisition Map which indicates the areas of land allocated for regional trunk drainage, water quantity and water quality infrastructure across the Aerotropolis. These locations are indicated by the yellow hatched areas in Figure 19, also known as the Land Reservation Acquisition (LRA) areas.

The master plan proposes to amend these areas to align with the proposed development's regional trunk drainage, water quantity and water quality infrastructure as shown in the civil engineering plans.

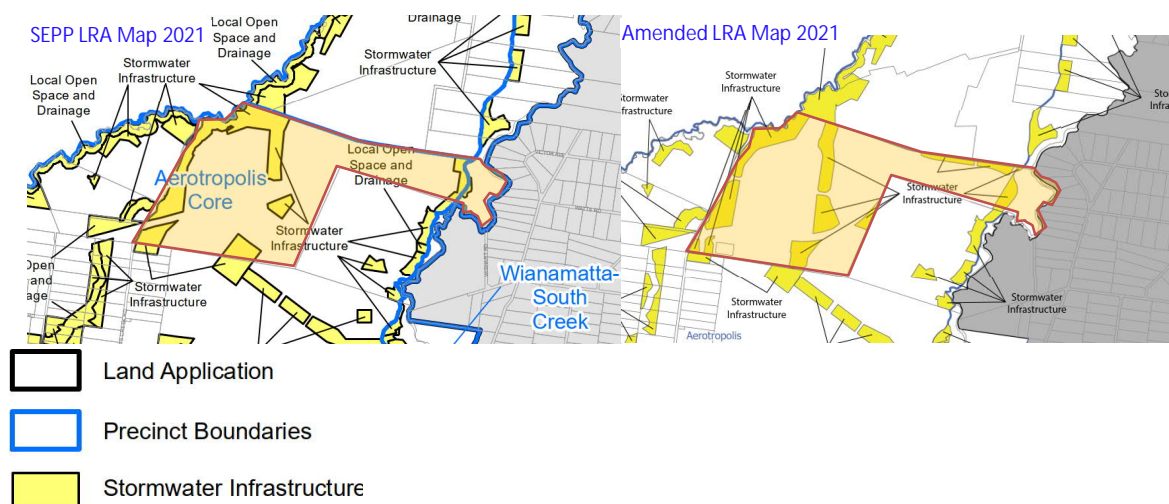


Figure 19: Land Reservation Area Map

7.5. Hydrologic and Hydraulic Modelling

DRAINS modelling software has been used to calculate the Hydraulic Grade Line (HGL) of the proposed estate-wide stormwater network, including pits, pipes, overland flow paths and detention basins. DRAINS is a computer program used for designing and analysing urban stormwater drainage systems and catchments. It is widely accepted by Councils across NSW as the basis for stormwater design and has been confirmed by Liverpool City Council as the preferred stormwater software analysis package.

A summary of the key hydrological and hydraulic design parameters adopted in DRAINS to develop a major and minor system drainage design for the proposed development are as follows:

- The combined pit and pipe drainage and overland flow paths have been designed to accommodate the 1% AEP storm event.
- Rainfall intensities have been adopted using the Bureau of Meteorology Design Rainfall Data System (2016).
- Times of concentration for each sub catchment have been determined using the kinematic wave equation or Friend's equation, whichever is more appropriate for the various sub-catchments.
- A hydraulic grade line (HGL) design method shall be adopted for all road pipe drainage design.
- Pit Loss coefficients have been calculated using the Missouri Hare Charts in accordance with ARR2019.

Minor System Criteria

- Minor system (pit and pipe) drainage has been designed to accommodate the 10% AEP storm event.
- The width of flow in the gutter does not exceed 2.5 metres in the 5 Year Average Recurrence Interval.
- Maximum bypass from any pit shall not exceed 10 l/s.
- Maximum flow around a kerb is to be 10 l/s.
- Minimum velocity of flow in stormwater pipelines shall be 0.6 m/s and the maximum velocity of flow shall be 6 m/s. Stormwater pipes and culverts within the public domain shall be hydraulically designed to achieve self-cleansing velocities.
- A minimum 150mm freeboard shall be maintained between pit HGL and pit surface levels for the minor design storm event (10% AEP).
- Minimum pipe gradient is to be limited to 1% except where site constraints require adoption of minimum grades in accordance with the Western Sydney Planning Partnership's Western Sydney Engineering Design Manual
- An absolute minimum grade of 0.5% for pipes with a diameter in excess of 600mm (and equivalent sized culverts) may be permitted up to a length of 75m.

- Where pipe grades are in excess of 15%, concrete bulkheads are to be placed at every second collar and are to be constructed in accordance with the engineering drawings.

Major System Criteria

- Where trapped low points are unavoidable and potential for flooding private property is a concern, an emergency overland flow path capable of conveying the total 1% AEP storm event shall be provided. Alternatively, the pipe and inlet system shall be upgraded to accommodate the 1% AEP storm event.
- Pits shall not be spaced more than 120 metres apart.
- The maximum depth of flow in the 1% AEP will be 0.2 metres.
- Velocity x depth product shall not exceed 0.4 m²/s for all storms up to and including the 1% AEP event.
- Blockage factors of 20% and 50% shall be adopted for on-grade and sag pits respectively and 10% for combination pits.
- Pipes discharging to an overland flow path shall adopt a minimum tailwater level equivalent to respective overland flow level.

7.6. Wetland High Flow Diversion Structures

AT&L has provided a preliminary design concept for the diversion of high flows from the proposed Wetlands across the site. This has been done by providing a splitter pit upstream of the proposed wetlands with:

- A low flow pipe for the 4EY storm event that will divert low flows to the wetland.
- A high flow weir located above the proposed wetland extended detention depth level.

We note that the low flow pipe will enter the wetland in the settling basin area and is unlikely to have scour impacts or high velocities experienced on the surface of the vegetated areas. Additionally, detailed designs for the overflow structures will be designed at the next phase to ensure that the wetlands are able to discharge excess flows in a safe manner without overtopping onto the proposed cycleways.

7.7. Non-Conformances

To reduce the visual impact of large discharge pipes and headwalls, these have been designed to be submerged within the settling basins. Despite this, hydraulic modelling has been undertaken to confirm that the drainage system would still work and is able to satisfy the design requirements outlined in Section 7.5.

8. Utility Services

8.1. Existing Utilities in the Vicinity of the Site

Based on an initial study and information obtained from Before You Dig (DBYD) and our ongoing discussion with the Authorities, the following local utility services have been determined to be in the vicinity of the site:

- Potable Water (Sydney Water Corporation)
- Electrical (Endeavour Energy)
- Telecommunications (Telstra)

Sewer is not located in close vicinity of the site.

Note the existing services have been provided to service the existing rural residential land use and will all require augmentation to service the development.

8.2. Proposed Services Masterplan

Services and Utilities Coordination Plans for the Site are enclosed in Appendix A.

8.3. Potable Water

8.3.1. Existing Services

DBYD indicates the following water services within the area:

- A 150mm diameter CICL main on the eastern side of Badgerys Creek Road along the Site frontage
- Sydney Water has also advised that they have recently completed construction of new 150mm and 450mm diameter CICL mains on Badgerys Creek Road which currently stops approx. 200m south of the IPG Estate and is currently not operational.

8.3.2. Proposed Services

Details of the proposed water supply infrastructure that will service the Site is contained in a feasibility letter from Sydney Water (Case No. 206507) to Ingham Rural Property Group, dated 7 June 2023, included as Appendix C.

The advice contained within the feasibility letter is a guide only. A Section 73 application will be submitted once the Master Plan has been approved. Sydney Water will then issue a Notice of Requirements containing servicing advice for the development, and Developer Works Deeds which will enable construction of lead-in and reticulated Sydney Water services.

The existing 150mm main located within Badgerys Creek Road is insufficient to service the entire development.

Servicing of the proposed development is proposed to be as follows:

- There is a recently constructed DN150 and DN450 main along Badgerys Creek Rd that connects to the existing DN600 Narellan South Water Supply Zone (WSZ) main in The Northern Rd. These mains are not yet operational at this time. Sydney Water are delivering a new Pressure Reducing Valve (PRV) to the DN450 main in Badgerys Creek Rd. These mains can be commissioned once the PRV has been installed. Based on current schedule, these mains are expected to be commissioned in 2024, in line with the proposed project staging and delivery program.
- Sydney Water's feasibility letter advises that potable water supply for the development should be via extension from the new DN150 main. However, a larger supply line, likely to be at least a DN300 off the DN450 main or an upgrade to the DN150 main, will be required to satisfy the expected demand from the initial stages of the development.
- Additional connections will be required for the later stages. It is assumed that these will connect to a future DN450 potable water main currently planned to be laid along the Eastern Ring Road.
- The reticulation extension required to service the initial stages will be confirmed at Section 73 Stage.
- Precinct trunk potable water mains and reticulation mains shall be sized as per WSAA code.

Consultations are currently ongoing with Sydney Water to coordinate the design and delivery of potable water infrastructure to the estate.

8.4. Wastewater

8.4.1. Existing Services

There is no existing wastewater infrastructure within or in the vicinity of the Site.

8.4.2. Ultimate Proposed Services

At present, no wastewater services are available in this area. Most of the development is located within the Badgerys Creek Stage 1 wastewater catchment with the eastern side of the development draining to the Thompsons Creek Stage 1 wastewater catchment. Location of trunk assets and high-level catchments are subject to confirmation during detailed design.

- Trunk wastewater infrastructure servicing the Badgerys Creek Stage 1 wastewater catchment is currently planned to be delivered by 2027 and is subject to funding approval. Based on preliminary advice from Sydney Water, this is understood to be a 450mm - 525mm pipe within the IPG estate and
- Badgerys Creek Stage 1 will have limited capacity prior to delivery of Badgerys Creek Stage 2 which will transfer flows to the new Upper South Creek (USC) Advanced Water Recycling Centre (AWRC)
- Trunk wastewater infrastructure servicing the Thompsons Creek Stage 1 wastewater catchment is currently planned to be delivered by 2027 and is subject to funding approval.
- Additional precinct trunk and reticulation mains will be required to be delivered by the developer based on the WSAA Code.

Consultations are currently ongoing with Sydney Water to coordinate the design and delivery of wastewater infrastructure to the estate.

8.4.3. Interim Proposed Services

An Interim Operating Procedure is proposed as part of Ingham's Stage 1 works and will be located within the Stage 1 area. This IOP will be sized to facilitate the delivery of at least Stages 1, 2 and designed to be modular to allow for future stages should the delivery of Sydney Water's Badgerys Creek Stage 1 be delayed beyond 2027. The sizing and ultimate location of the IOP will need to be assessed at the detailed design phase once the extent of the initial stages and the end user flows have been determined. This is subject to planning approval timing and will need to align with ultimate delivery strategy of Sydney Water for the Trunk Gravity services.

The IOP will be similar to those being delivered elsewhere within the Aerotropolis and Mamre Road Precinct and will be subject to Sydney Water approval.

8.5. Recycled Water

8.5.1. Existing Infrastructure

There is no existing recycled (non-potable) water infrastructure within or in the vicinity of the Site.

8.5.2. Proposed Infrastructure

Sydney Water is in the detailed planning phase of providing recycled water service from the future Upper South Creek Advanced Water Recycling Centre, which is expected to operate from 2025-26. The recycling scheme boundary and timing of future assets is subject to the outcome of the planning phase and future approvals. Any further information on timing and potential non-drinking demand for the proposed development would help us in our investigation.

Sydney Water supports the use of recycled water and/or harvested stormwater to meet non-drinking demands for the proposed development as these measures would contribute to meeting liveability, productivity and sustainability vision for Western Sydney. To future-proof the proposed development, recycled water pipes will be reticulated throughout the estate with provisions for future connection to Sydney Water's recycled water main.

8.6. Electrical

8.6.1. Existing Services

BYD and a recent site inspection indicates that there is a high voltage overhead power line (11kV) in Badgerys Creek Road. There are no underground services in Badgerys Creek Road.

Investigations by Estate Power Design (EPD) also identified an existing overhead power line network (11kV) and abandoned underground electrical assets within the site. These will be removed as part of the proposed development.

8.6.2. Proposed Services

It is anticipated that future electrical supply for the proposed development will be serviced by Endeavour Energy's North Bradfield Zone Substation which is currently under construction at the southeast corner of the site.

Endeavour Energy is expected to bring in 2x132kV transmission feeders and distribute 22kV supply throughout the estate from the new zone substation. HV and LV electrical conduits will be reticulated underground throughout the site in anticipation of the zone sub's completion in 2025.

8.7. Gas

8.7.1. Existing Services

DBYD indicates the following gas services within the area:

- A 110mm diameter PE (300kPa) main on the eastern side of Badgerys Creek Road along the Site frontage
- A 200mm diameter Steel (1050kPa) high pressure main traversing across the site and along the northern boundary. This main will need to be relocated in accordance with the requirements of Jemena.

8.7.2. Future Services

It is not currently proposed to reticulate gas throughout the estate. However, a supply line may be provided, to specific lots if required by future owners/tenants. It is assumed that any future supply will connect via the existing valves at the western boundary, near the current site entrance.

The developer will need to submit a Commercial Connection Application once final demands are known. <https://jemena.com.au/about/document-centre/gas/application-forms>

8.8. Telecommunications

8.8.1. Existing Services

Dial Before You Dig (DBYD) indicates that there are both overhead cables and underground Telstra conduits located within the Badgerys Creek Road reserve, along the site frontage.

8.8.2. Proposed Services

It is anticipated that there is adequate capacity within the existing telecommunications network to service the initial development stages. Communications conduits, including spare conduits, will be reticulated throughout the estate in anticipation of new communications cables to be brought into the site by NBN. Additional spare conduits may be provided to specific lots, if required by future owners / tenants.

It is understood that a minor Telstra network is located within the Site and will ultimately need to be relocated or removed by the developer.

As part of the overall NBN policy, the Government has released the Telecommunications Infrastructure in New Developments Policy, replacing the 2011 “Fibre in New Developments” (FIND) policy. The new policy provides direction on how telecommunications will be delivered in new developments. A major objective of the new policy is to promote the competitive provision of infrastructure to new developments that will increase choice for developers. The policy requires developers to make a financial contribution for the provision of telecommunications infrastructure related to their development and will allow developers to pick and choose providers based on price and service delivery. Amongst other things, the new policy will require developers to:

- Be directly involved in the provision of telecommunications for their development;
- Contribute to the cost of telecommunications infrastructure, including where the network infrastructure is being provided by NBN Co or Telstra in its capacity as the Infrastructure Provider of Last Resort (IPOLR), including where Telstra is deploying copper access infrastructure;
- Recognise that where it applies, Telstra’s IPOLR obligation is to offer a commercial solution to a developer; and
- Recognise that where the developer chooses a party other than Telstra or NBN Co to build infrastructure in their development (alternative provider), the alternative provider becomes responsible for providing infrastructure and services to all premises in the development and Telstra is not required to install fixed line infrastructure or use alternative provider infrastructure to offer its retail services.

The developer shall apply for NBN Co fiber to be installed for the development subject to an agreed Master Developer Agreement.

9. Infrastructure Staging

9.1. Indicative Staging

Construction of the proposed development is to be staged. This approach is necessary in relation to the precinct as it offers the flexibility needed to respond to changes in the market and the ability to respond to opportunistic conditions that may arise in meeting the specific needs and preferences of potential tenants and end-users.

An indicative staging of works for the proposed site is enclosed in Drawing C2006 in Appendix B. The staging sequence, number of lots and extents of each stage may change subject to market conditions, public infrastructure delivery and / or servicing availability. See Table 5 below for approximate staging timeframes.

The development and construction staging of specific lots will be the subject of separate future Applications via Complying Development, as this will be based purely on take up and demand by prospective tenants. Proposed construction staging may be further refined in the detailed design of the proposal and further details provided via Complying Development pathways.

Table 5: Indicative Staging

Stage	Area (Ha)	Estimated Completion
Zone Substation	1.4	Q3 2025 (under construction)
1	35.1	2026
2	26.8	2026
3	19.8	2027
4	15.1	2028
5	18.7	2029
6	38.2	2030
7	14.2	2031

APPENDIX A – Civil Engineering Drawings

(The Civil Engineering Drawings are no longer attached to this document to reduce file size. Refer separate document file.)

Company:

Document Number:

Civil Engineers and Project Managers

Job Number: 22-1002
Date: 12/04/2024

Level 7, 153 Walker Street
North Sydney NSW 2060
ABN 96 130 882 405
Tel: 02 9439 1777
Fax: 02 9923 1055
www.atl.net.au
info@atl.net.au

Attention:

475 BADGERYS CREEK ROAD BRADFELD MASTERPLAN

By:

Media and Status Details

Print Size			Digital	Media	Purpose	Phase
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<input type="checkbox"/> Other	<input type="checkbox"/>	Other	<input type="checkbox"/> Other	<input type="checkbox"/> LAN/WAN	<input type="checkbox"/> Construction	<input type="checkbox"/> As Built

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Address

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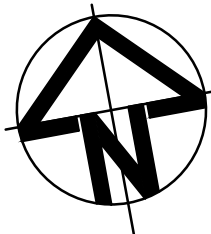
Drawing No.	Revision	Document Title
22-1002-C2000	F	COVER SHEET AND LOCALITY PLAN
22-1002-C2001	F	DRAWING LIST
22-1002-C2002	F	LEGEND
22-1002-C2003	F	NOTES
22-1002-C2004	F	DEMOLITION AND TREE PROTECTION PLAN
22-1002-C2005	F	GENERAL ARRANGEMENT PLAN
INDICATIVE STAGING PLAN		
22-1002-C2006	E	INDICATIVE STAGING PLAN
TYPICAL ROAD SECTIONS		
22-1002-C2010	E	ROAD TYPES PLAN
22-1002-C2011	D	TYPICAL ROAD SECTIONS SHEET 1
22-1002-C2012	D	TYPICAL ROAD SECTIONS SHEET 2
22-1002-C2013	D	TYPICAL ROAD SECTIONS SHEET 3
22-1002-C2014	D	TYPICAL ROAD SECTIONS SHEET 4
22-1002-C2015	E	TYPICAL ROAD VERGE SECTIONS
22-1002-C2016	D	TYPICAL SECTIONS
22-1002-C2017	D	TYPICAL SECTIONS
22-1002-C2018	D	TYPICAL SECTIONS SHEET 1
22-1002-C2019	D	TYPICAL SECTIONS SHEET 2
22-1002-C2020	D	TYPICAL SECTIONS SHEET 3
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22-1002-C2032	B	SITEWORKS DETAILS SHEET 2
22-1002-C2033	B	SITEWORKS DETAILS SHEET 3
22-1002-C2034	B	SITEWORKS DETAILS SHEET 4
22-1002-C2035	B	SITEWORKS DETAILS SHEET 5
BULK EARTHWORKS		
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22-1002-C2052	E	BULK EARTHWORKS SECTIONS SHEET 1
22-1002-C2053	E	BULK EARTHWORKS SECTIONS SHEET 2
22-1002-C2054	E	BULK EARTHWORKS SECTIONS SHEET 3
22-1002-C2055	E	BULK EARTHWORKS SECTIONS SHEET 4
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22-1002-C2084	E	BULK EARTHWORKS PLAN SHEET 25

CIVIL WORKS PLAN		
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22-1002-C2563	E	STORMWATER LONGITUDINAL SECTIONS SHEET 13
22-1002-C2564	D	STORMWATER LONGITUDINAL SECTIONS SHEET 14
22-1002-C2565	D	STORMWATER LONGITUDINAL SECTIONS SHEET 15
22-1002-C2566	D	STORMWATER LONGITUDINAL SECTIONS SHEET 16
22-1002-C2567	D	STORMWATER LONGITUDINAL SECTIONS SHEET 17
22-1002-C2568	D	STORMWATER LONGITUDINAL SECTIONS SHEET 18
22-1002-C2569	D	STORMWATER LONGITUDINAL SECTIONS SHEET 19
22-1002-C2570	E	STORMWATER LONGITUDINAL SECTIONS SHEET 20
22-1002-C2571	E	STORMWATER LONGITUDINAL SECTIONS SHEET 21
22-1002-C2572	E	STORMWATER LONGITUDINAL SECTIONS SHEET 22
22-1002-C2573	E	STORMWATER LONGITUDINAL SECTIONS SHEET 23
22-1002-C2574	E	STORMWATER LONGITUDINAL SECTIONS SHEET 24
22-1002-C2575	D	STORMWATER LONGITUDINAL SECTIONS SHEET 25
ROAD LONGSECTIONS		
22-1002-C2701	F	MC (ERR) LONGITUDINAL SECTIONS SHEET 1
22-1002-C2702	F	MC (ERR) LONGITUDINAL SECTIONS SHEET 2
22-1002-C2703	F	MC (ERR) LONGITUDINAL SECTIONS SHEET 3
22-1002-C2704	F	MC (ERR) LONGITUDINAL SECTIONS SHEET 4
22-1002-C2705	F	MC (ERR) LONGITUDINAL SECTIONS SHEET 5
22-1002-C2706	F	MC (ERR), MC (BMLR) LONGITUDINAL SECTIONS SHEET 6
22-1002-C2707	F	MC (BMLR), MC01 (ROAD 01) LONGITUDINAL SECTIONS SHEET 7
22-1002-C2708	F	MC01 (ROAD 01) LONGITUDINAL SECTIONS SHEET 8
22-1002-C2709	F	MC01 (ROAD 01), MC02 (ROAD 02) LONGITUDINAL SECTIONS SHEET 9
22-1002-C2710	F	MC02 (ROAD 02) LONGITUDINAL SECTIONS SHEET 10
22-1002-C2711	F	MC02 (ROAD 02), MC03 (ROAD 03) LONGITUDINAL SECTIONS SHEET 11
22-1002-C2712	F	MC03 (ROAD 03) LONGITUDINAL SECTIONS SHEET 12
22-1002-C2713	F	MC03 (ROAD 03) LONGITUDINAL SECTIONS SHEET 13
22-1002-C2714	F	MC04 (ROAD 04) LONGITUDINAL SECTIONS SHEET 14
22-1002-C2715	F	MC05 (ROAD 05) LONGITUDINAL SECTIONS SHEET 15
22-1002-C2716	F	MC06 (ROAD 06) LONGITUDINAL SECTIONS SHEET 16
22-1002-C2717	F	MC07 (ROAD 07) LONGITUDINAL SECTIONS SHEET 17
22-1002-C2718	F	MC07 (ROAD 07), MC08 (ROAD 08) LONGITUDINAL SECTIONS SHEET 18
22-1002-C2719	F	MC08 (ROAD 08), MC09 (ROAD 09) LONGITUDINAL SECTIONS SHEET 19
22-1002-C2720	F	MC10 (ROAD 10), MC11 (ROAD 11) LONGITUDINAL SECTIONS SHEET 20
22-1002-C2721	F	MC12 (ROAD 12) LONGITUDINAL SECTIONS SHEET 21
ROAD CROSS SECTIONS		
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22-1002-C2752	F	MC01 CROSS SECTIONS SHEET 3
22-1002-C2753	F	MC01 CROSS SECTIONS SHEET 4
22-1002-C2754	F	MC01 CROSS SECTIONS SHEET 5
22-1002-C2755	F	MC01 CROSS SECTIONS SHEET 6
22-1002-C2757	F	MC02 CROSS SECTIONS SHEET 1
22-1002-C2758	F	MC02 CROSS SECTIONS SHEET 2
22-1002-C2759	F	MC02 CROSS SECTIONS SHEET 3
22-1002-C2760	F	MC02 CROSS SECTIONS SHEET 4
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22-1002-C2762	F	MC02 CROSS SECTIONS SHEET 6
22-1002-C2764	F	MC03 CROSS SECTIONS SHEET 1
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22-1002-C2766	F	MC03 CROSS SECTIONS SHEET 3
22-1002-C2767	F	MC03 CROSS SECTIONS SHEET 4
22-1002-C2768	F	MC03 CROSS SECTIONS SHEET 5
22-1002-C2769	F	MC03 CROSS SECTIONS SHEET 6
22-1002-C2770	F	MC03 CROSS SECTIONS SHEET 7
22-1002-C2771	F	MC03 CROSS SECTIONS SHEET 8
22-1002-C2773	F	MC04 CROSS SECTIONS SHEET 1
22-1002-C2774	F	MC04 CROSS SECTIONS SHEET 2
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22-1002-C2777	F	MC05 CROSS SECTIONS SHEET 1

22-1002-C2778	F	MC05 CROSS SECTIONS SHEET 2
22-1002-C2780	F	MC06 CROSS SECTIONS SHEET 1
22-1002-C2781	F	MC06 CROSS SECTIONS SHEET 2
22-1002-C2782	F	MC06 CROSS SECTIONS SHEET 3
22-1002-C2783	F	MC07 CROSS SECTIONS SHEET 1
22-1002-C2784	F	MC07 CROSS SECTIONS SHEET 2
22-1002-C2785	F	MC07 CROSS SECTIONS SHEET 3
22-1002-C2786	F	MC07 CROSS SECTIONS SHEET 4
22-1002-C2787	F	MC07 CROSS SECTIONS SHEET 5
22-1002-C2788	F	MC08 CROSS SECTIONS SHEET 1
22-1002-C2789	F	MC08 CROSS SECTIONS SHEET 2
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22-1002-C2791	F	MC08 CROSS SECTIONS SHEET 4
22-1002-C2792	F	MC09 CROSS SECTIONS
22-1002-C2794	F	MC10 CROSS SECTIONS SHEET 1
22-1002-C2795	F	MC10 CROSS SECTIONS SHEET 2
22-1002-C2796	F	MC11 CROSS SECTIONS
VEHICLE TURN PATHS		
22-1002-C2851	E	DESIGN VEHICLES TURNING PATHS PLAN SHEET 1
22-1002-C2852	E	DESIGN VEHICLES TURNING PATHS PLAN SHEET 2
22-1002-C2853	E	DESIGN VEHICLES TURNING PATHS PLAN SHEET 3
22-1002-C2854	E	DESIGN VEHICLES TURNING PATHS PLAN SHEET 4
22-1002-C2855	E	DESIGN VEHICLES TURNING PATHS PLAN SHEET 5
22-1002-C2858	E	DESIGN VEHICLES TURNING PATHS PLAN SHEET 6
22-1002-C2859	E	DESIGN VEHICLES TURNING PATHS PLAN SHEET 7
22-1002-C2864	E	DESIGN VEHICLES TURNING PATHS PLAN SHEET 8
22-1002-C2865	E	DESIGN VEHICLES TURNING PATHS PLAN SHEET 9
22-1002-C2866	E	DESIGN VEHICLES TURNING PATHS PLAN SHEET 10
22-1002-C2867	E	DESIGN VEHICLES TURNING PATHS PLAN SHEET 11
22-1002-C2868	E	DESIGN VEHICLES TURNING PATHS PLAN SHEET 12
22-1002-C2869	E	DESIGN VEHICLES TURNING PATHS PLAN SHEET 13
22-1002-C2870	B	DESIGN VEHICLES TURNING PATHS PLAN SHEET 14
SIGHT DISTANCE		
22-1002-C2881	E	SIGHT DISTANCE PLAN SHEET 1
22-1002-C2882	E	SIGHT DISTANCE PLAN SHEET 2
22-1002-C2883	E	SIGHT DISTANCE PLAN SHEET 3
22-1002-C2884	E	SIGHT DISTANCE PLAN SHEET 4
22-1002-C2885	E	SIGHT DISTANCE PLAN SHEET 5
22-1002-C2886	E	SIGHT DISTANCE PLAN SHEET 6
22-1002-C2887	E	SIGHT DISTANCE PLAN SHEET 7

APPENDIX B – Construction Staging



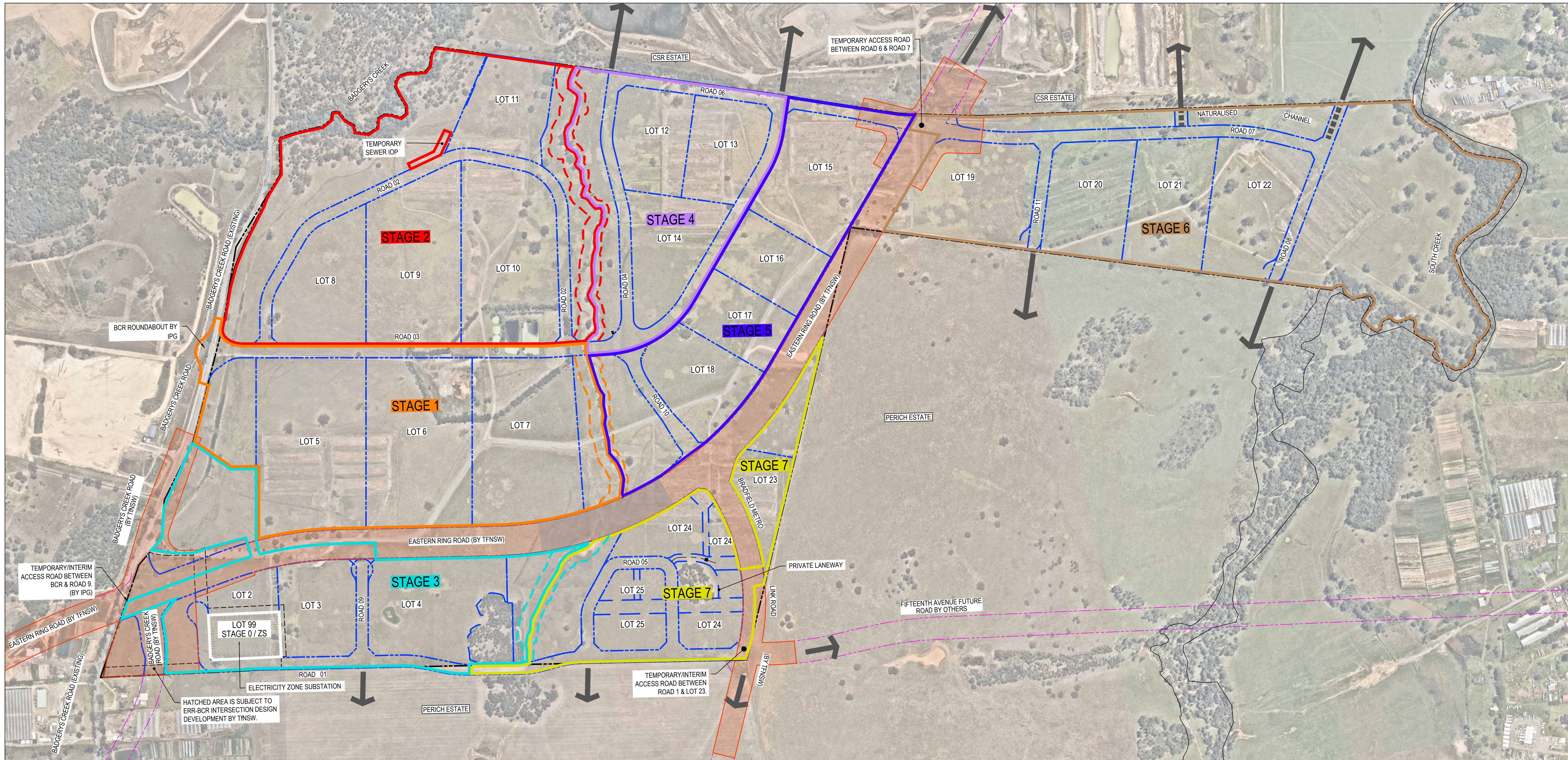
NOTE:

THE NUMBER AND SIZE OF EACH STAGE, SEQUENCING, EXTENTS AND COMPLETION DATES FOR EACH STAGE MAY CHANGE SUBJECT TO MARKET CONDITIONS, PUBLIC INFRASTRUCTURE DELIVERY, AND/OR SERVICING AVAILABILITY.

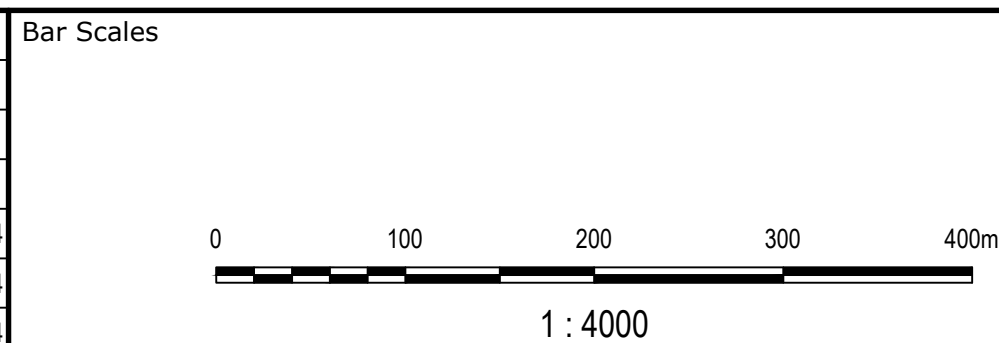
RIPARIAN CORRIDOR REHABILITATION WORKS STAGING

- STAGE 1
- STAGE 2
- STAGE 3

ESTATE DEVELOPMENT STAGING		AREA	ESTIMATED COMPLETION
STAGE 0/ZS	ZONE SUBSTATION	1.4Ha	EARLY WORKS
	STAGE 1	27.8Ha	2026
	STAGE 2	33.9Ha	2026
	STAGE 3	20.1Ha	2027
	STAGE 4	15.9Ha	2028
	STAGE 5	17.8Ha	2029
	STAGE 6	38.2Ha	2030
	STAGE 7	14.2Ha	2031



Issue	Description	Date
E	ISSUED FOR MASTER PLAN APPROVAL	27-05-2024
D	ISSUED FOR MASTER PLAN APPROVAL	12-04-2024
C	ISSUED FOR TAP SUBMISSION	04-03-2024
B	ISSUED FOR IPG REVIEW	24-11-2023
A	ISSUED FOR TAP SUBMISSION	20-11-2023



THIS DRAWING CANNOT BE COPIED OR REPRODUCED IN ANY FORM OR USED FOR ANY OTHER PURPOSE OTHER THAN THAT ORIGINALLY INTENDED WITHOUT THE WRITTEN PERMISSION OF AT&L

INGHAM
PROPERTY

Scales	1:4000	Drawn	NT
		Designed	JD
Grid	MGA2020	Checked	CB
Height Datum	AHD	Approved	
NOT FOR CONSTRUCTION			

Project	475 BADGERYS CREEK ROAD BRADFIELD MASTERPLAN
Title	INDICATIVE STAGING PLAN

Civil Engineers and Project Managers		
Level 7, 153 Walker Street North Sydney NSW 2060 P 02 9439 1777 E info@atl.net.au www.atl.net.au ABN 96 130 882 405		
Status	FOR MP APPROVAL CONCEPT DESIGN ONLY	A1
Project - Drawing No.	22-1002-C2006	Issue E

APPENDIX C – Sydney Water letter

Case Number: 206507

June 7, 2023

Ingham Rural Property Group Pty Ltd
c/- AT&L AND ASSOCIATES PTY LTD

Feasibility Letter

Developer: Ingham Rural Property Group Pty Ltd

Your reference: 22-1002

Development: Lot 475 Badgerys Creek Road, Badgerys Creek

Development Description: Rural residential area rezoned to industrial.

Feasibility application for development of 31 light warehouse units and associated roads and infrastructure.

Your application date: May 12, 2023

Dear Applicant

This Feasibility Letter (Letter) is a guide only. It provides general information about what our requirements could be if you applied to us for a Section 73 Certificate (Certificate) for your proposed subdivision. **The information is accurate at today's date only.**

We have not allocated any system capacity to your proposal from the investigation into this Feasibility advice. This advice is only an indication of our systems and possible requirements as of today. Where there is system capacity, it may have been fully utilised by the time you obtain a Consent. The requirements applied to any approved Development proposal may differ significantly in the future since the original advice was issued.

If you obtain development consent for that subdivision from your consent authority (this is usually your local Council) they will require you to apply to us for a Section 73 Certificate. You will need to submit a new application (and pay another application fee) to us for that Certificate by using your current or another Water Servicing Coordinator (WSC).

We'll then send you either a:

- Notice of Requirements (Notice) and Developer Works Deed (Deed)
or
- Certificate.

These documents will be the definitive statement of our requirements.

There may be changes in our requirements between the issue dates of this Letter and the Notice or Certificate. The changes may be:

- if you change your proposed development eg the development description or the plan/site layout, after today, the requirements in this Letter could change when you submit your new application
- if you decide to do your development in stages then you must submit a new application (and pay another application fee) for each stage.

No warranties or assurances can be given about the suitability of this document or any of its provisions for any specific transaction. It does not constitute an approval from us and to the extent that it is able, we limit its liability to the reissue of this Letter or the return of your application fee. You should rely on your own independent professional advice.

What You Must Do To Get A Section 73 Certificate In The Future.

To get a Section 73 Certificate you must do the following things. You can also find out about this process by visiting [Plumbing, building & developing](#) page on our website.

1. **Obtain Development Consent from the consent authority for your subdivision proposal.**
2. **Engage a Water Servicing Coordinator (WSC).**

You must engage your current or another authorised WSC to manage the design and construction of works that you must provide, at your cost, to service your subdivision. If you wish to engage another WSC (at any point in this process) you must write and tell us.

You'll find a list of WSC's at [Listed providers](#) on our website.

The WSC will be your point of contact with us. They can answer most questions that you might have about the process and developer charges and can give you a quote or information about costs for services/works (including our costs).

4. **Water and Sewer Works**

4.1 **Water**

Each lot in your subdivision must have a frontage to a water main that is the right size and can be used for connection.

We've assessed your application and found that:

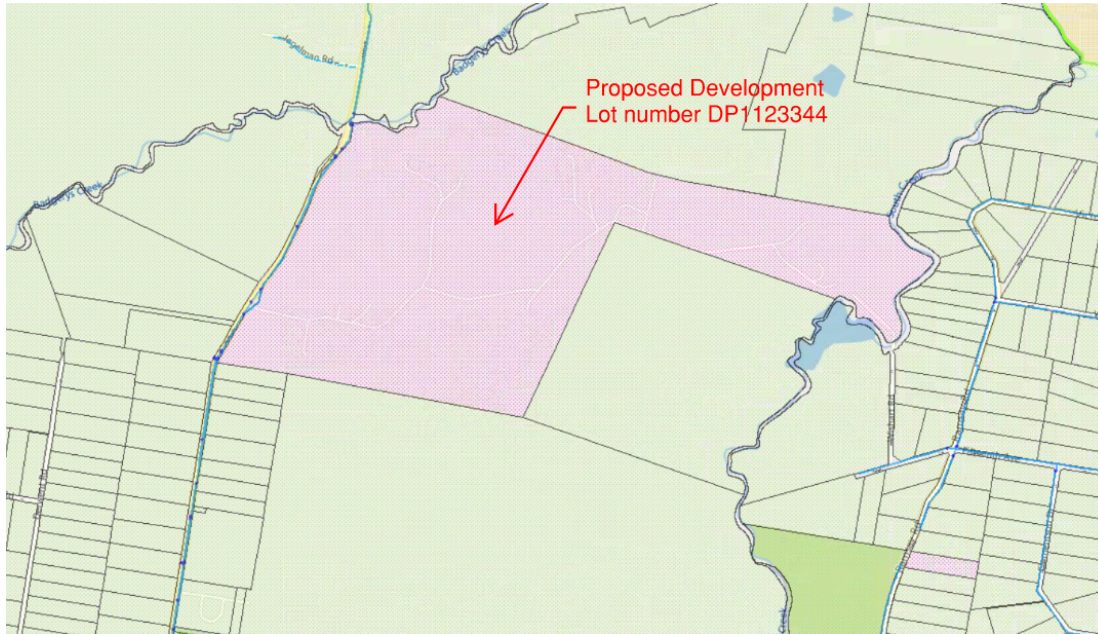


Figure 1 – Proposed Development

- The existing reticulation main in Badgerys Creek Road does not have capacity to service this development.
- Servicing of the proposed development will be as follows:
 - There is recently constructed DN150 and DN450 main along Badgerys Creek Rd that connects to existing DN600 Narellan South Water Supply Zone (WSZ) main in The Northern Rd. The supply to the proposed development will be via extension from this new DN150 main. These mains are not commissioned for water supply at this time. We are delivering a new Pressure Reducing Valve (PRV) on DN450 main in Badgerys Creek Rd. Once this PRV is delivered, these mains can be commissioned. Based on current schedule, the commissioning of these mains is expected in 2024. **The supply to the proposed development is dependent on the commissioning of these mains.**
 - The reticulation extension required to service this development will be confirmed at Section 73 stage.
 - Precinct trunk drinking water mains and reticulation mains are required to be sized as per the WSAA code.

4.2 Sewer

Each lot in your subdivision must have a sewer main that is the right size and can be used for connection. That sewer must also have a connection point within each lot's boundaries.

We've assessed your application and found that:

- At present, no wastewater services are available in this area. Most of the development is located within the Badgerys Creek Stage 1 wastewater catchment with a portion of the western side of the development draining to the Thompsons Creek Stage 1 wastewater catchment. Refer to Figure below for indicative location of trunk assets and high-level catchments, subject to confirmation during detailed design.
- Trunk wastewater infrastructure servicing the Badgerys Creek Stage 1 wastewater catchment is currently planned to be delivered by 2027 and subject to funding approval.
- Stage 1 will have limited capacity prior to delivery of Stage 2 which will transfer flows to the new Upper South Creek (USC) Advanced Water Recycling Centre (AWRC)
- Trunk wastewater infrastructure servicing the Thompsons Creek Stage 1 wastewater catchment is currently planned to be delivered by 2027, and subject to funding approval
- Additional precinct trunk and reticulation mains will be required to be delivered by the developer based on the WSAA Code.

4.3 Recycled Water

Sydney Water is in the detailed planning phase of providing recycled water service from the future Upper South Creek Advanced Water Recycling Centre, which is expected to operate from 2025-26. The recycling scheme boundary and timing of future assets is subject to the outcome of the planning phase and future approvals. Any further information on timing and potential non-drinking demand for the proposed development would help us in our investigation.

Sydney Water supports the use of recycled water and/or harvested stormwater to meet non-drinking demands for the proposed development as these measures would contribute to meeting liveability, productivity and sustainability vision for Western Sydney. To future-proof the proposed development, design for the water supply could include provision for dual plumbing/recycled water connection

5. Ancillary Matters

5.1 Asset adjustments

After we issue this Notice (and more detailed designs are available), we may require that the water main/sewer main/stormwater located in the footway/your property needs to be adjusted/deviated. If this happens, you'll need to do this work as well as the extension we have detailed above at your cost. The work must meet the conditions of this Notice and you will need to complete it **before we can issue the Certificate**. We'll need to see the completed designs for the work, and we'll require you to lodge a security. The security will be refunded once the work is completed.

5.2 Entry onto neighbouring property

If you need to enter a neighbouring property, you must have the written permission of the relevant property owners and tenants. You must use our **Permission to Enter** form(s) for this. You can get copies of these forms from your WSC or on our website. Your WSC can also negotiate on your behalf. Please make sure that you address all the items on the form(s) including payment of compensation and whether there are other ways of designing and constructing that could avoid or reduce their impacts. You will be responsible for all costs of mediation involved in resolving any disputes. Please allow enough time for entry issues to be resolved.

Disused Sewerage Service Sealing

Please do not forget that you must pay to disconnect all disused private sewerage services and seal them at the point of connection to our sewer main. This work must meet our standards in the Plumbing Code of Australia (the Code) and be done by a licensed drainer. The licensed drainer must arrange for an inspection of the work by a NSW Fair Trading Plumbing Inspection Assurance Services (PIAS) officer. After that officer has looked at the work, the drainer can issue the Certificate of Compliance. The Code requires this.

Soffit Requirements

Please be aware that floor levels must be able to meet our soffit requirements for property connection and drainage.

All developments discharging non-residential waste need to apply to Discharge Trade Waste via Sydney Water's online portal *Sydney Water Tap In*.

Non-residential waste shall not be discharged to Sydney Water's wastewater system without written approval from Sydney Water.

Fire Fighting

Definition of fire fighting systems is the responsibility of the developer and is not part of the Section 73 process. It is recommended that a consultant should advise the developer regarding the fire fighting flow of the subdivision and the ability of our system to provide that flow in an emergency. Sydney Water's Operating Licence directs that our mains are only required to provide domestic supply at a minimum pressure of 15 m head.

A report supplying modelled pressures called the Statement of Available pressure can be purchased through [Sydney Water Tap in](#)™ and may be of some assistance when defining the fire fighting system. The Statement of Available pressure may advise flow limits that relate to system capacity or diameter of the main and pressure limits according to pressure management initiatives. If mains are required for fire fighting purposes, the mains shall be arranged through the water main extension process and not the Section 73 process.

Large Water Service Connection

A water main are available to provide your subdivision with a domestic supply. The size of your subdivision means that you will need a connection larger than the standard domestic 20 mm size.

To get approval for your connection, you will need to lodge an application with [Sydney Water Tap in](#)™. You, or your hydraulic consultant, may need to supply the following:

- a plan of the hydraulic layout
- a list of all the fixtures/fittings within the property
- a copy of the fireflow pressure inquiry issued by us
- a pump application form (if a pump is required)
- all pump details (if a pump is required).

You'll have to pay an application fee.

We don't consider whether a water main is adequate for fire fighting purposes for your development. We can't guarantee that this water supply will meet your Council's fire fighting requirements. The Council and your hydraulic consultant can help.

Disused Water Service Sealing

You must pay to disconnect all disused private water services and seal them at the point of connection to our water main. This work must meet our standards in the Plumbing Code of Australia (the Code) and be done by a licensed plumber. The licensed plumber must arrange for an inspection of the work by a NSW Fair Trading Plumbing Inspection Assurance Services (PIAS) officer. After that officer has looked at the work, the drainer can issue the Certificate of Compliance. The Code requires this.

Other fees and requirements

The requirements in this Notice relate to your Certificate application only. We may be involved with other aspects of your development and there may be other fees or requirements. These include:

- plumbing and drainage inspection costs
- the installation of backflow prevention devices;
- trade waste requirements
- large water connections and
- council fire fighting requirements. (It will help you to know what the fire fighting requirements are for your subdivision as soon as possible. Your hydraulic consultant can help you here.)

No warranties or assurances can be given about the suitability of this document or any of its provisions for any specific transaction. It does not constitute an approval from us and to the extent that it is able, we limit its liability to the reissue of this Letter or the return of your application fee. You should rely on your own independent professional advice.

END



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