

A photograph of a koala climbing a tree trunk, positioned on the left side of the cover. The koala is grey with a white chest and is clinging to the rough, textured bark of the tree. The background is a solid blue gradient.

Travers

bushfire & ecology

Watercourse Assessment Report

State Significant Development (SSD)

Proposed data centre
Warehouse / distribution centre

Lot 1 DP 1151370
1 Sirius Road
Lane Cove West

August 2019
(REF: 18AWE02W)



Watercourse Assessment Report

**State Significant Development
Proposed data centre
Warehouse / distribution centre
Lot 1 DP 1151370
1 Sirius Road, Lane Cove West**

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The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

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Executive Summary

Travers bushfire & ecology has been engaged to undertake a Watercourse Assessment Report for construction of a data centre within Lot 1 DP 1151370, No. 1 Sirius Road, Lane Cove West. This lot will hereafter be referred to as the 'study area'.

This watercourse assessment report has been prepared by *Travers bushfire & ecology* to verify the existing watercourses on site and to identify the riparian buffer vegetated riparian zone (VRZ) constraints in accordance with the *NSW Department of Industry - Guidelines for controlled activities on waterfront land - Riparian corridors* (2018).

The proposal is for a data centre for cloud computing services. The proposed development would service development of the Metropolitan Sydney Region, ultimately providing an advanced facility to support the growth and development of information technology infrastructure.

Riparian corridor losses and offsets are provided that demonstrate a net gain in riparian corridors. As the site is adjoining an estuarine wetland ecosystem, the boundaries of the wetland have been defined and demonstrate that there is net improvement in protection.

Based on ground truthing, watercourses abut the northern boundary for less than 20m. Whilst the site itself straddles two (2) catchments, the dominant catchment is associated with Stringybark Creek which has a catchment area of 227ha.

The Lane Cover River is located to the west and as a fifth order stream is required to have a riparian corridor width of 40m from top of bank, subject to permissible non-riparian corridor uses.

The site also abuts wetland vegetation for a small portion of its boundary and the existing vegetation lands surrounding the wetland have been retained and enhanced marginally as a result of the proposal. Wetlands are defined as Waterfront land in accordance with the definitions of the *Water Management Act 2000 (WM Act)*. The proposal does not directly affect wetland surrounding the site but may indirectly affect wetlands through stormwater drainage. Mitigation measures are proposed within this assessment and incorporated into a vegetation management plan (VMP). The proposal does meet the minimum 40m wetland buffer setback to the western and northern aspects of the site

All works within the riparian protection zone and ongoing management will be in accordance with *NSW Department of Industry - Guidelines for controlled activities on waterfront land - Riparian corridors* (2018) and the issued General Terms of Approval for future development applications.

Alternative solutions and riparian offsets are appropriate within this site for highly degraded riparian corridors and are approvable under a Controlled Activity Approval from the Natural Resource Access Regulator (NRAR) in accordance with the requirements of the *WM Act*.

Riparian offsets have been provided for:

- Impacts within the 20m riparian zone of Stringybark Creek caused by a stormwater basin
- Impacts within the 40m riparian zone of Lane Cover River caused by a stormwater basin

Within the site there are 2.33ha of riparian corridor. In accordance with this assessment the pre and post development area of riparian zones, including riparian corridors adjoining the site, are as follows:

Pre & post development area of riparian zones adjoining the site	Area (ha)
Pre development area of mapped riparian zones	2.33ha
Post development area of protected riparian zones (inclusive of all stormwater devices and RZ offsets)	2.59ha
Net gain or loss (ha)	Gain of 0.26ha

Travers bushfire & ecology concludes that the proposed development has provided a net gain in riparian protection and revegetation including native vegetation protection zones immediately adjoining the riparian corridors and wetland areas.

A vegetation management plan (VMP) has been prepared to specify the outcomes of all riparian management works in terms of areas to be protected, revegetation inclusive of planting densities and plant species to be used. A landscaping plan has been prepared for the site cognisant of the VMP requirements.

Controlled Activity Approval will be required for all works within waterfront land as defined under the *WM Act* and its Regulations.

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List of abbreviations

APZ	asset protection zone
BAM	Biodiversity Assessment Method
BAR	Biodiversity Assessment Report
<i>BC Act</i>	<i>Biodiversity Conservation Act (2016)</i>
<i>BC Reg</i>	<i>Biodiversity Conservation Regulation (2017)</i>
BCAR	Biodiversity Certification Assessment Report
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
BPA	bushfire protection assessment
BSSAR	Biodiversity Stewardship Site Assessment Report
CEEC	Critically endangered ecological community
<i>CM Act</i>	<i>Coastal Management Act 2016</i>
DCP	development control plan
DEC	NSW Department of Environment and Conservation (superseded by DECC from April 2007)
DECC	NSW Department of Environment and Climate Change (superseded by DECCW from October 2009)
DECCW	NSW Department of Environment, Climate Change and Water (superseded by OEH from April 2011)
DEWHA	Commonwealth Department of Environment, Water, Heritage & the Arts (superseded by SEWPAC)
DOEE	Commonwealth Department of Environment & Energy
EEC	endangered ecological community
EPA	Environmental Protection Agency
<i>EP&A Act</i>	<i>Environmental Planning and Assessment Act (1979)</i>
<i>EPBC Act</i>	<i>Environment Protection and Biodiversity Conservation Act (1999)</i>
<i>FM Act</i>	<i>Fisheries Management Act</i>
IBRA	Interim Biogeographic Regionalisation for Australia
LEP	local environmental plan
LGA	local government area
<i>LLS Act</i>	<i>Local Land Services Act (2013)</i>
NRARA	Natural Resource Access Regulator
NES	national environmental significance
<i>NPW Act</i>	<i>National Parks and Wildlife Act (1974)</i>
NSW DPI	NSW Department of Industry and Investment
OEH	Office of Environment and Heritage
PCT	plant community type
PFC	projected foliage cover
RFS	NSW Rural Fire Service
ROTAP	rare or threatened Australian plants
SAII	Serious And Irreversible Impacts
SEPP	State Environmental Planning Policy
SEWPAC	Commonwealth Dept. of Sustainability, Environment, Water, Population & Communities (superseded by DOEE)
SIS	species impact statement
SRZ	Structural root zone
SULE	safe useful life expectancy
TEC	threatened ecological community
TPZ	tree preservation zone
<i>TSC Act</i>	<i>Threatened Species Conservation Act (1995) – Superseded by the Biodiversity Conservation Act (2016)</i>
VMP	vegetation management plan



Introduction

1

Travers bushfire & ecology has been engaged to prepare a Watercourse Assessment Report for construction of a data centre within Lot 1 DP 1151370, No. 1 Sirius Road, Lane Cove West. This lot will hereafter be referred to as the 'study area'.

The proposal is for a data centre for cloud computing services. The proposed development would service development of the Metropolitan Sydney Region, ultimately providing an advanced facility to support the growth and development of information technology infrastructure.

The identification of watercourses and vegetated riparian zones (VRZs) are required pursuant to the *WM Act* which controls activities within 40m of a designated watercourse. Any controlled activities being undertaken within 40m of a designated watercourse require a permit from the administering authority, the Natural Resource Access Regulator (NRAR).

This watercourse assessment report has been prepared by *Travers bushfire & ecology* to verify the existing watercourses on site and to identify the riparian buffer (VRZ) constraints in accordance with the *NSW Department of Industry - Guidelines for controlled activities on waterfront land - Riparian corridors* (2018).

This advice identifies whether the site is affected by a watercourse as defined under the *WM Act*, assesses the existence and condition of the mapped watercourses, presence of any sensitive riparian or wetland habitat, confirms the extent of watercourses, their classification and assesses the level of riparian corridor protection required in accordance with the Controlled Activity Guidelines for watercourses as issued by the NSW Department of Industry.

The site also abuts wetland vegetation for a small portion of its boundary and the existing vegetation lands surrounding the wetland have been retained and enhanced marginally as a result of the proposal. Wetlands are defined as Waterfront land in accordance with the definitions of the *WM Act*. The proposal does not directly affect wetland surrounding the site but may indirectly affect wetlands through stormwater drainage. Mitigation measures are proposed within this assessment and incorporated into VMP.



Figure 1 – Study area
(Source: SIX Maps)

Where warranted, recommendations are also made for poor condition riparian corridors that can be replaced with designed embankments, vegetated banks, offline stormwater quality and quantity control devices that will mitigate the potential impacts, protect the catchment and riparian functions and habitat.

1.1 Proposed data centre

The proposal involves the construction of a data centre within Lot 1 DP 1151370 (refer Figure 1.1). Identified as a warehouse / distribution centre, the proposed facility will be operated 24/7 and will provide cloud computing services to its clients.

Approval is sought for the development and associated works as follows:

- A 5-storey data centre building comprising 34,282m² of gross floor area with associated plant and equipment (refer Figures 1.2-1.6). This consists of;
 - a) Basement;
 - Plant room as well as fuel / water storage. Fuel storage includes three (3) diesel tanks sitting within the basement - which are considered to be low risk (underground in a 4-hour enclosure).
 - b) Ground and First Floor;
 - Data Hall A and Data Hall B.
 - c) Second Floor;
 - Second floor comprises of an ancillary office and Data Hall B.
 - d) Roof Plan;
 - Roof comprises of roof plant.

- Electrical substation and associated infrastructure;
- Maximum building height up to 24m; and
- Associated works including landscaping, earthworks, and servicing upgrades.

Data centre operations and procedures

Once the development project is fully commissioned and handed over to the operations team, staff and contractors manage the ongoing health and safety of the site. This includes the implementation and management of a thorough maintenance program. Established robust tools, systems and procedures will ensure the site remains compliant with government regulations and best in class global standards for data centre operations.

The main facets of the data centre operations are as follows:

- Minimising unplanned outages and critical equipment failures through well documented management processes and procedures;
- Reducing operating risks including those related to security; and
- Providing continuous customer support on a 24x7x365 basis.

Access

Access to the proposed development will be provided from an existing road extending from Sirius Road in the east with staff car parking provided within the southern portion of the site. An internal road network will be constructed to provide vehicular access to both the southern and northern building façades, terminating in the north-east.

Secondary emergency egress points for firefighting operations are provided via 4m wide fire trails which run parallel to the northern building façade. Fire trails will provide access to the eastern and western building facades, with the western trail also servicing the electrical transmission tower external to the site's western boundary. Each fire trail will terminate with a 'T-turning' or 'Y-turning' head. Roof access will also be available for firefighting services in the event of an emergency, with enclosed concrete stairs permitting safe pedestrian egress exit routes located towards Sirius Road.

Figures 2-7 show the proposed layout of the data centre for every floor level. Figure 8 shows the proposed landscape plan.

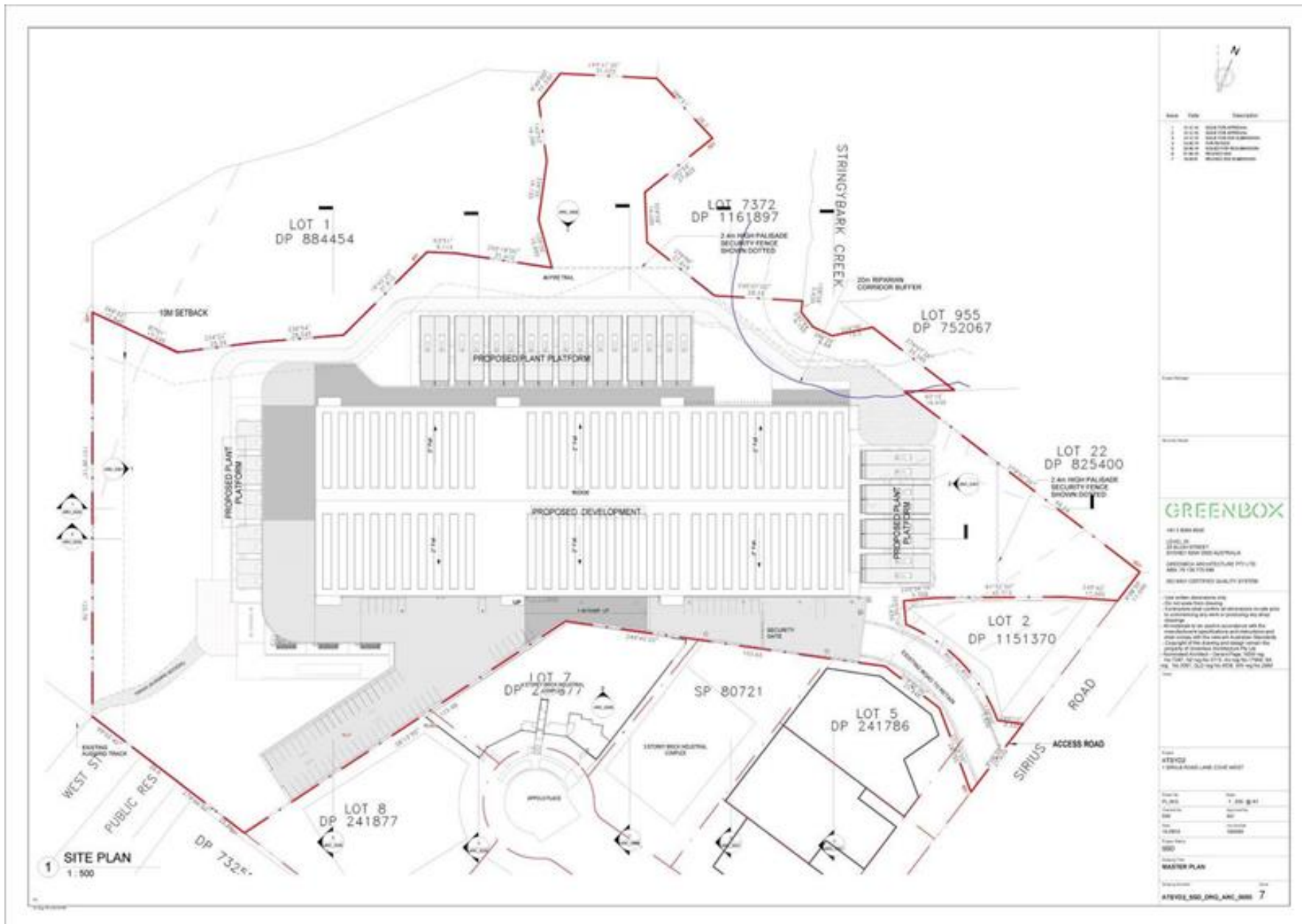


Figure 2 – Proposed State Significant Development – Masterplan for data centre
(Source: Greenbox, dated 16.08.2019, drawing no. ATSYD02_SSD_DRG_ARC_0050 Issue)

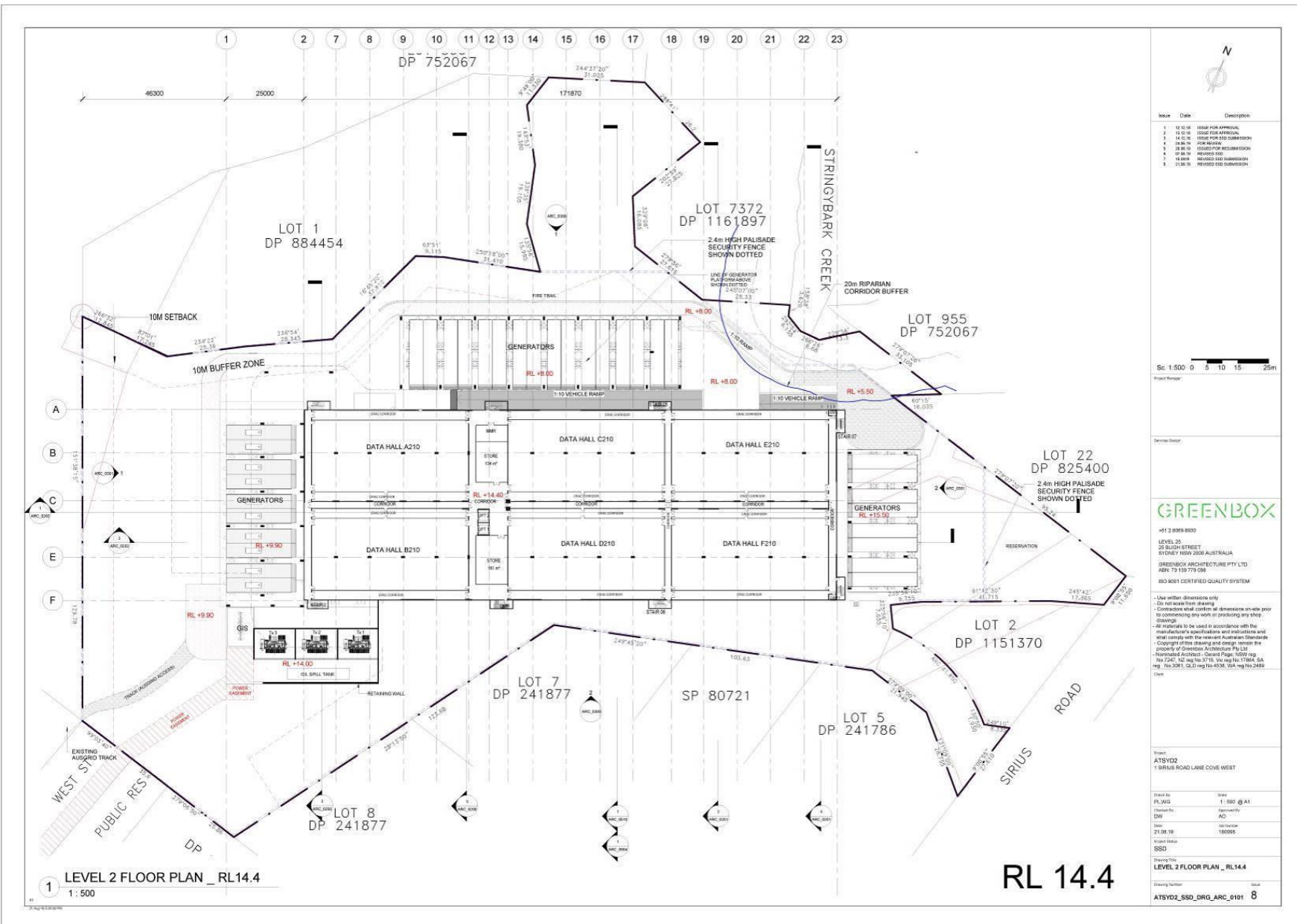


Figure 4 – Level 2 floor plan
(Source: Greenbox, dated 21.08.2019, drawing no. ATSYD02_SSD_DRG_ARC_0101 Issue 8)

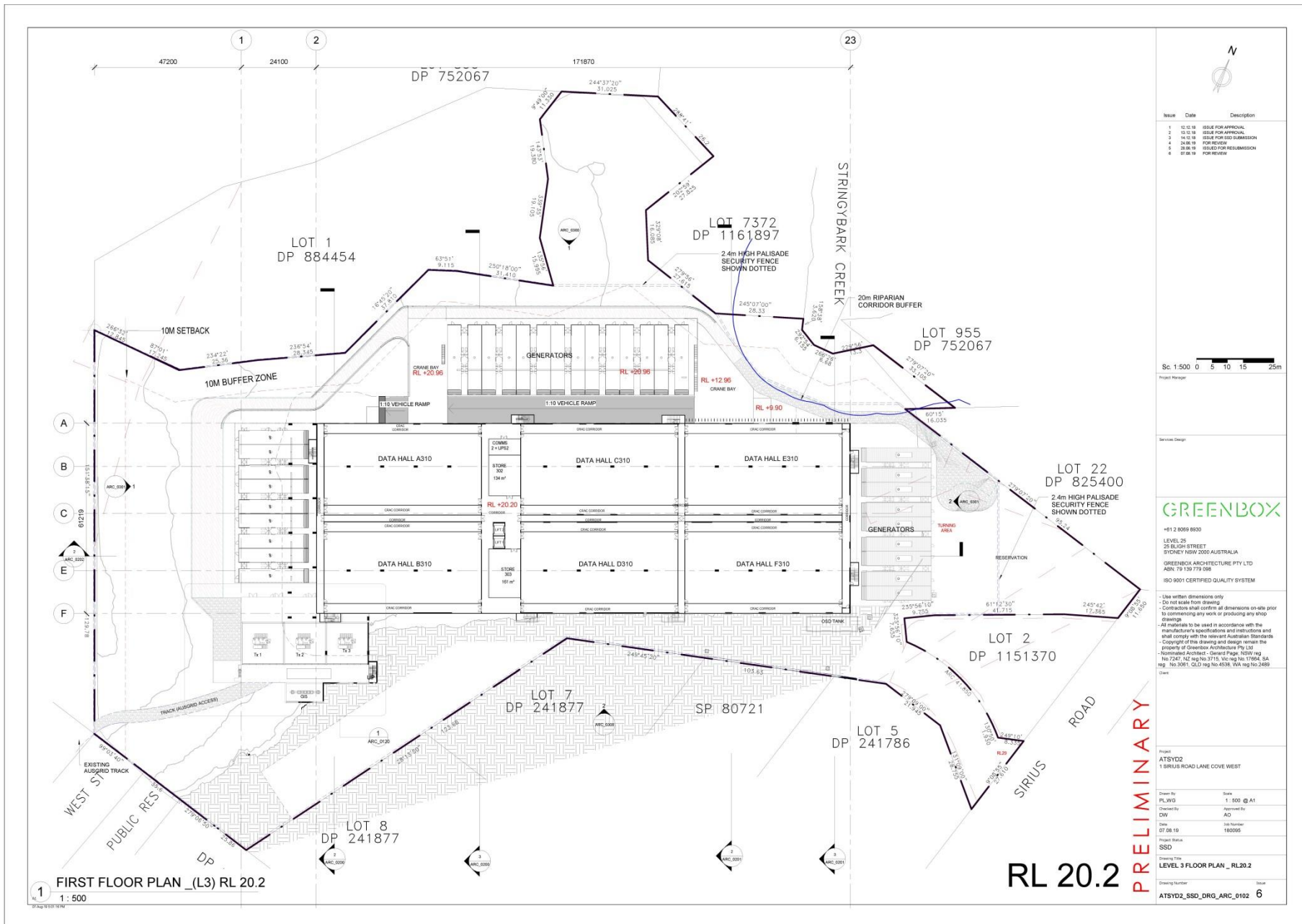


Figure 5 – Level 3 floor plan
 (source: Greenbox, dated 21.08.2019, drawing no. ATSYD02_SSD_DRG_ARC_0102 Issue 8)

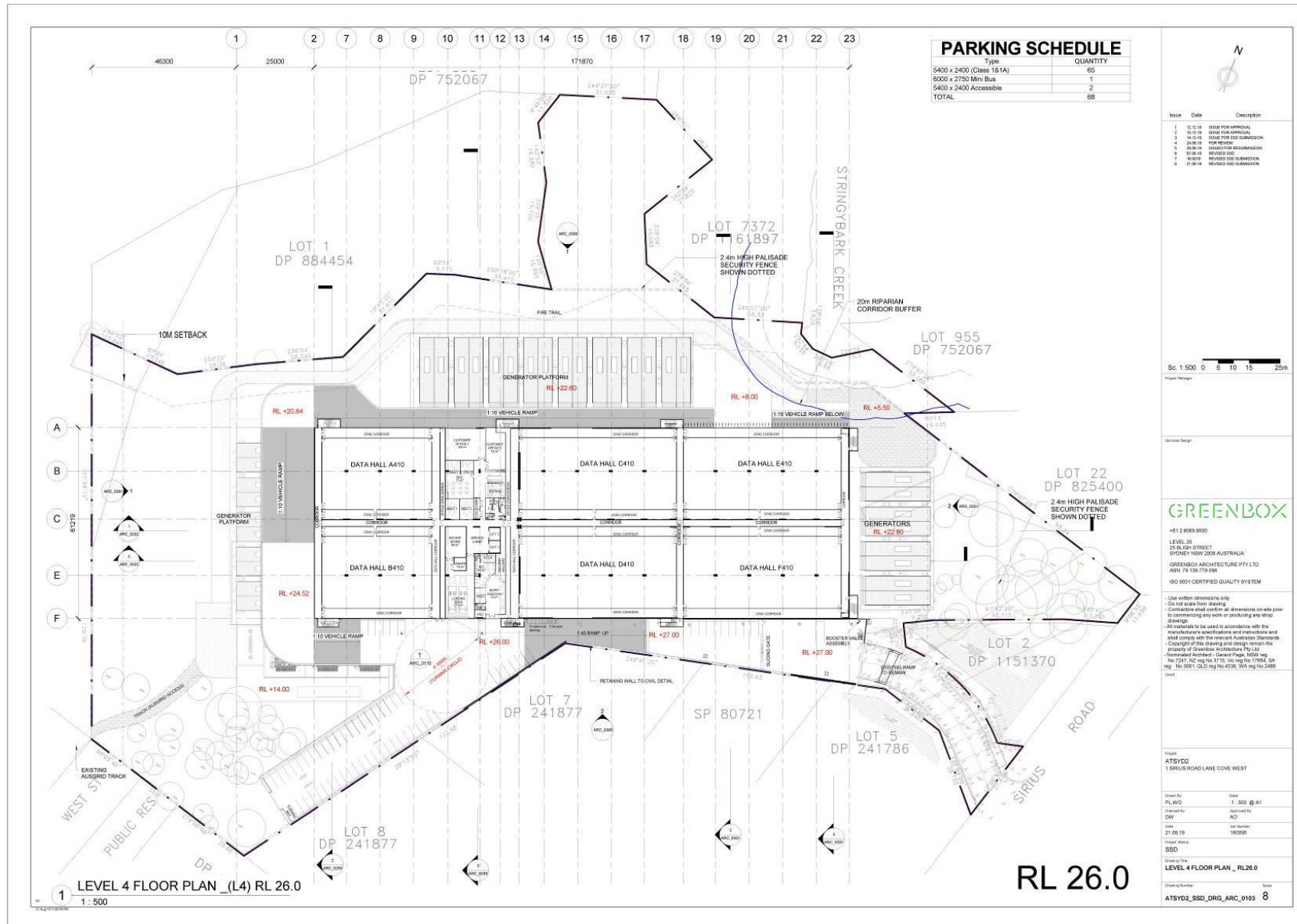


Figure 6 – Level 4 floor plan
 (Source: Greenbox, dated 21.08.2019, drawing no. ATSYD02_SSD_DRG_ARC_0103 Issue 8)

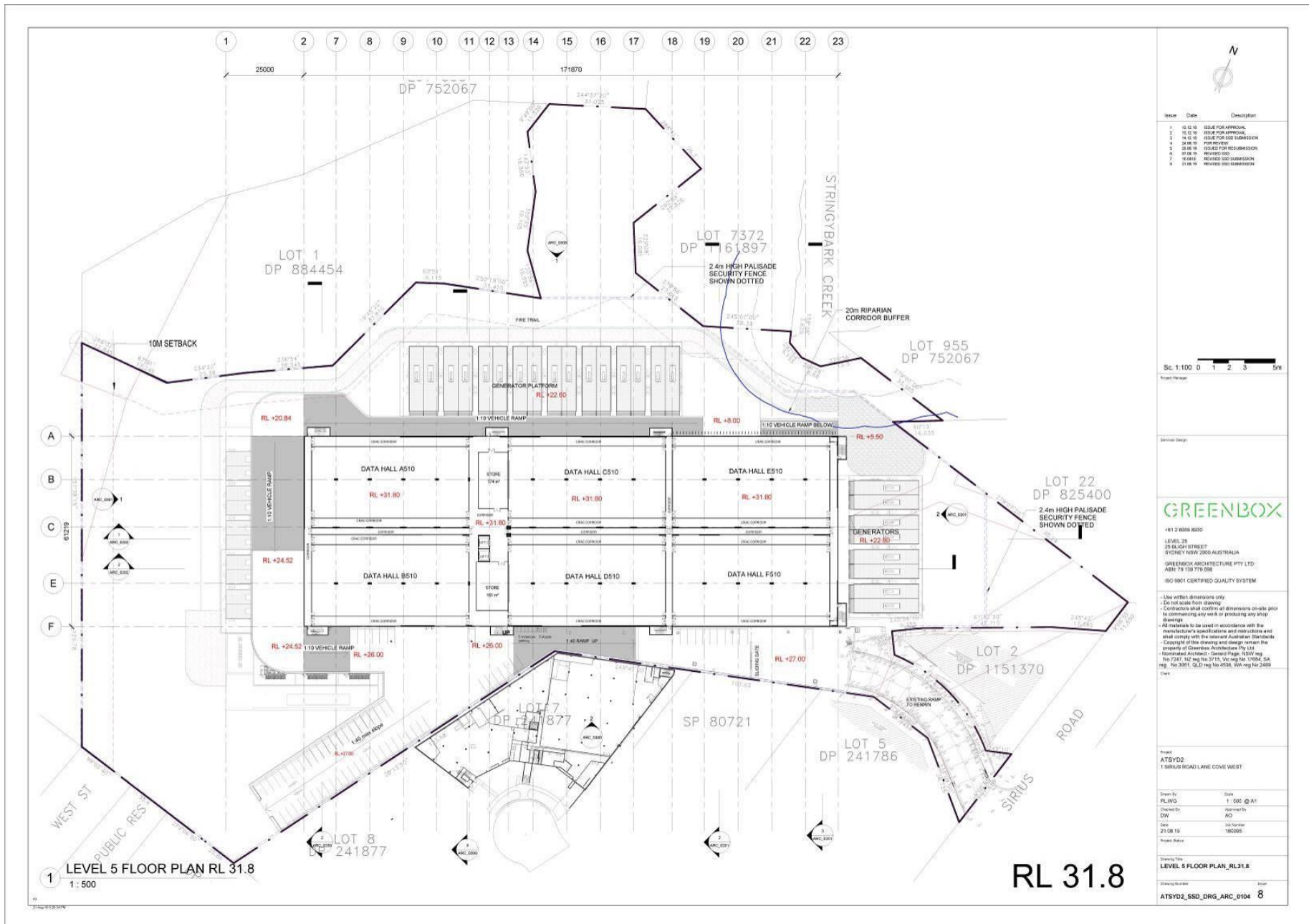


Figure 7 – Level 5 floor plan
(Source: Greenbox, dated 21.08.2019, drawing no. ATSYD02_SSD_DRG_ARC_0104 Issue 8)

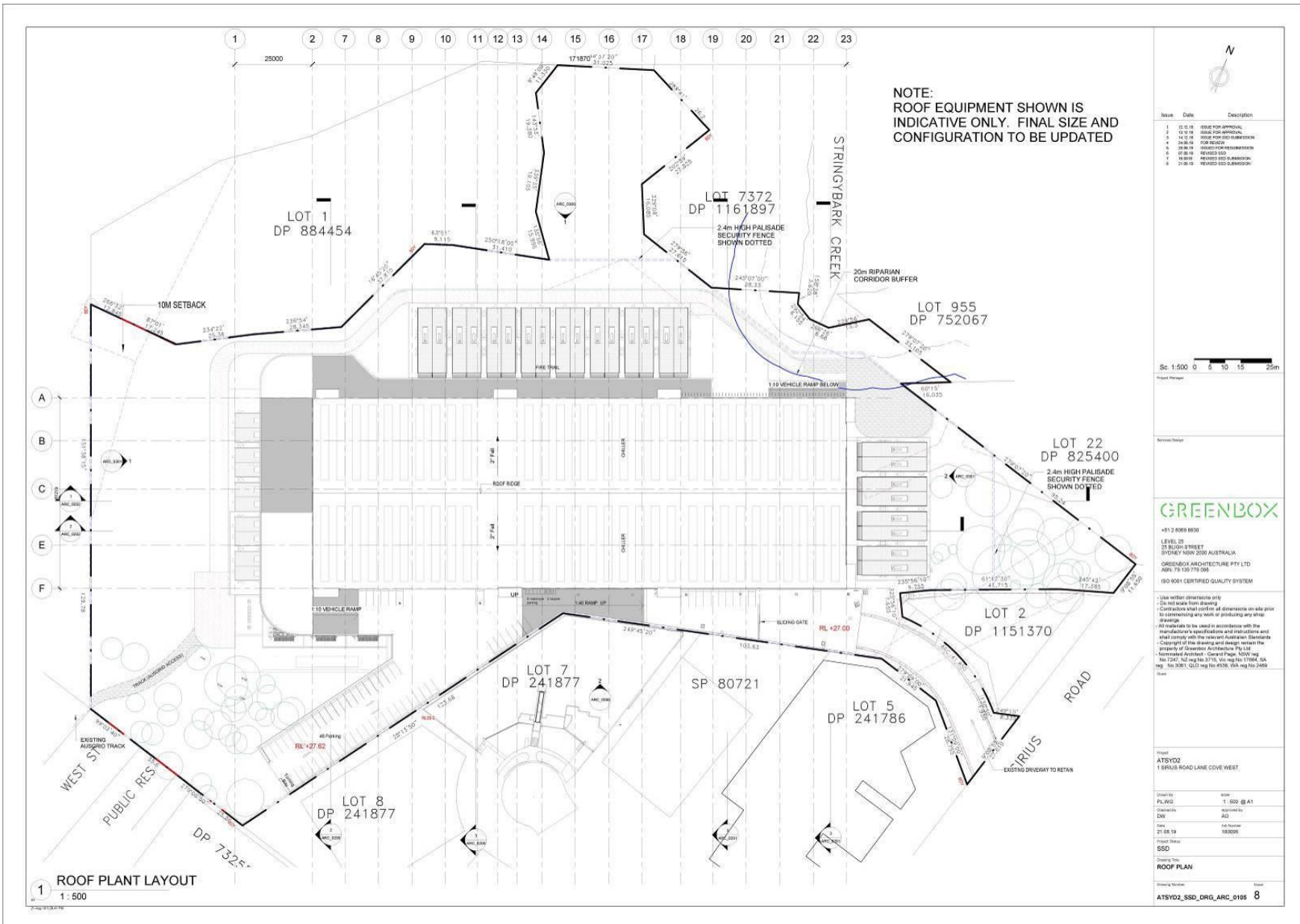


Figure 8 – Roof plan
 (source: Greenbox, dated 21.08.2019, drawing no. ATSYD02_SSD_DRG_ARC_0105 Issue 8)

The following sections provide a brief description of the site.

1.2 Site description

Table 1 provides a summary of the planning, cadastral, topographical, and disturbance details of the subject site.

Table 1 – Site features

Location	Lot 1, DP1151370, 1 Sirius Road, Lane Cove West
Size	Approximately 3.957ha
Grid reference	328287E 6257617N
Elevation	Approximately 2-25m AHD
Topography	Situated in a moderate to very steep slope with a north-western aspect.
Geology and soils	Geology: Hawkesbury Sandstone – Medium to coarse grained quartz sandstone, very minor shale and laminate lenses. Soils: Gynea – shallow to moderately deep (30-100 cm) Yellow Earths (Gn2.24) and Earthy Sands (Uc5.11,Uc5.23) on crests and inside of benches; shallow (<20 cm) Siliceous Sands (Uc1.21) on leading edges of benches; localised Gleyed Podzolic Soils (Dg4.21) and Yellow Podzolic Soils (Dy4.11, Dy5.11, Dy5.41) on shale lenses; shallow to moderately deep (<100 cm) Siliceous Sands (Uc1.21) and Leached Sands (Uc2.21) along drainage lines.
Catchment and drainage	Hawkesbury catchment. Overland flow into Stringybark Creek in the north and Lane Cove River in the west. No streams or waterbodies occur within the study area.
Vegetation	Remnant forest and exotic vegetation.
Existing land use	Vacant. Zoned IN2 - light industrial.
Clearing	>80% of the original vegetation has been cleared.

1.3 Vegetation descriptions

Vegetation communities observed within the study site include:

- Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast (PCT 1776)
- Disturbed land / exotics

Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast (PCT 1776)

This vegetation community is located in the north-eastern and south-western corners of the study site.

Canopy – Dominated by *Angophora costata*, *Eucalyptus piperita* and *Eucalyptus resinifera* with occasional *Corymbia gummifera* and *Eucalyptus pilularis* to a height of 30m and with a projected foliage cover (PFC) of 35–45%.

Midstorey – *Acacia parramattensis*, *Acacia suaveolens*, *Allocasuarina littoralis*, *Dodonaea triquetra*, *Grevillea buxifolia*, *Micrantheum ericoides*, *Notelaea longifolia*, *Woolisia pungens*, *Zieria pilosa*, *Elaeocarpus reticulatus* and *Glochidion ferdinandi* with a PFC of 5–25%.

Groundlayer – The groundlayer contained a high cover and species richness of native grasses, forbs and sedges including *Austrostipa pubescens*, *Entolasia stricta*, *Gonocarpus*

teucroides, *Imperata cylindrica*, *Lepidosperma laterale*, *Lomandra longifolia* and *Lomandra multiflora* subsp. *multiflora* with a PFC of up to 40%. Portions of the vegetation community have been underscrubbed, resulting in thinning, and in some instances the complete removal, of the mid-storey.

The condition of this vegetation community is variable with some areas in a relatively undisturbed condition with low levels of exotic species, particularly woody weeds, while other areas have been disturbed, resulting in a high cover of woody weeds, such as *Cinnamomum camphora*, *Ligustrum lucidum*, *Ligustrum sinense*, *Robinia pseudoacacia* and *Ochna serrulata*.



Photo 1 – Smooth-barked Apple - Red Bloodwood open forest (PCT 1776) in the north-eastern corner of the site



Photo 2 – Smooth-barked Apple - Red Bloodwood open forest (PCT 1776) in the southern corner of the site



Photo 3 – Smooth-barked Apple - Red Bloodwood open forest (PCT 1776) with shrub layer dominated by exotic shrubs *Ligustrum sinense* and *Lantana camara*

Disturbed land / exotics

This vegetation community covers the majority of the entire site and is dominated by exotic trees, shrubs and groundcovers including *Ligustrum sinense*, *Ligustrum lucidum*, *Cinnamomum camphora*, *Robinia pseudoacacia*, *Lantana camara*, *Rubus fruticosus* spp. agg., *Ageratina adenophora*, *Asparagus aethiopicus*, *Cenchrus clandestinus*, *Cirsium vulgare*, *Ochna serrulata*, *Ehrharta erecta* and *Eragrostis curvula*.



Photo 4 – Disturbed land / exotics in the south-west of the site



Photo 5 – Disturbed land / exotics in the centre of the site looking east



Photo 6 – Disturbed land / exotics in the centre of the site looking north

1.4 Riparian features

Aerial photography and mapping obtained from the NSW Land and Property Management Authority's (LPMA) *Spatial Information Exchange (SIX Viewer)*, *Google Earth Pro* and topographic mapping indicates that there are watercourses in close proximity of the site (refer Figure 9).

Where required, measures need to be taken to provide appropriate riparian protection for any future development to maintain water quality and to conserve riparian vegetation and associated faunal habitat.

Stringybark Creek (2nd order stream) occurs just to the north of the lot and outside the restoration areas. A 20m riparian buffer from the top of bank extends into the study area (and is to be revegetated as specified in the VMP).

Lane Cove River is to the north-western aspect of the site and, as a high order stream, it attracts a 40m riparian buffer from top of bank. This buffer impacts the north-western portion and the western corner of the lot.

The Lane Cove Local Environment Plan (LEP) mapping (2009) identifies a portion in the north of the site as Riparian Land. The mapped 'riparian land' overlaps with the proposed works.

Regarding 'riparian land', Lane Cove LEP states:

Development consent must not be granted for development on land to which this clause applies unless the consent authority has considered the impact of the proposed development on the land and any opportunities for rehabilitation of aquatic and riparian vegetation and habitat on that land.

The required riparian setbacks can be achieved and appropriate offsets provided for those encroachments, this assessment concludes that the proposed development can be implemented in accordance with the *NSW Department of Industry - Guidelines for controlled activities on waterfront land - Riparian corridors* (2018). Impacts on riparian land can be mitigated as recommended within this assessment.



Figure 9 – Riparian land mapping (Lane Cove LEP mapping 2009)

1.5 Contaminated land

A current contaminated lands notice applies to an area in the north-east of the lot (formerly Lot 2 DP 884454 and Lot 1 DP 546860 before that). This notice states that:

- (a) *The recipient must obtain the prior written approval of the EPA to any works that are to be carried out on the land, whether or not the works are carried out by the recipient, for the purposes of:*
 - (i) *Covering, dispersing or reducing the contamination of the land; or*
 - (ii) *Restoring or rehabilitating the land; or*
 - (iii) *Removing or disposing of any soil, sand, rock, water, or any other solid or liquid material of any kind from the land; and*
- (b) *The recipient must maintain the land in a manner that maintains the integrity and impermeability of the clay capping which is on the land, including selection of vegetation with root systems that do not grow into the clay capping layer; and*
- (c) *The recipient must not undertake any work, or cause, permit or allow the undertaking of any work which would result in any disturbance to, or modification of the clay capping layer unless the prior written approval of the undertaking has been obtained from the EPA and the work is undertaken in accordance with any conditions of that approval.*

A remediation action plan is to be prepared by *Sinversa* that sets out strategies to contain and manage the contaminated soil within the contaminated lands. These remediation works are to be completed before the implementation of any restoration works specified in this VMP within the contaminated lands.

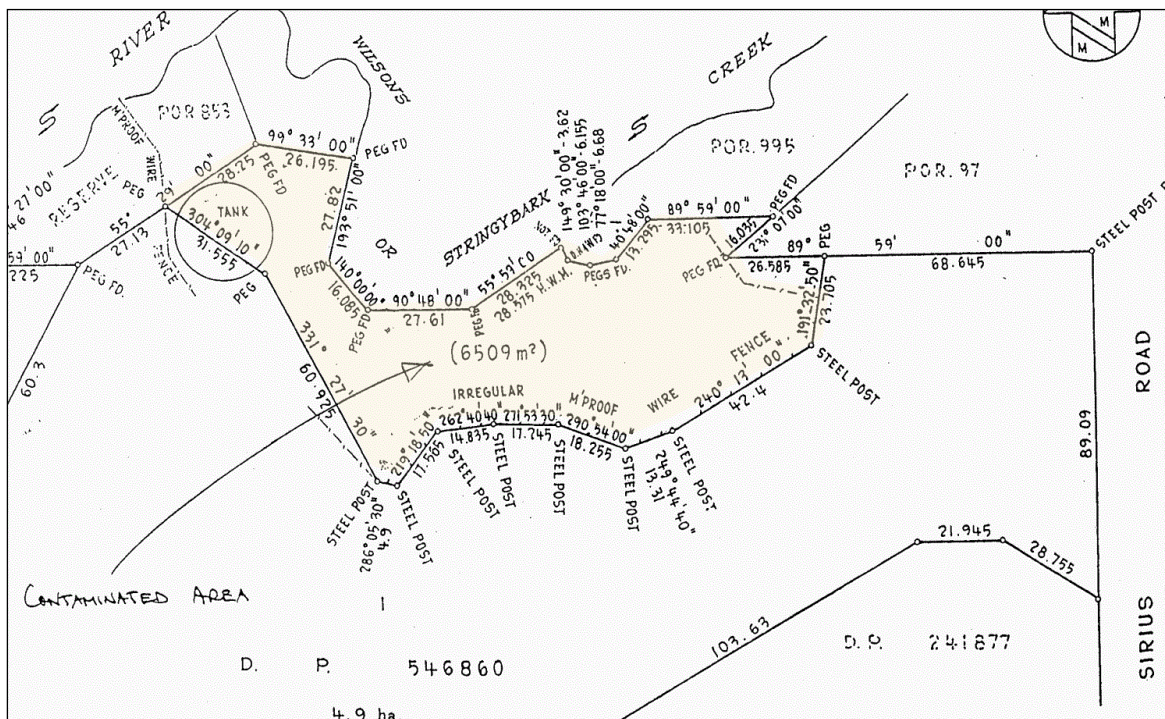


Figure 10 – Contaminated area in the north-east of the lot



Photo 7 – Edge of Stringybark Creek showing gabion wall containing the contaminated fill lands – top of bank for Stringybark Creek coincident with the wetland vegetation boundary

1.6 Wetlands adjacent to the site

The site also abuts wetland vegetation for a small portion of its boundary and the existing vegetated lands surrounding the wetland have been retained and enhanced marginally as a result of the proposal. Wetlands are defined as *waterfront land* in accordance with the definitions of the *WM Act*.

The proposal does not directly affect wetland surrounding the site but may indirectly affect wetlands through stormwater drainage. Mitigation measures are proposed within this assessment and incorporated into a VMP.

All works within the RPZ and ongoing management will be in accordance with *NSW Department of Industry - Guidelines for controlled activities on waterfront land - Riparian corridors* (2018) and the issued General Terms of Approval for future development applications.

A review of the Sydney Metro Vegetation Mapping 2016 and a site inspection were undertaken to determine the extent of wetland adjacent to the site and the extent of the wetland vegetation.

Figure 14 shows the distribution of adjoining wetland vegetation is made up of the following vegetation types:

- Flax Leaved paperbark forest to closed mesic forest on alluvial riverflats

- Mangrove Forests in estuaries
- Saltmarsh in estuaries
- Swamp Oak Swamp Forest

Currently, there is a minimum buffer of 15m to the western boundary of the site. In the context of the proposed development a buffer of 27m will be retained inclusive of APZ and fire trail to the western aspect of the building.

The site's northern boundary is a minimum of 10m from the wetland boundary. With the building setback, this is increased by 91m which includes the APZ and fire-fighting truck access. The main stormwater basin is 22m to the nearest wetland boundary.

The site's eastern lot boundary is 0m from the wetland boundary and has a rock gabion wall for the full length of the minimum 10.5m to the stormwater basin and 25m to the proposed building wall.



Photo 8 – Sedgeland and swamp oak forest wetland vegetation adjoining Lane Cove River to the south-west of the site



Photo 9 – Wetland interface with abrupt change into sedgeland species and Swamp Oak in the background



Photo 10 – Paperbark Forest forming part of the wetland vegetation adjacent to western boundary



Mapped Watercourses

2

Electronic aerial photography from *Google Earth Pro* and *Spatial Information Exchange* were viewed. Topographic mapping for the site (Figure 11) was also viewed as the key trigger of a nominated watercourse for assessment purposes.

Based on ground truthing, watercourses abut the northern boundary for less than 20m. Whilst the site itself straddles two (2) catchments the dominant catchment is associated with Stringybark Creek which has a catchment area of 227ha.

The Lane Cover River is located to the west and, as a fifth order stream, is required to have a riparian corridor width of 40m from top of bank subject to permissible non-riparian corridor uses. This setback is achieved except for a minor incursion of stormwater basin on the northern aspect of the site. A suitable riparian offset has however been proposed and results in an overall net gain in protection to the Lane Cover River.

The site also abuts wetland vegetation for a small portion of its boundary and the existing vegetation lands surrounding the wetland have been retained and enhanced marginally as a result of the proposal. Wetlands are defined as Waterfront land in accordance with the definitions of the *WM Act*. The proposal does not directly affect wetland surrounding the site but may indirectly affect wetlands through stormwater drainage. Mitigation measures are proposed within this assessment and incorporated into a VMP.

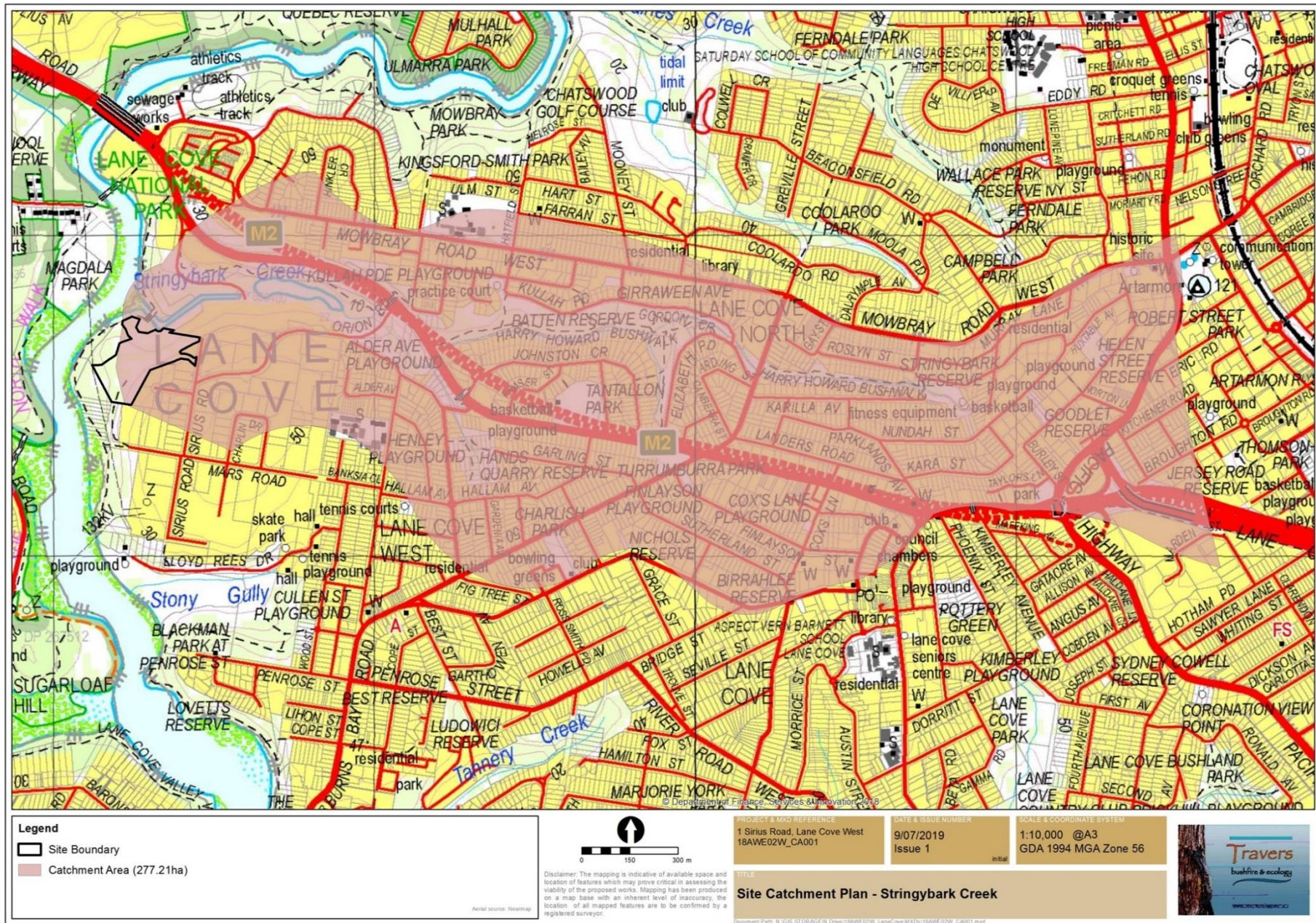


Figure 11 – Extent of Stringybark Creek catchment and watercourses
(Liverpool and Campbelltown 1:25000 topographic maps)



Validation of Watercourses & Wetlands

3

An inspection of the site and its watercourses was undertaken on 2 July 2018 to identify the presence or absence of watercourse and wetland features and to examine the impacts of the proposed works on riparian zones.

For each watercourse present, the following features were assessed:

- the presence of a defined channel (either intermittent or continuous) along the alignment of the watercourse;
- the extent of riparian vegetation;
- the presence of vegetation with environmental value
- the presence of noxious weeds and degree of weed infestation
- the presence of any ponded water;
- the potential connectivity between any riparian vegetation and upstream or downstream riparian vegetation.

For the purposes of wetland boundary definition, the following features were used to define the extent of the wetland and its boundary:

- any observed endangered protection wetlands
- any observed tidal influences
- any observed estuarine features
- topographic constraints and presence of non-wetland vegetation types
- presence of any groundwater dependent ecosystems that also correspond with a wetland vegetation type.

As identified on Figure 11, the majority of the site drains into Stringybark Creek and hence into Lane Cover River which has a total catchment area of 227ha.

The extent of each validated watercourse is shown on Figure 12. The existing topographic mapping resents the existing watercourses and associated estuarine or intertidal zones.

The existing top of bank and wetland boundaries have however been verified by ground truthing to ensure accurate assessment of setbacks and potential riparian impacts, both direct and indirect. All boundaries have been located with a sub 1m accurate differential GPS. The extent of wetland vegetation has been mapped by walking the boundary, comparison against regional mapped vegetation and interpolation of contours generated from *LiDAR* data. In this case the *LiDAR* data is considered to be reliable.

3.1 Stringybark Creek

Stringybark Creek abuts the northern boundary of the site for a limited distance of 20m. There is no existing riparian bank vegetation on this boundary due to past site management works to cap and seal contaminated fill and the installation of a rock gabion wall to contain that fill. The first natural features are the intertidal zone and mangroves and *Phragmites australis* in areas that have been cleared of canopy cover.

An existing pedestrian bridge crosses Stringybark Creek which is currently closed to pedestrian traffic.

The inspection identified the following characteristics:

- permanent flow, defined channels with highly incised banks or rock gabion retaining walls;
- no natural riparian vegetation on the southern boundary;
- well established mangroves within the intertidal zone – part cleared in one section;
- artificial top of bank.

Physical evidence supports the presence of a modified second order watercourse that is capable of providing a long-term vegetative link not requiring any works for flood mitigation works or bend or bank stabilisation.

3.1.1 Recommended management

Second order streams require a 20m VRZ from top of bank. Management options include:

- protect with a 20m VRZ from top of bank and revegetate corridor with Smooth-barked Apple - Red Bloodwood open forest (PCT 1776)
- (upper reaches) and Swamp Sclerophyll Forest (lower reach on flats)
- integrate drainage works with the riparian corridor with appropriate riparian offsets
- ensure stable and dissipated runoff from the stormwater outlet through a level spreader to avoid concentrated flows and erosion of intertidal mudflats.

3.1.2 Watercourse photos

The following images are typical of the riparian bank and intertidal zone along Stringybark Creek to the north-west of the site.



Photo 11 – Edge of Stringybark Creek just outside the northern boundary of the lot



Photo 12 – Intertidal zone of Stringybark Creek nearest to the stormwater basin output



Photo 13 – Intertidal zone of Stringybark Creek

3.2 Lane Cove River

Lane Cove River is prominent to the north-west but is well shielded by existing remnant native vegetation and well-established riparian vegetation. Extensive areas of wetland vegetation extend between the site boundary, particularly on the western boundary, and thins considerably on the north-western aspects.

The proposed development is well set back from Lane Cove River and is only closest on the northern most extension of the lot and the northern boundary abutting Stringybark Creek. The site inspection identified the following characteristics:

- permanent flow, defined channels with highly incised banks or rock gabion retaining walls;
- a mixture of extensive riparian and wetland vegetation with significant setbacks;
- well established mangroves within the intertidal zone – part cleared in one section;
- weed encroachment on the western boundary due to cut and fill works and past vegetation clearance.

Physical evidence supports the presence of a modified fifth order watercourse that is capable of providing a long-term vegetative link not requiring any works for flood mitigation works or bend or bank stabilisation.

3.2.1 Recommended management

Second order streams require a 20m VRZ from top of bank. Management options include:

- protect with a 40m VRZ from top of bank and revegetate corridor with Smooth-barked Apple - Red Bloodwood open forest (PCT 1776) and Flax Leaved Paperbark Forest (flood affected zones);
- integrate drainage works with the riparian corridor with appropriate riparian offsets;
- ensure stable and dissipated runoff from the stormwater outlet through a level spreader to avoid concentrated flows and erosion of intertidal mudflats.

3.2.2 Watercourse photos

The following images are typical of the riparian bank along the Lane Cove River to the north west of the site.



Photo 14 – Typical bank of Lane Cove River adjoining wetland vegetation looking upstream towards Stringybark Creek



Photo 15 – Typical bank of Lane Cove River adjoining wetland vegetation looking downstream

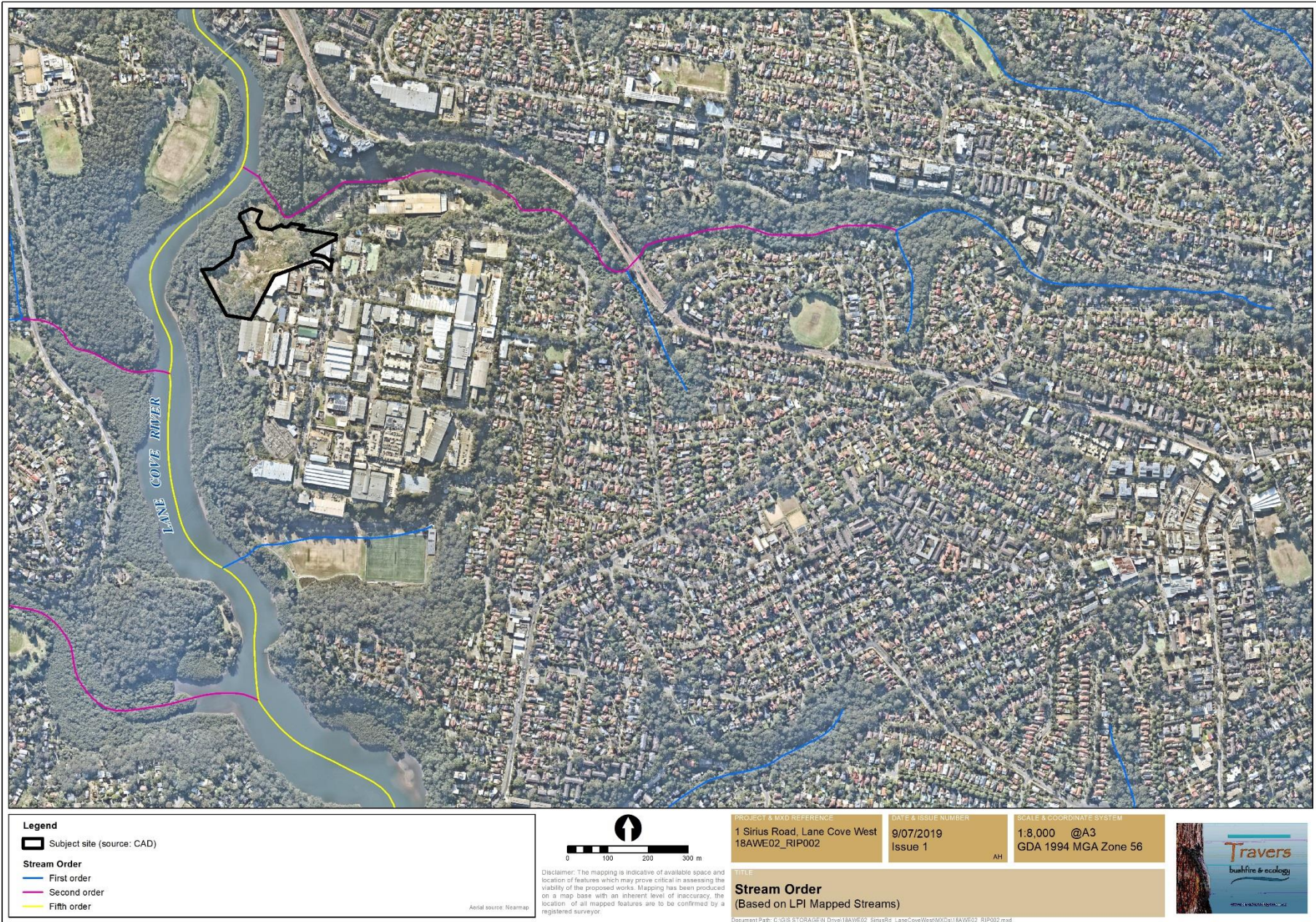


Figure 12 - Validated watercourses and stream order

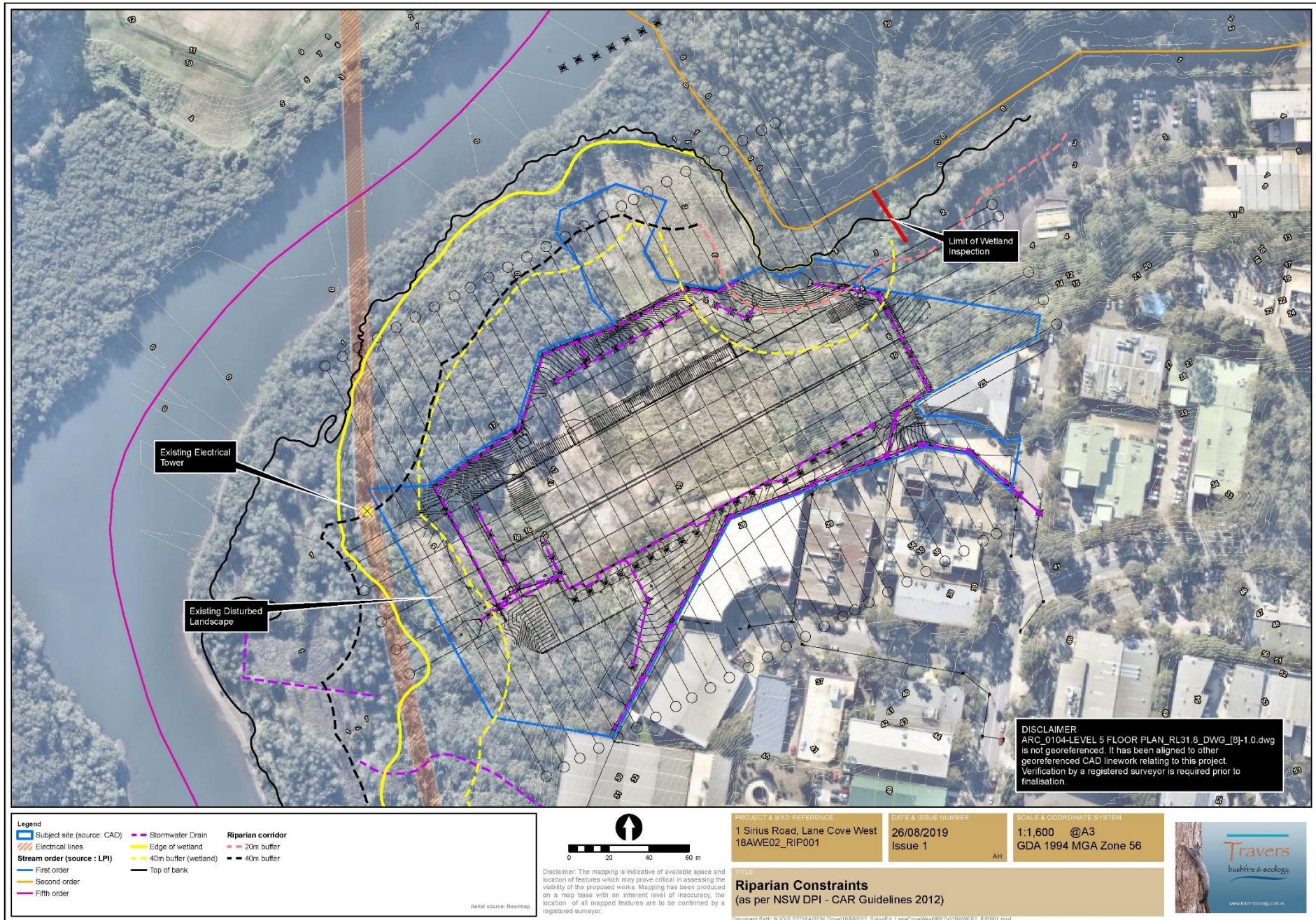


Figure 13 – Riparian Constraints

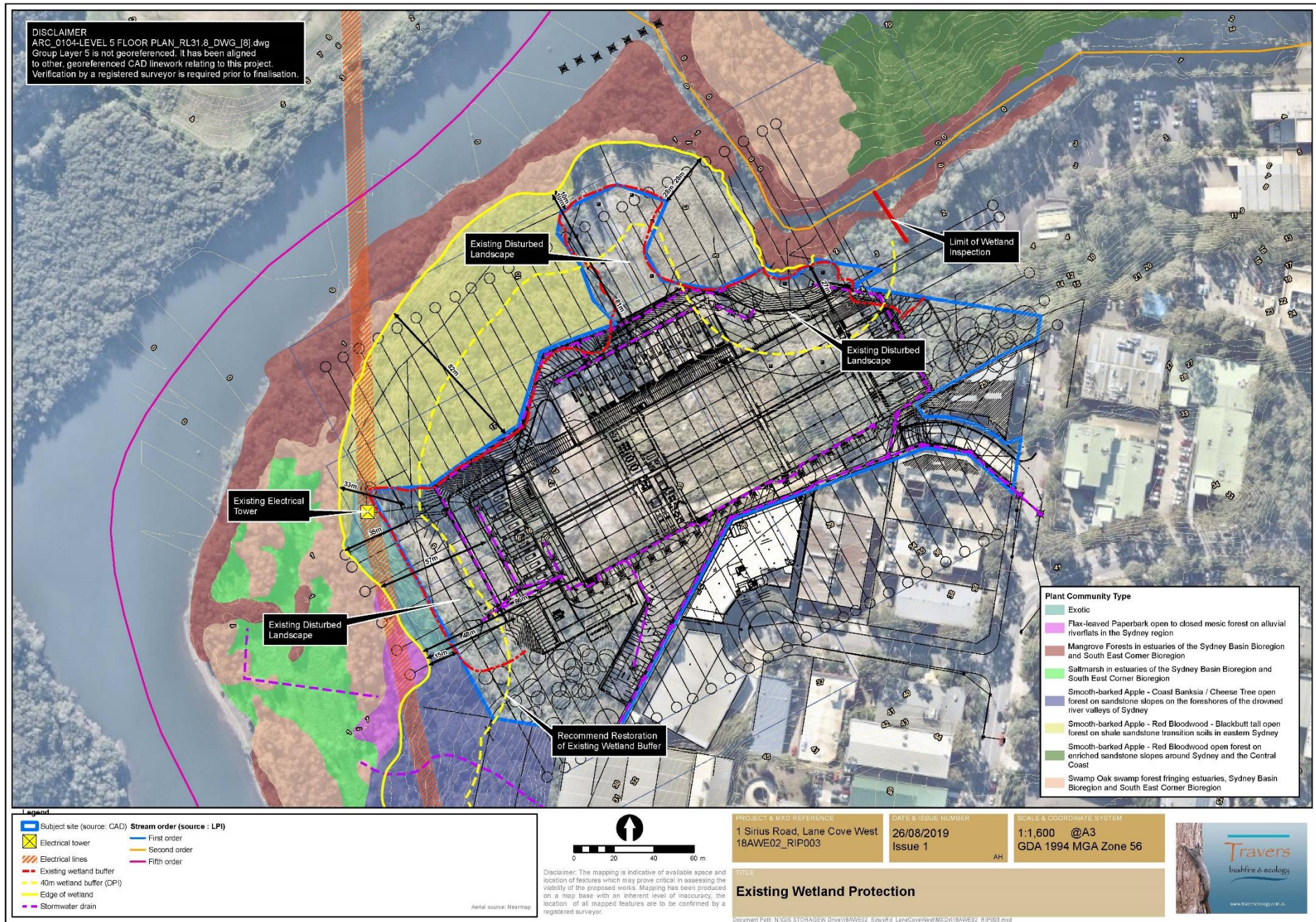


Figure 14 – Existing wetland protection and vegetation adjoining the site



Riparian Buffers & Controls

4

4.1 Objectives for riparian corridor management

The overarching objective of the controlled activities provisions of the *WM Act* is to establish and preserve the integrity of riparian corridors (*NSW Department of Industry - Guidelines for controlled activities on waterfront land - Riparian corridors* (2018)). Ideally, the environmental functions of riparian corridors should be maintained or rehabilitated by applying the following principles:

- Identify whether or not there is a watercourse present and determine its order in accordance with the Strahler System.
- If a watercourse is present, define the riparian corridor / vegetated riparian zone on a map in accordance with Table 2.
- Seek to maintain or rehabilitate a riparian corridor / vegetated riparian zone with fully structured native vegetation in accordance with Table 2.
- Seek to minimise disturbance and harm to the recommended riparian corridor / VRZ.
- Minimise the number of creek crossings and provide a perimeter road separating development from the riparian corridor / VRZ.
- Locate services and infrastructure outside of the riparian corridor / VRZ. Within the riparian corridor / VRZ, provide multiple service easements and / or utilise road crossings where possible.
- Treat stormwater run-off before discharging into the riparian corridor / VRZ.

The NSW Department of Industry however, does allow for a range of works and activities on waterfront land and in riparian corridors to better meet the needs of the community, providing that they cause minimal harm, as outlined in the riparian corridor matrix below.

4.2 Riparian corridors

Controlled activities carried out in, on or under waterfront land are regulated by the *WM Act*. The NSW Department of Industry administers the *WM Act* and is required to assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront land as a consequence of carrying out the controlled activity.

Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40m of the highest bank of the river, lake or estuary. This means that a controlled activity approval must be obtained from the NRAR before commencing the controlled activity.

On 1 July 2012, new rules commenced regarding controlled activities within riparian corridors. The new rules amend the riparian corridor widths that apply to watercourses, providing more flexibility in how riparian corridors can be used and making it easier for applicants to determine the NRAR-controlled activity approval requirements. Key aspects of the changes include:

- Provision of greater flexibility in the allowable uses and works permitted within riparian corridors
- The core riparian zone and vegetated buffer have been combined into a single VRZ
- The width of the VRZ within the riparian corridor has been pre-determined and standardised for first, second, third and fourth order and greater watercourses
- Where suitable, applicants may provide an offset for this activity by connecting an equivalent area to the riparian corridor within the development site.
- The riparian corridors matrix enables applicants to determine what activities can be considered in riparian corridors.

As stated in the *Controlled Activity Guidelines* for the preparation of VMPs (NSW Department of Industry 2018), a riparian corridor (RC) forms a transition zone between the land, also known as the terrestrial environment, and the river or watercourse or aquatic environment. Riparian corridors perform a range of important environmental functions such as:

- providing bed and bank stability and reducing bank and channel erosion
- protecting water quality by trapping sediment, nutrients and other contaminants
- providing diversity of habitat for terrestrial, riparian and aquatic plants (flora) and animals (fauna)
- providing connectivity between wildlife habitats
- conveying flood flows and controlling the direction of flood flows
- providing an interface or buffer between developments and waterways
- providing passive recreational uses

The protection, restoration or rehabilitation of vegetated riparian corridors is important for maintaining or improving the shape, stability (or geomorphic form) and ecological functions of a watercourse (NSW Department of Industry 2018).

The proposed management of the riparian corridors can accommodate all these functions without compromising the bushfire safety of the proposed development areas.

4.3 Riparian corridor widths

The NSW Officer of Water recommends a VRZ width based on watercourse order as classified under the Strahler System of ordering watercourses and using current 1:25 000 topographic maps (see Figure 12 and Table 5). The width of the VRZ should be measured from the top of the highest bank on both sides of the watercourse (*NSW Department of Industry - Guidelines for controlled activities on waterfront land - Riparian corridors* (2018)).

Figure 15- The Strahler System

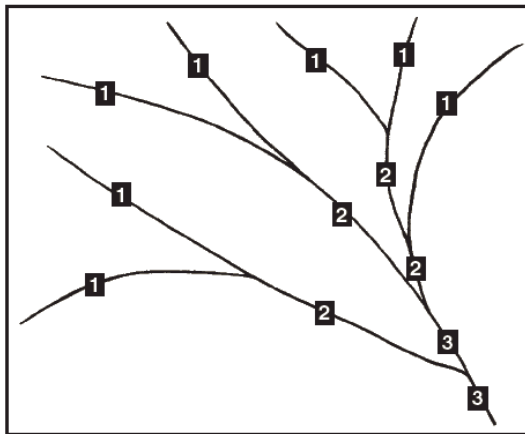


Table 2 - Recommended riparian corridor widths

Watercourse type	VRZ width (each side of watercourse) (metres)	Total RC width (metres)
First order	10	20 + channel width
second order	20	40 + channel width
third order	30	60 + channel width
fourth order and greater (includes estuaries, wetlands and any parts of rivers influenced by tidal waters)	40	80 + channel width

Stream order: The watercourse order as classified under the Strahler System based on 1:25,000, 1:50,000 or 1:100,000 topographic maps, whichever is the smallest scale available. A full list is provided at Part 2, Schedule 2 of the *Water Management (General) Regulation 2011*.

Adherence to the NSW Department of Industry - Controlled Activity Guidelines (2018) is subject to the approval by the NRAR and the development consent authority. Consequently, alternative solutions are assessed by the NRAR based on their performance in terms of achieving riparian management objectives. Where a watercourse does not exhibit the features of a defined channel with bed and banks, the NRAR may determine that the watercourse is not waterfront land for the purposes of the *WM Act*.

The proposed riparian setbacks are consistent with the *NSW Department of Industry - Guidelines for controlled activities on waterfront land - Riparian corridors* (2018). Riparian corridors will provide hydraulic and ecological functions and assist in maintaining ecological connectivity upstream and downstream of the site.

To promote ecological as well as hydraulic functions, the riparian corridors can be revegetated over the life of the project which allows for progressive revegetation and regeneration works.

Preparation of a VMP for the riparian corridors is recommended to accurately define the planting densities, spacings and species to be used within each riparian corridor and to integrate with any other vegetation management works or landscaping within the site.

4.4 Permissible works and activities within riparian corridors

The following riparian corridor matrix enables applicants to identify certain works and activities that can occur on waterfront land and in riparian corridors. Applicants should note that the matrix relates to controlled activity approvals under the *WM Act* only. They are still required to comply with other relevant government legislation, such as threatened species, flood planning levels and fisheries guidelines.

Table 3 - Riparian corridor matrix

Stream order	Vegetated Riparian Zone (VRZ)	RC off-setting for non RC uses	Cycleways and paths	Detention basins		Stormwater outlet structures and essential services	Stream realignment	Road crossings		
				Only within 50% outer VRZ	Online			Any	Culvert	Bridge
1 st	10m	•	•	•	•	•	•			
2 nd	20m	•	•	•	•	•		•		
3 rd	30m	•	•	•		•			•	•
4 th +	40m	•	•	•		•			•	•

4.4.1 Riparian corridor off-setting for non-riparian corridor uses

In accordance with the *NSW Department of Industry - Guidelines for controlled activities on waterfront land - Riparian corridors* (2018), non-riparian uses, such as APZs are allowed within the outer 50% of the vegetated riparian zone, providing that offsets are provided in accordance with the averaging rule.

The riparian corridor offsetting provision can be used to offset the loss of any portions of the riparian corridor impacted by proposed works within the riparian corridor.

Other proposed activities such as cycleways, paths, detention basins, stormwater outlet structures and essential services and stream realignment are permissible in accordance with the *NSW Department of Industry - Guidelines for controlled activities on waterfront land - Riparian corridors* (2018).

In accordance with Figure 14, storm waterworks impact within the required riparian corridors.

Where buildings are adjacent to a mapped first order stream, the building and associated APZ are not to encroach within 10m of the top of bank as a minimum standard. Where the proposed building and APZ impact on mapped riparian protection zone for a second order stream or higher, then the proposed building and associated APZ are not to encroach within 50% of the mapped riparian protection zone (that is 10m from top of bank). Similarly the 50% offset line for a fifth order stream is 20m from top of bank.

In accordance with the riparian offset plan, no works encroach with 10m of Stringybark Creek and 20m for Lane Cove River and where they encroach within the defined riparian corridors an offset has been provided resulting in a net gain in riparian protection area (0.26ha) as a VRZ.

4.5 Wetland setbacks

Reference to table identifies that a typical setback for a fourth order steam (which includes wetlands) the set back is 40m. This setback has been mapped on Figure 14. It is noted the adjoining Stringybark Creek, the top of bank and wetland boundary are coincident due to the past installation of a rock gabion wall that retained fill within previous capped contaminated fill areas. Consequently, past site works have removed an existing riparian or wetland protection and replaced it with an artificial wall and grassed fill area.

In practice, the imposition of a 40m wetland buffer is justified where existing native vegetation is present and acts as that buffer. In cases where the existing prescribed buffer has been significantly reduced by past works such as cut and fill, and the proposal provides adequate stormwater treatment to reduce the risk of indirect impacts on the wetland ecosystem, an alternative solution is permissible at the discretion of the NRAR. The proponents have proposed an alternative solution and it results in an improvement in riparian protection within the lot boundary.

The minimum existing separation between disturbed landscape and the adjoining wetland boundary is 15m to the west, 15m to the north and 0m to the east. This is a result of past clearing, deposition works and remediation of contaminated lands. The proposed revegetation works will improve wetland separation 33m to the west, 80m to the north and 10m to the east.

The proposed data centre does not lessen these setbacks and results in an improvement in setbacks in the following manner.

The minimum setbacks as a result of the proposed development are as follows:

- western aspect – 57m to the proposed building wall
- northern aspect – 81m to the proposed proposed fire trail
- eastern aspect – 25 m to the proposed proposed fire trail

Direct impacts have therefore been avoided and setbacks will be improved to all aspects of the wetland. Landscaping on the western aspect is to be APZ compliant and improvement in the landscape can be achieved by providing selected APZ suitable native species. The buffer to the wetland on the western boundary is largely determined by the existing high voltage power easement and cannot be improved.

Indirect impacts on the surrounding wetlands has been achieved by implementing the following measures:

- specifying native landscaping to be used on the site surrounding the proposed facility;
- implementing stormwater works that catch and divert potential runoff through stormwater treatment devices and utilising existing drainage networks where possible;
- restoring riparian vegetation in areas disturbed by past works and effectively increasing the buffers through native landscaping in the site.

Travers bushfire & ecology concludes that the proposal results in a net improvement in the protection of the surrounding wetland vegetation and associated habitat.

4.6 Proposed stormwater works

Figure 13 – *Riparian constraints* shows the location of proposed stormwater works and devices. Figure 15 shows the riparian corridor loss and offsets within the site boundary to compensate for the loss of riparian protection.

In all cases the installation of devices within corridors are to be in accordance with the *NSW Office of Water - Guidelines for controlled activities on waterfront land - Riparian corridors* (2012) or subsequent edition that may be issued by NSW Department of Industries.

The proposed devices and outlets do not present a significant impact on riparian corridor or nearby wetlands and can be installed appropriately with stabilisation and restoration of any riparian vegetation.

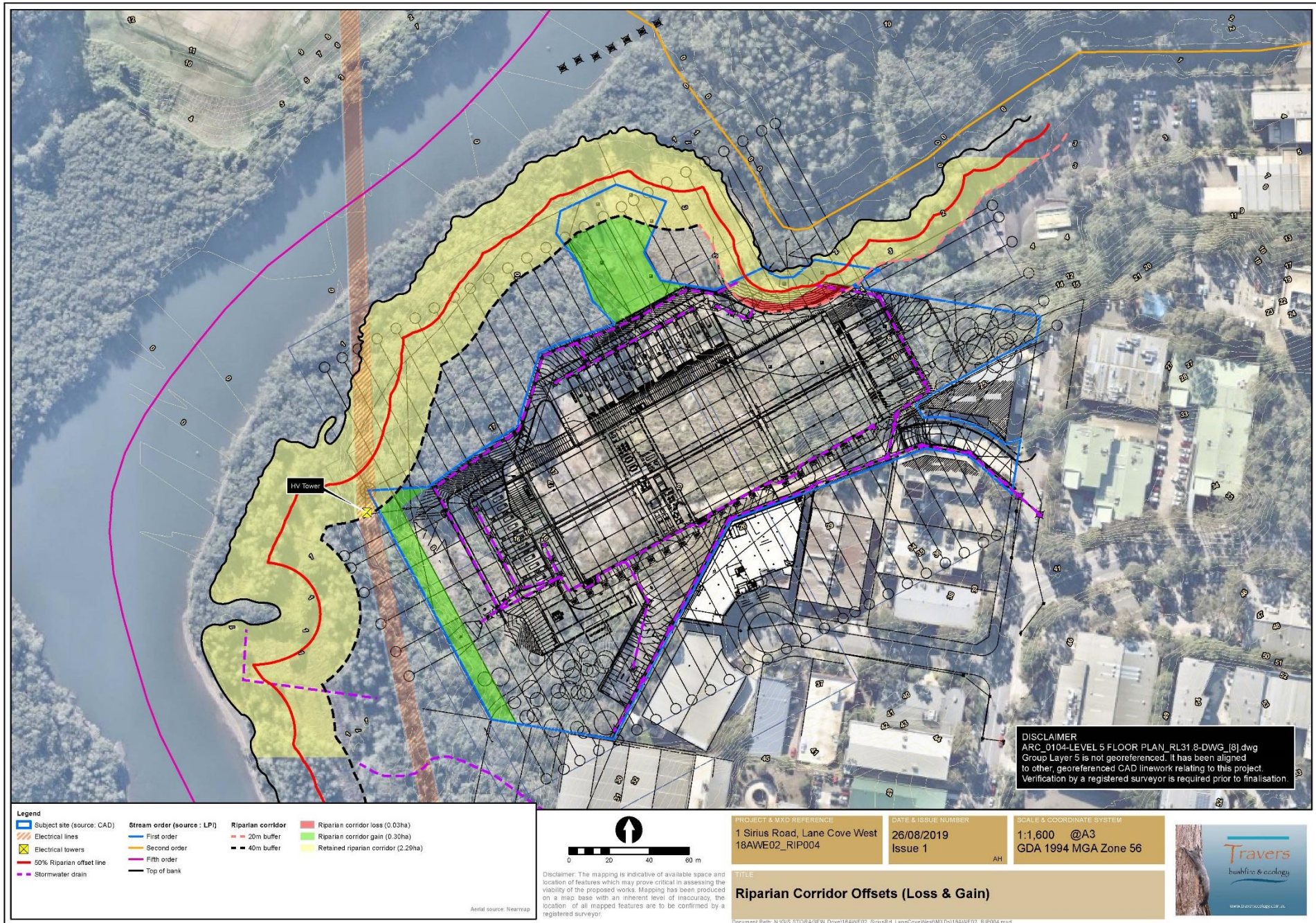


Figure 15 – Proposed riparian offsets



Conclusions and Recommendations

5

5.1 Conclusions

Based on ground truthing, watercourses abut the northern boundary of the site only. Whilst the site itself straddles two (2) catchments, the dominant catchment is associated with Stringybark Creek which has a catchment area of 227ha.

Stringybark Creek is a second order stream requiring a 20m riparian corridor measured from top of bank. The Lane Cover River is located to the west and as a fifth order stream is required to have a riparian corridor width of 40m from top of bank. Works are permitted to encroach within the outer 50% of the riparian corridors to permissible non-riparian corridor uses and associated offsetting.

Riparian corridor losses and offsets are provided that demonstrate a net gain in riparian corridor protection. As the site is adjoining an estuarine wetland ecosystem, the boundaries of the wetland have been defined and demonstrate that there is net improvement in protection.

Wetlands are defined as Waterfront land in accordance with the definitions of the *WM Act*. The proposal does not directly affect wetland surrounding the site but will indirectly affect wetlands through stormwater drainage. The site also abuts wetland vegetation for a small portion of its boundary and the existing vegetated lands surrounding the wetland have been retained and enhanced as a result of the proposal. Mitigation measures are proposed within this assessment and incorporated into a VMP.

All works within the riparian protection zone and ongoing management will be in accordance with *NSW Department of Industry - Guidelines for controlled activities on waterfront land - Riparian corridors* (2018) and the issued General Terms of Approval for future development applications.

Alternative solutions and riparian offsets are appropriate within this site for highly degraded riparian corridors and approvable under a Controlled Activity Approval from the NRAR in accordance with the requirements of the *WM Act*.

Riparian offsets have been provided for:

- Impacts within the 20m riparian zone of Stringybark Creek caused by a stormwater basin;
- Impacts within the 40m riparian zone of Lane Cover River caused by a stormwater basin.

Within the site there is 2.33ha of riparian corridor. In accordance with this assessment the pre and post development area of riparian zones, including riparian corridors adjoining the site are as follows:

Table 3 - Riparian corridor loss/gain

Pre & post development area of riparian zones adjoining the site	Area (ha)
Pre development area of mapped riparian zones	2.33ha
Post development area of protected riparian zones (inclusive of all stormwater devices and RZ offsets)	2.59ha
Net gain or loss (ha)	Gain of 0.26ha

5.2 Recommendations

Implementing the following measures will mitigate potential indirect impacts caused by the proposal:

- native landscaping to be used on the site surrounding the proposed facility;
- implementing stormwater works that catch and divert potential runoff through stormwater treatment devices and utilising existing drainage networks where possible;
- restoring riparian vegetation in areas disturbed by past works and effectively increasing the buffers through native landscaping in the site;
- undertaking target weed control and replacement with indigenous planting in any weed infested area;
- jointly managing the wetland interface with Lane Cove Council and electrical providers to remove weed infestations and re-establish habitat;
- ensure all stormwater outlets dissipate the energy of water before delivery to any riparian or wetland areas;
- ensuring stormwater treatment during and post construction is to a high standard for environmentally sensitive ecosystems.

Travers bushfire & ecology concludes that the proposed development has provided a net gain in riparian protection and revegetation including native vegetation protection zones immediately adjoining the riparian corridors and wetland areas.

A VMP has been prepared to specify the outcomes of all riparian management works in terms of areas to be protected, revegetation inclusive of planting densities and plant species to be used. A landscaping plan has been prepared for the site cognisant of the VMP requirements.

Controlled Activity Approval will be required for all works within waterfront land as defined under the *WM Act* and its Regulations.