7. AVOIDANCE, MINIMISATION & MITIGATION

7.1 Avoidance and Minimisation

When assessing the biodiversity impacts of a proposed activity there are three key considerations. These three approaches are listed in a descending order of best biodiversity outcomes:

- Avoid: measures taken by a proponent such as careful site selection, or actions taken through the design, planning, construction and operational phases of the development to completely prevent impacts on biodiversity values, or certain areas of biodiversity
- Minimise: a process applied throughout the development planning and design life cycle that seeks to reduce the residual impacts of development on biodiversity values
- Compensate: measures in a proposed activity to compensate for the biodiversity values lost. This can be achieved through offsets (financial or not).

Given the nature of the proposed activity (widening of an existing pathway), opportunities to change the project design in favour of vegetation retention are fairly limited and defined by engineering requirements. The proposed activity has been designed with consideration of impact avoidance to nearby Coastal Wetlands. Furthermore, laydown and storage areas will be positioned outside of native vegetation to avoid any additional impacts to native vegetation beyond the unavoidable impacts associated with the proposed activity.

7.2 Impact Mitigation and Minimisation Recommendations

This section of the report details recommended efforts to avoid and minimise impacts on biodiversity values associated with the proposed activity. Measures to be implemented before, during, and post construction are detailed in **Table 9**.

Table 9. Measures to be implemented before, during, and after construction to avoid and minimise the impacts of the proposed activity.

Action	Outcome	Timing	Responsibility
Assigning a Project Ecologist for Vegetation Clearing	Prior to works, the applicant should commission the services of a qualified and experienced Ecologist (minimum 3 years' experience). The Ecologist must be licensed with a current Department of Primary Industries Animal Research Authority permit and New South Wales Scientific License issued under the BC Act. The Ecologist will be commissioned to implement the following measures in accordance with best-practice, publicly available guidelines: ▪ Pre-clearing surveys will be undertaken in accordance with Guide 1: Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on Transport for NSW projects (TfNSW, 2024) ▪ Vegetation and Habitat removal should be undertaken in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Guidelines: Protecting and managing biodiversity on Transport for NSW projects (TfNSW, 2024) ▪ Fauna will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on Transport for NSW projects (TfNSW, 2024) ▪ Habitat will be replaced or re-instated in accordance with Guide 5: Re-use of woody debris and bushrock and Guide 8: Nest boxes of the Biodiversity Guidelines: Protecting and managing biodiversity on Transport for NSW projects (TfNSW, 2024) The unexpected species find procedure is to be followed under Guide 1: Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on Transport for NSW projects (TfNSW, 2024) if threatened flora and fauna, not assessed in the biodiversity assessment, are identified in the Subject Land.	Prior to Construction	City of Parramatta Council Ecologist

Action	Outcome	Timing	Responsibility
Edge Effects on Adjacent Native Vegetation and Habitat	Exclusion zones will be set up at the limit of clearing in accordance with Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on Transport for NSW projects (TfNSW, 2024)	During Construction	City of Parramatta Council
Erosion and Sedimentation	Appropriate erosion and sediment control should be erected and maintained at all times during construction in order to avoid the potential of incurring indirect impacts on biodiversity values. Erosion and sediment controls would be established in accordance with an erosion and sedimentation plan to be produced for the proposed works. As a minimum, such measures should comply with the relevant industry guidelines such as 'the Blue Book' (Landcom, 2004).	During Construction	City of Parramatta Council
Storage and Stockpiling (Soil and Materials)	Allocate all storage, stockpile, and laydown sites away from any vegetation that is planned to be retained. Avoid importing any soil from outside the site in order to avoid the potential of incurring indirect impacts on biodiversity values as this can introduce weeds and pathogens to the site. If materials are required to be imported for landscaping works, they are to be sterilised according to industry standards prior to importation to site.	During Construction	City of Parramatta Council
No Weeds imported on to the Subject Land	No priority or environmental weeds, pathogens or other biosecurity issues (e.g. fireants) are to be imported on to the site prior to or during construction works.	During Construction	City of Parramatta Council
Minimisation of Light Spill	Control measures (e.g. the directional lighting and task lighting) are to be installed to minimise glare and light spillage into adjoining vegetation to minimise potential impacts to fauna species.	During Construction and Operation	City of Parramatta Council

8. CONCLUSION

The proposed activity will result in the clearing of the following 31 native trees characteristic of PCT 4006:

- 2 x *Corymbia citriodora* (T12, T253)
- 1 x *Allocasuarina torulosa* (T13)
- 3 x *Corymbia maculata* (T17, T24, T231)
- 4 x *Angophora costata* (T39, T110, T150 – T151)
- 9 x *Casuarina glauca* (T40, T232, T276 – T282)
- 1 x *Livistona australis* (T155)
- 5 x *Casuarina cunninghamiana* (T164, T166, T252, T256 – T257)
- 1 x *Glochidion ferdinandi* (T236)
- 2 x *Melaleuca quinquenervia* (T239, T248)
- 2 x *Melaleuca styphelioides* (T179, T273)
- 1 x *Eucalyptus spp.* (T180), and
- Occasional native shrubs and groundcovers.

The proposed activity will result in the removal of 31 native trees characteristic the following BC Act Listed TEC;

- Swamp Sclerophyll Forest of the New South Wales North Coast, Sydney Basin and Southeast Corner Bioregions (endangered).

Additionally, the following three commonly planted exotic species also require removal from within the Subject Land to facilitate the proposal:

- 1 x *Pistacia chinensis* (T38)
- 1 x *Phoenix canariensis* (T226), and
- 1 x *Olea europaea subsp. Cuspidata* (T181).

Each of these trees belong to a now highly modified landscape. The result of a Test of Significance (5-Part Test) under the BC Act was that the proposed activity will not result in a 'significant impact' on any threatened entities and therefore the Biodiversity Offset Scheme is not triggered (**Appendix C** & **Appendix D**).

Although all areas of native vegetation within the Subject Land may be considered minor, potential habitat for threatened fauna; based on the minor nature of the impacts, no threatened fauna species were considered likely to be significantly impacted by the proposed activity. No threatened flora were identified within the Subject Land. A likelihood of occurrence table for threatened flora and fauna species within the Subject Land is presented in **Appendix B**.

Based on a lack of suitable habitat constraints, or the minor nature of the impact (i.e. select tree removal) no significant impact is likely and no further assessment was required. As such, an SIS or a BDAR is not required. The proposed activity will not result in a 'significant impact' on any MNES and a referral to the Australian Government Minister for the Environment is not required.

9. REFERENCES

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Transport for NSW (2024), Biodiversity Management Guidelines: Protecting and managing biodiversity on Transport for NSW Projects

10. APPENDICES

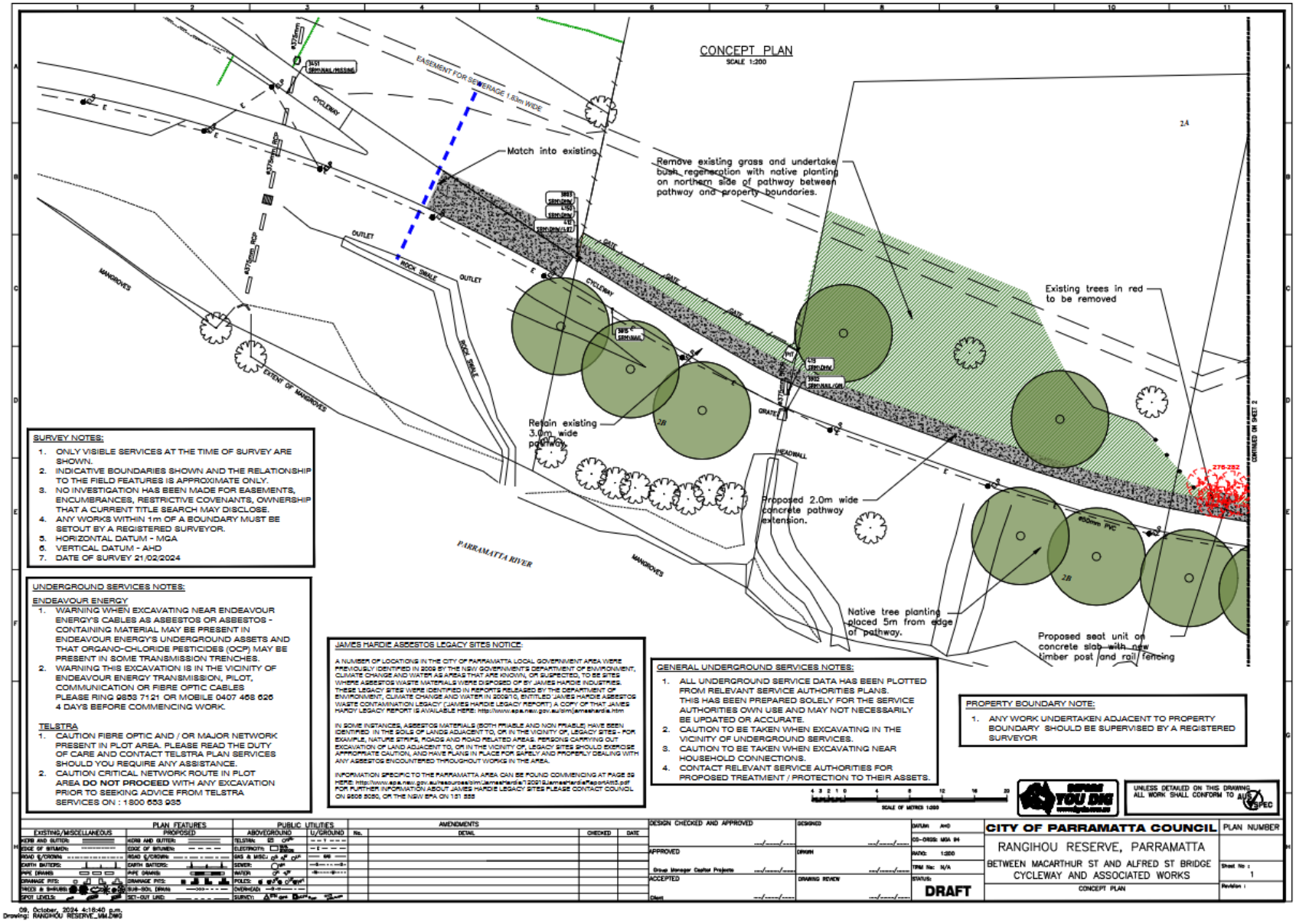
Appendix A. Concept Design Plans (City of Parramatta Council, 2024).

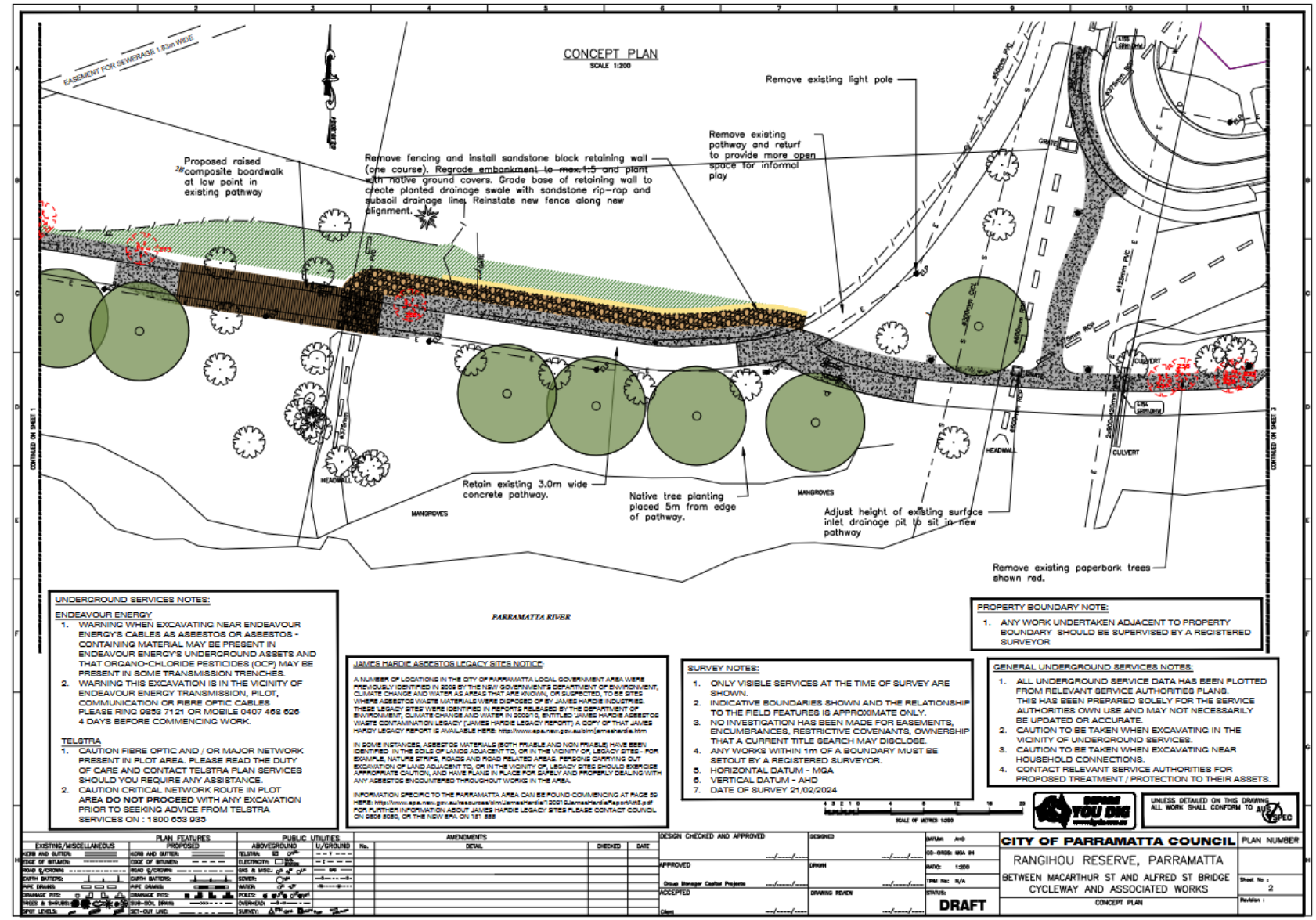
Appendix B. Assessment of likely occurrence of threatened species within the Subject Land.

Appendix C. 5-Part Tests (Tests of Significance) (BC Act).

Appendix D. Assessment of Significant Impact Criteria under the EPBC Act.

Appendix A. Concept Design Plans (City of Parramatta Council, 2024).

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EASEMENT FOR SEWERAGE 1.83m WIDE
Proposed raised composite boardwalk at low point in existing pathway
Remove fencing and install sandstone block retaining wall (one course). Regrade embankment to max.1:5 and plant with native ground covers. Grade base of retaining wall to create planted drainage swale with sandstone rip-rap and subsoil drainage line. Reinstate new fence along new alignment.
Remove existing light pole
Remove existing pathway and returf to provide more open space for informal play
Retain existing 3.0m wide concrete pathway.
Native tree planting placed 5m from edge of pathway.
Adjust height of existing surface inlet drainage pit to sit in new pathway
Remove existing paperbark trees shown red.
HEADWALL
MANGROVES
CULVERT
CONTINUED ON SHEET 1
CONTINUED ON SHEET 3
PARRAMATTA RIVER
UNDERGROUND SERVICES NOTES:
ENDEAVOUR ENERGY
1. WARNING WHEN EXCAVATING NEAR ENDEAVOUR ENERGY'S CABLES AS ASBESTOS OR ASBESTOS - CONTAINING MATERIAL MAY BE PRESENT IN ENDEAVOUR ENERGY'S UNDERGROUND ASSETS AND THAT ORGANO-CHLORIDE PESTICIDES (OCP) MAY BE PRESENT IN SOME TRANSMISSION TRENCHES.
2. WARNING THIS EXCAVATION IS IN THE VICINITY OF ENDEAVOUR ENERGY TRANSMISSION, PILOT, COMMUNICATION OR FIBRE OPTIC CABLES PLEASE RING 9853 7121 OR MOBILE 0407 468 626 4 DAYS BEFORE COMMENCING WORK.
TELSTRA
1. CAUTION FIBRE OPTIC AND / OR MAJOR NETWORK PRESENT IN PLOT AREA. PLEASE READ THE DUTY OF CARE AND CONTACT TELSTRA PLAN SERVICES SHOULD YOU REQUIRE ANY ASSISTANCE.
2. CAUTION CRITICAL NETWORK ROUTE IN PLOT AREA DO NOT PROCEED WITH ANY EXCAVATION PRIOR TO SEEKING ADVICE FROM TELSTRA SERVICES ON : 1800 653 935
JAMES HARDIE ASBESTOS LEGACY SITES NOTICE:
A NUMBER OF LOCATIONS IN THE CITY OF PARRAMATTA LOCAL GOVERNMENT AREA WERE PREVIOUSLY IDENTIFIED IN 2009 BY THE NSW GOVERNMENT'S DEPARTMENT OF ENVIRONMENT, CLIMATE CHANGE AND WATER AS AREAS THAT ARE KNOWN, OR SUSPECTED, TO BE SITES WHERE ASBESTOS WASTE MATERIALS WERE DISPOSED OF BY JAMES HARDIE INDUSTRIES. THESE LEGACY SITES WERE IDENTIFIED IN REPORTS RELEASED BY THE DEPARTMENT OF ENVIRONMENT, CLIMATE CHANGE AND WATER IN 2009/10, ENTITLED JAMES HARDIE ASBESTOS WASTE CONTAMINATION LEGACY ('JAMES HARDIE LEGACY REPORT') A COPY OF THAT JAMES HARDY LEGACY REPORT IS AVAILABLE HERE: http://www.epa.nsw.gov.au/prh/jameshardie.htm
IN SOME INSTANCES, ASBESTOS MATERIALS (BOTH FRIABLE AND NON FRIABLE) HAVE BEEN IDENTIFIED IN THE SOILS OF LANDS ADJACENT TO, OR IN THE VICINITY OF, LEGACY SITES - FOR EXAMPLE, NATURE STRIPS, ROADS AND ROAD RELATED AREAS. PERSONS CARRYING OUT EXCAVATION OF LAND ADJACENT TO, OR IN THE VICINITY OF, LEGACY SITES SHOULD EXERCISE APPROPRIATE CAUTION, AND HAVE PLANS IN PLACE FOR SAFELY AND PROPERLY DEALING WITH ANY ASBESTOS ENCOUNTERED THROUGHOUT WORKS IN THE AREA.
INFORMATION SPECIFIC TO THE PARRAMATTA AREA CAN BE FOUND COMMENCING AT PAGE 59 HERE: http://www.epa.nsw.gov.au/resources/prh/JamesHardie120213JamesHardieReport3.pdf FOR FURTHER INFORMATION ABOUT JAMES HARDIE LEGACY SITES PLEASE CONTACT COUNCIL ON 9806 5050, OR THE NSW EPA ON 131 555
PROPERTY BOUNDARY NOTE:
1. ANY WORK UNDERTAKEN ADJACENT TO PROPERTY BOUNDARY SHOULD BE SUPERVISED BY A REGISTERED SURVEYOR
SURVEY NOTES:
1. ONLY VISIBLE SERVICES AT THE TIME OF SURVEY ARE SHOWN.
2. INDICATIVE BOUNDARIES SHOWN AND THE RELATIONSHIP TO THE FIELD FEATURES IS APPROXIMATE ONLY.
3. NO INVESTIGATION HAS BEEN MADE FOR EASEMENTS, ENCUMBRANCES, RESTRICTIVE COVENANTS, OWNERSHIP THAT A CURRENT TITLE SEARCH MAY DISCLOSE.
4. ANY WORKS WITHIN 1m OF A BOUNDARY MUST BE SETOUT BY A REGISTERED SURVEYOR.
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6. VERTICAL DATUM - AHD
7. DATE OF SURVEY 21/02/2024
SCALE OF METRES 1:200
GENERAL UNDERGROUND SERVICES NOTES:
1. ALL UNDERGROUND SERVICE DATA HAS BEEN PLOTTED FROM RELEVANT SERVICE AUTHORITIES PLANS. THIS HAS BEEN PREPARED SOLELY FOR THE SERVICE AUTHORITIES OWN USE AND MAY NOT NECESSARILY BE UPDATED OR ACCURATE.
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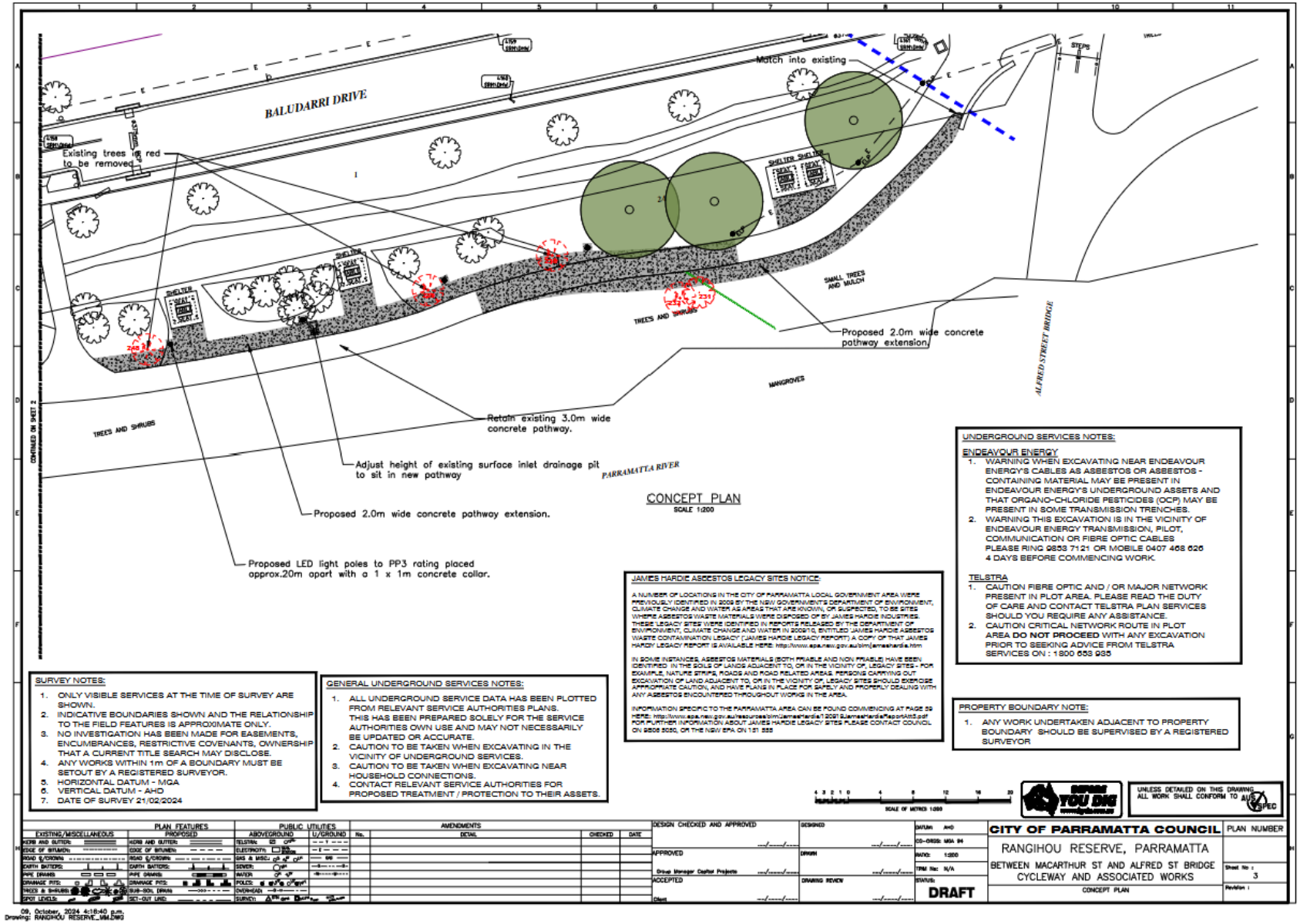
BALUDARRI DRIVE
Match into existing
Existing trees in red to be removed
Proposed 2.0m wide concrete pathway extension.
Retain existing 3.0m wide concrete pathway.
Adjust height of existing surface inlet drainage pit to sit in new pathway
Proposed 2.0m wide concrete pathway extension.
Proposed LED light poles to PP3 rating placed approx.20m apart with a 1 x 1m concrete collar.
PARRAMATTA RIVER
ALFRED STREET BRIDGE
MANGROVES
TREES AND SHRUBS
SMALL TREES AND MULCH
SHELTER
STEPS
CONTINUED ON SHEET 2
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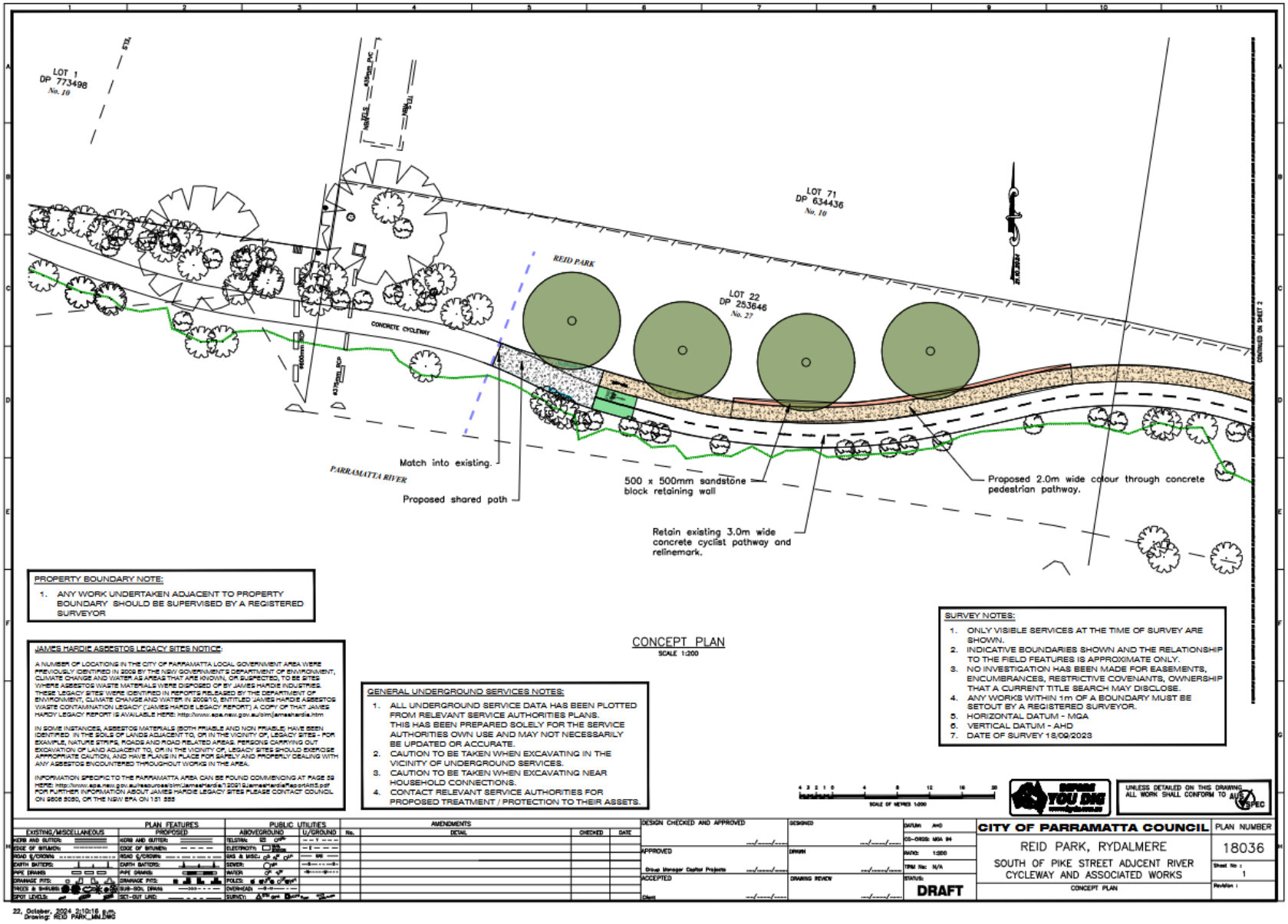
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No. 27
REID PARK
CONCRETE CYCLEWAY
PARRAMATTA RIVER
Match into existing.
Proposed shared path
500 x 500mm sandstone block retaining wall
Retain existing 3.0m wide concrete cyclist pathway and relinemark.
Proposed 2.0m wide colour through concrete pedestrian pathway.
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SCALE 1:200
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5. HORIZONTAL DATUM - MGA
6. VERTICAL DATUM - AHD
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18036
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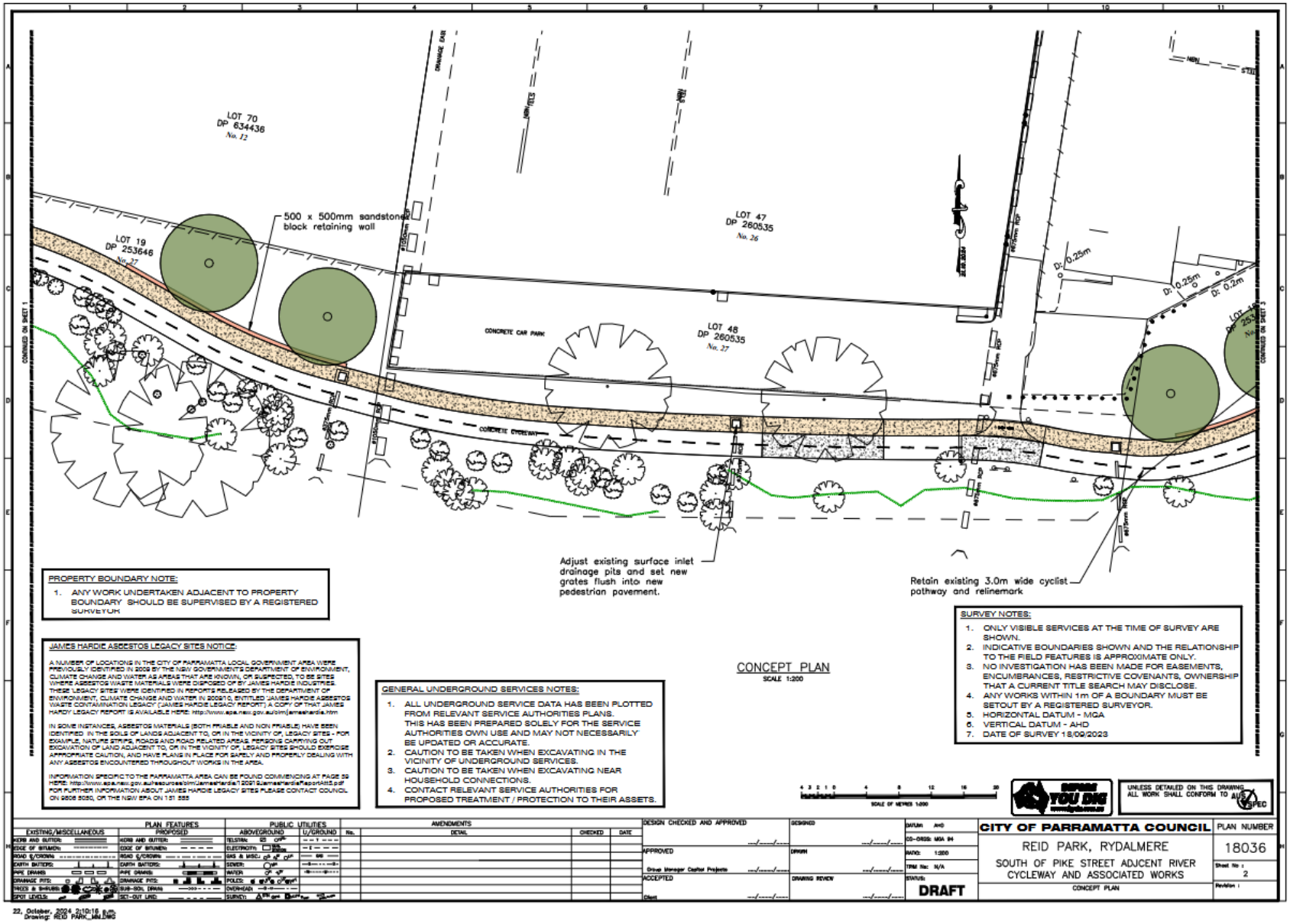

22, October, 2024, 2:10:18 p.m.
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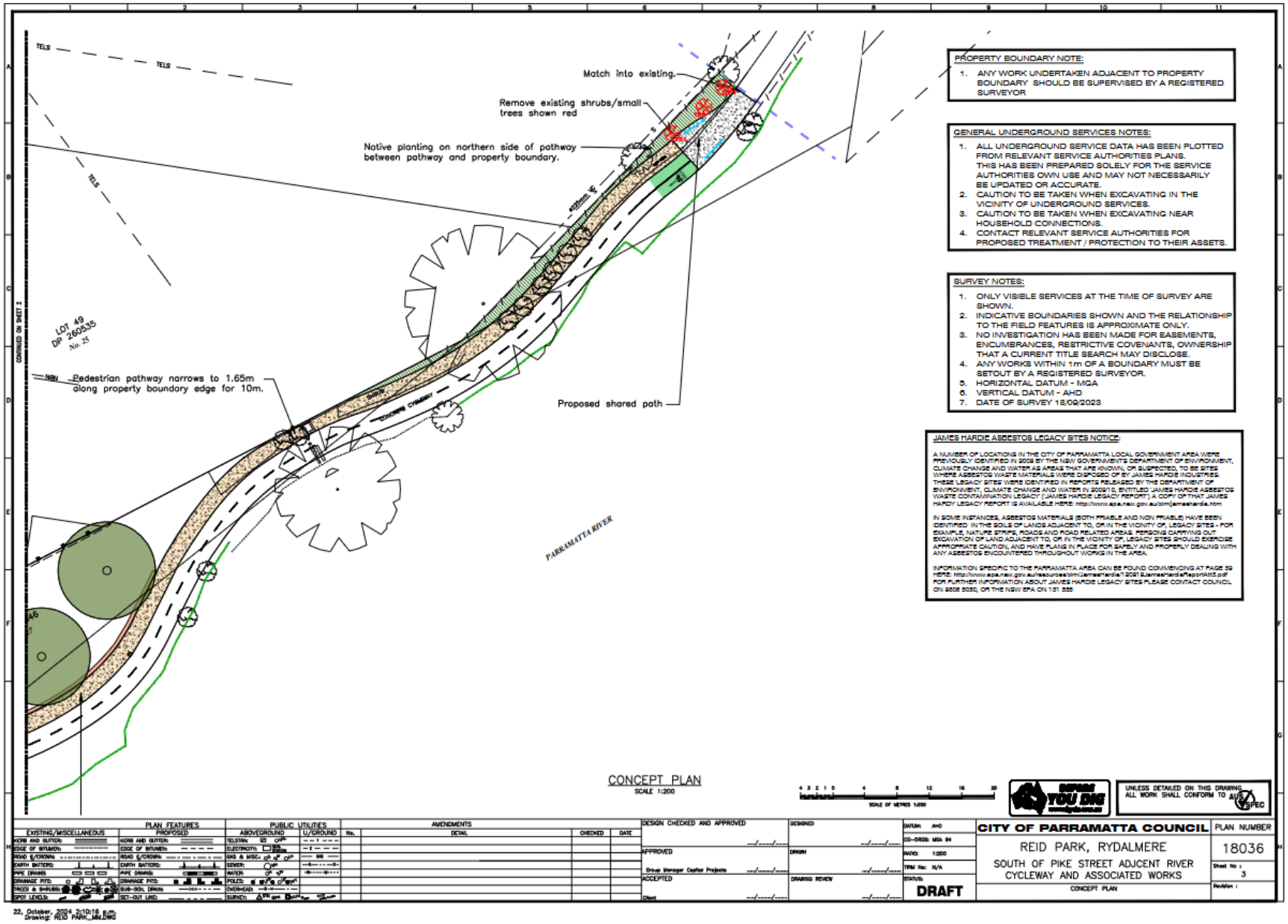
Match into existing.
Remove existing shrubs/small trees shown red
Native planting on northern side of pathway between pathway and property boundary.
Pedestrian pathway narrows to 1.65m along property boundary edge for 10m.
Proposed shared path
PARRAMATTA RIVER
LOT 49 DP 260535 No. 25
TELS
CONTINUED ON SHEET 2
PROPERTY BOUNDARY NOTE:
1. ANY WORK UNDERTAKEN ADJACENT TO PROPERTY BOUNDARY SHOULD BE SUPERVISED BY A REGISTERED SURVEYOR
GENERAL UNDERGROUND SERVICES NOTES:
1. ALL UNDERGROUND SERVICE DATA HAS BEEN PLOTTED FROM RELEVANT SERVICE AUTHORITIES PLANS. THIS HAS BEEN PREPARED SOLELY FOR THE SERVICE AUTHORITIES OWN USE AND MAY NOT NECESSARILY BE UPDATED OR ACCURATE.
2. CAUTION TO BE TAKEN WHEN EXCAVATING IN THE VICINITY OF UNDERGROUND SERVICES.
3. CAUTION TO BE TAKEN WHEN EXCAVATING NEAR HOUSEHOLD CONNECTIONS.
4. CONTACT RELEVANT SERVICE AUTHORITIES FOR PROPOSED TREATMENT / PROTECTION TO THEIR ASSETS.
SURVEY NOTES:
1. ONLY VISIBLE SERVICES AT THE TIME OF SURVEY ARE SHOWN.
2. INDICATIVE BOUNDARIES SHOWN AND THE RELATIONSHIP TO THE FIELD FEATURES IS APPROXIMATE ONLY.
3. NO INVESTIGATION HAS BEEN MADE FOR EASEMENTS, ENCUMBRANCES, RESTRICTIVE COVENANTS, OWNERSHIP THAT A CURRENT TITLE SEARCH MAY DISCLOSE.
4. ANY WORKS WITHIN 1m OF A BOUNDARY MUST BE SETOUT BY A REGISTERED SURVEYOR.
5. HORIZONTAL DATUM - MGA
6. VERTICAL DATUM - AHD
7. DATE OF SURVEY 18/09/2023
JAMES HARDIE ASBESTOS LEGACY SITES NOTICE:
A NUMBER OF LOCATIONS IN THE CITY OF PARRAMATTA LOCAL GOVERNMENT AREA WERE PREVIOUSLY IDENTIFIED IN 2009 BY THE NSW GOVERNMENT'S DEPARTMENT OF ENVIRONMENT, CLIMATE CHANGE AND WATER AS AREAS THAT ARE KNOWN, OR SUSPECTED, TO BE SITES WHERE ASBESTOS WASTE MATERIALS WERE DISPOSED OF BY JAMES HARDIE INDUSTRIES. THESE LEGACY SITES WERE IDENTIFIED IN REPORTS RELEASED BY THE DEPARTMENT OF ENVIRONMENT, CLIMATE CHANGE AND WATER IN 2009/10, ENTITLED 'JAMES HARDIE ASBESTOS WASTE CONTAMINATION LEGACY ('JAMES HARDIE LEGACY REPORT'). A COPY OF THAT JAMES HARDY LEGACY REPORT IS AVAILABLE HERE: http://www.epa.nsw.gov.au/clm/jameshardie.htm
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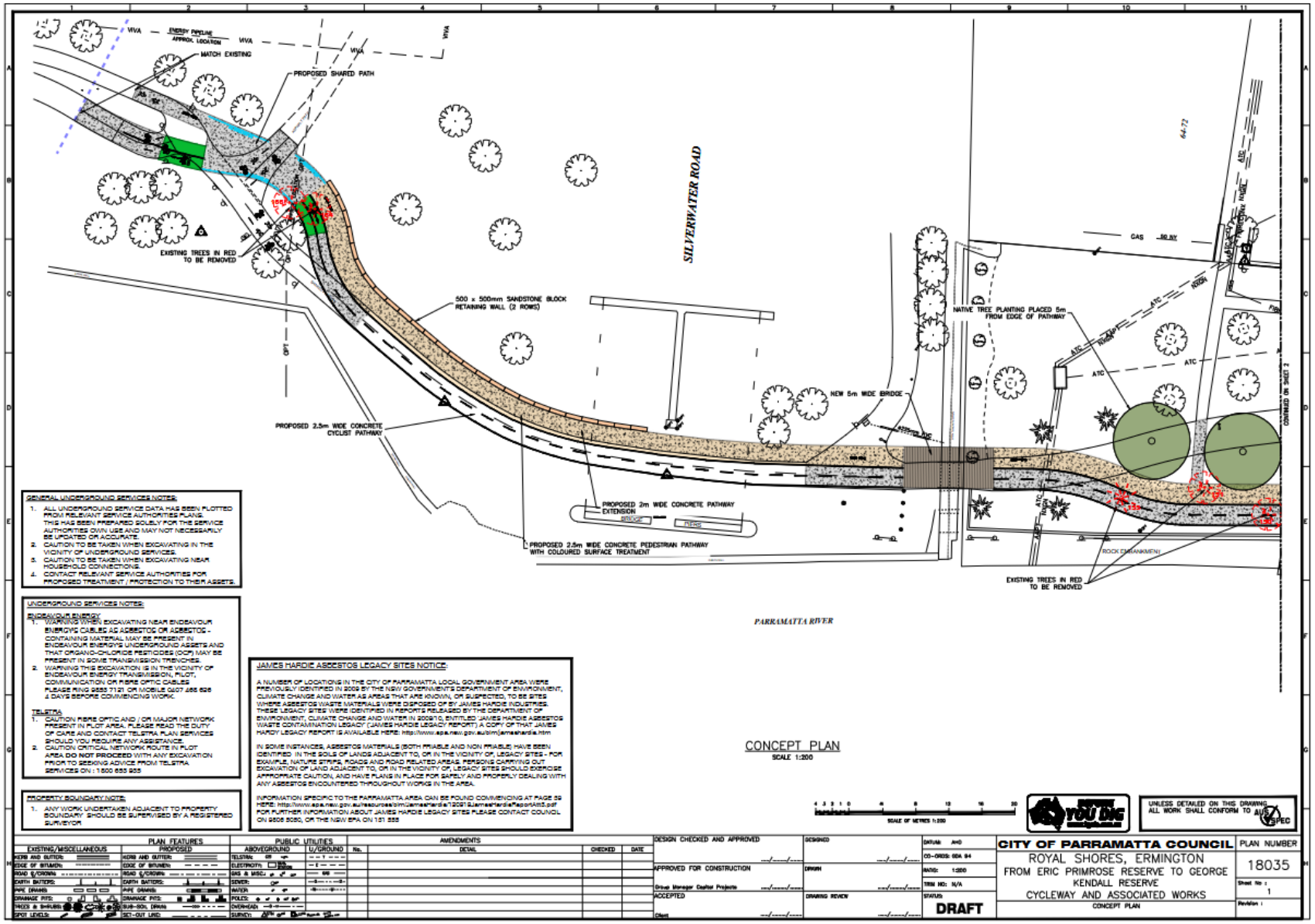
INFORMATION SPECIFIC TO THE PARRAMATTA AREA CAN BE FOUND COMMENCING AT PAGE 39 HERE: http://www.epa.nsw.gov.au/resources/clm/JamesHardie120912JamesHardieReportAttS.pdf
FOR FURTHER INFORMATION ABOUT JAMES HARDIE LEGACY SITES PLEASE CONTACT COUNCIL ON 9806 5050, OR THE NSW EPA ON 131 555
CONCEPT PLAN
SCALE 1:200
SCALE OF METRES 1:200
DIAL BEFORE YOU DIG
UNLESS DETAILED ON THIS DRAWING ALL WORK SHALL CONFORM TO AUS-SPEC
PLAN FEATURES
EXISTING/MISCELLANEOUS
PROPOSED
KERB AND GUTTER:
EDGE OF BITUMEN:
ROAD ℄/CROWN:
EARTH BATTERS:
PIPE DRAINS:
DRAINAGE PITS:
TREES & SHRUBS:
SPOT LEVELS:
SUB-SOIL DRAIN:
SET-OUT LINE:
PUBLIC UTILITIES
ABOVEGROUND
U/GROUND
TELSTRA:
ELECTRICITY:
GAS & MISC.:
SEWER:
WATER:
POLES:
OVERHEADS:
SURVEY:
AMENDMENTS
No.
DETAIL
CHECKED
DATE
DESIGN CHECKED AND APPROVED
APPROVED
Group Manager Capital Projects
ACCEPTED
Client
DESIGNED
DRAWN
DRAWING REVIEW
DATUM: AHD
CO-ORDS: MGA 94
RATIO: 1:200
TRM No: N/A
STATUS:
DRAFT
CITY OF PARRAMATTA COUNCIL
REID PARK, RYDALMERE
SOUTH OF PIKE STREET ADJCENT RIVER CYCLEWAY AND ASSOCIATED WORKS
CONCEPT PLAN
PLAN NUMBER
18036
Sheet No : 3
Revision :
22, October, 2024 2:10:16 p.m.
Drawing: REID PARK_MN.DWG


PROPOSED SHARED PATH
MATCH EXISTING
EXISTING TREES IN RED TO BE REMOVED
SILVERWATER ROAD
500 x 500mm SANDSTONE BLOCK RETAINING WALL (2 ROWS)
NATIVE TREE PLANTING PLACED 5m FROM EDGE OF PATHWAY
NEW 5m WIDE BRIDGE
PROPOSED 2.5m WIDE CONCRETE CYCLIST PATHWAY
PROPOSED 2m WIDE CONCRETE PATHWAY EXTENSION
PROPOSED 2.5m WIDE CONCRETE PEDESTRIAN PATHWAY WITH COLOURED SURFACE TREATMENT
ROCK EMBANKMENT
EXISTING TREES IN RED TO BE REMOVED
PARRAMATTA RIVER
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UNDERGROUND SERVICES NOTES:
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2. WARNING THIS EXCAVATION IS IN THE VICINITY OF ENDEAVOUR ENERGY TRANSMISSION, PILOT, COMMUNICATION OR FIBRE OPTIC CABLES PLEASE RING 9853 7131 OR MOBILE 0407 466 626 5 DAYS BEFORE COMMENCING WORK.
TELSTRA
1. CAUTION FIBRE OPTIC AND / OR MAJOR NETWORK PRESENT IN PLOT AREA. PLEASE READ THE DUTY OF CARE AND CONTACT TELSTRA PLAN SERVICES SHOULD YOU REQUIRE ANY ASSISTANCE.
2. CAUTION CRITICAL NETWORK ROUTE IN PLOT AREA DO NOT PROCEED WITH ANY EXCAVATION PRIOR TO SEEKING ADVICE FROM TELSTRA SERVICES ON : 1800 653 935
PROPERTY BOUNDARY NOTE:
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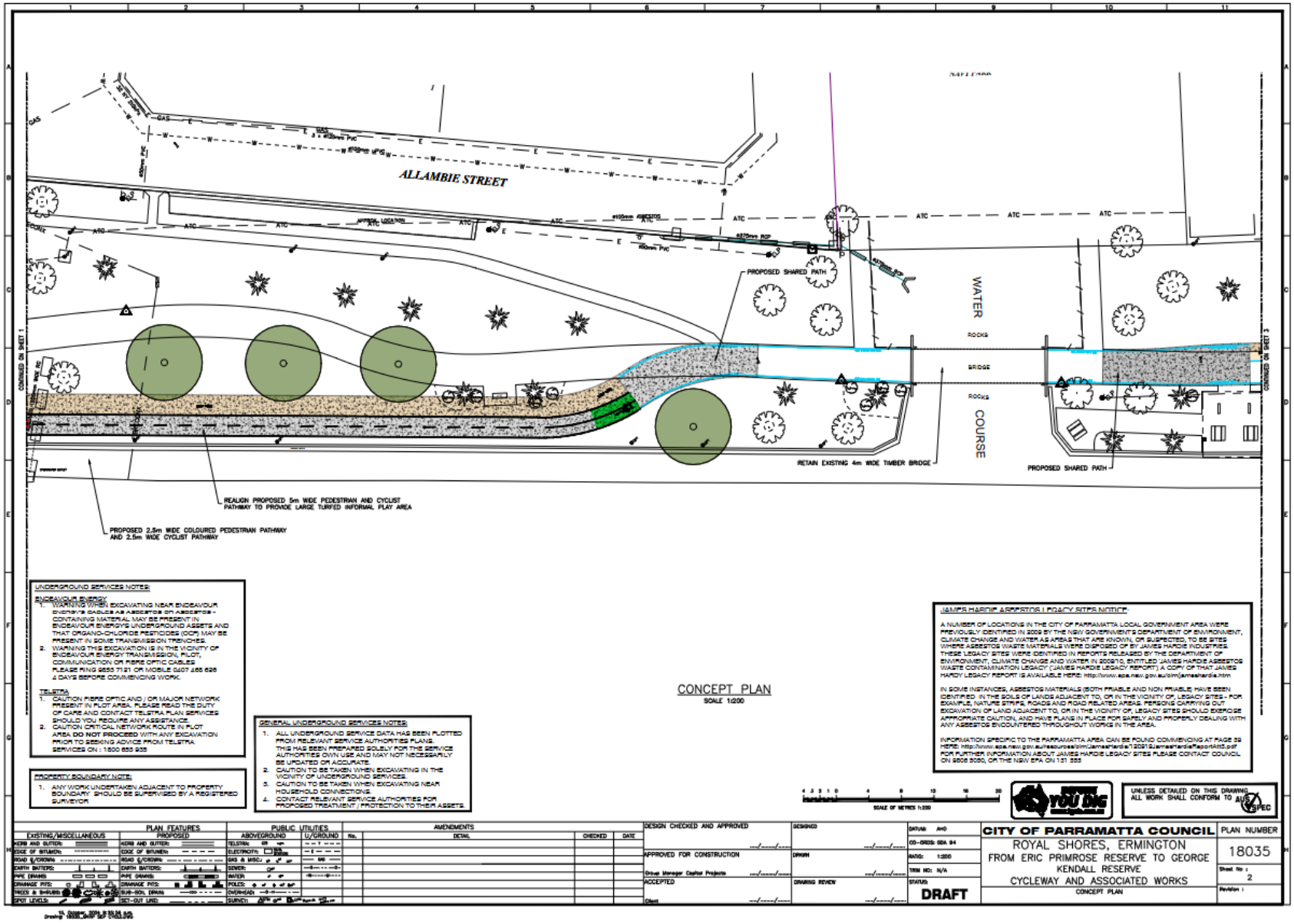
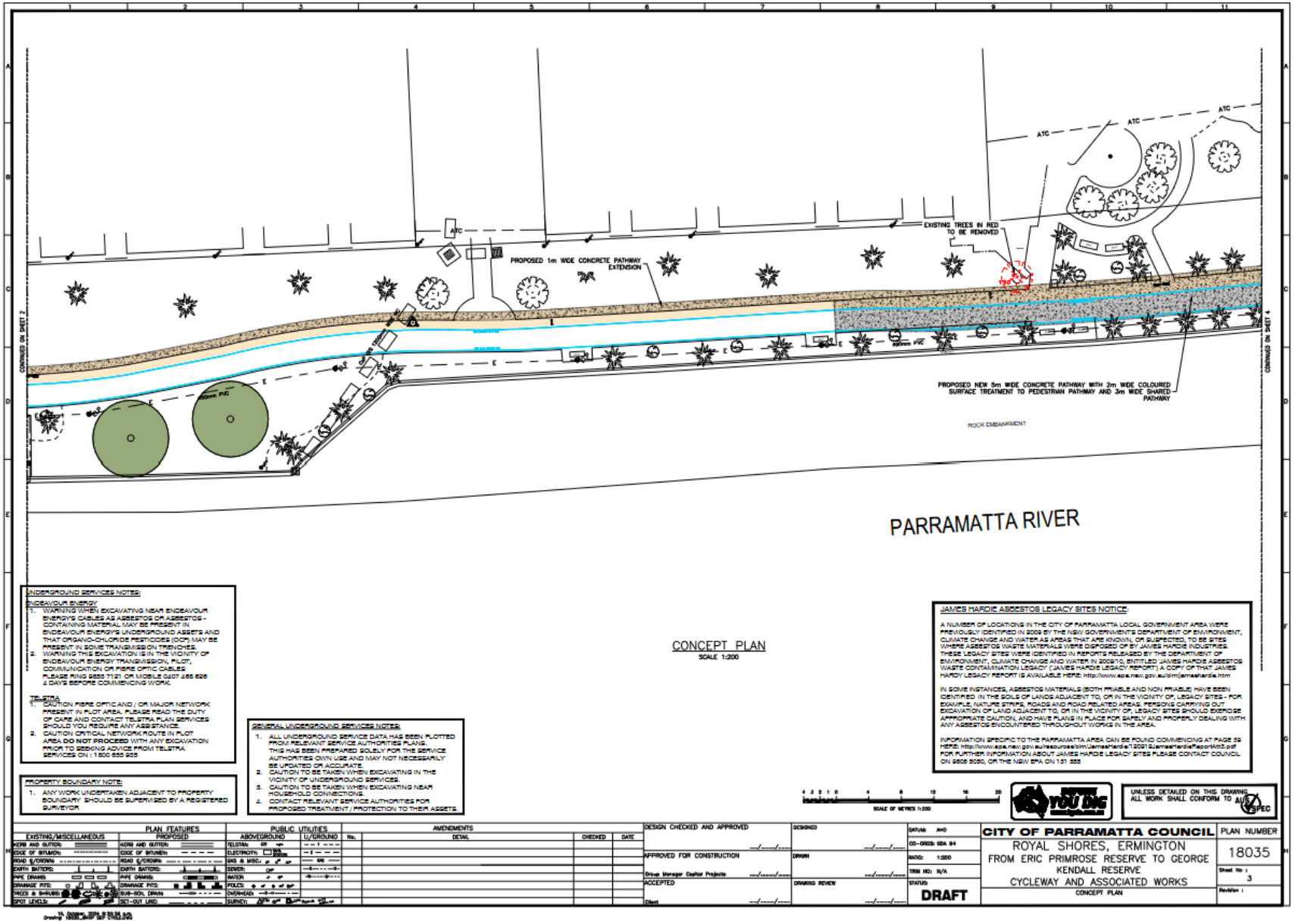
INFORMATION SPECIFIC TO THE PARRAMATTA AREA CAN BE FOUND COMMENCING AT PAGE 59 HERE: http://www.epa.nsw.gov.au/resources/prc/JamesHardie120971JamesHardieReportAttS.pdf FOR FURTHER INFORMATION ABOUT JAMES HARDIE LEGACY SITES PLEASE CONTACT COUNCIL ON 9806 5050, OR THE NSW EPA ON 131 555
CONCEPT PLAN
SCALE 1:200
PLAN FEATURES
PUBLIC UTILITIES
AMENDMENTS
DESIGN CHECKED AND APPROVED
APPROVED FOR CONSTRUCTION
ACCEPTED
DESIGNED
DRAWN
DRAWING REVIEW
DATUM: AHD
CO-ORDS: GDA 94
RATIO: 1:200
TRIM NO: N/A
STATUS: DRAFT
CITY OF PARRAMATTA COUNCIL
ROYAL SHORES, ERMINGTON
FROM ERIC PRIMROSE RESERVE TO GEORGE KENDALL RESERVE
CYCLEWAY AND ASSOCIATED WORKS
CONCEPT PLAN
PLAN NUMBER
18035
UNLESS DETAILED ON THIS DRAWING ALL WORK SHALL CONFORM TO AUSPEC


ALLAMBIE STREET
PROPOSED SHARED PATH
WATER
ROCKS
BRIDGE
ROCKS
COURSE
RETAIN EXISTING 4m WIDE TIMBER BRIDGE
PROPOSED SHARED PATH
REALIGN PROPOSED 5m WIDE PEDESTRIAN AND CYCLIST PATHWAY TO PROVIDE LARGE TURFED INFORMAL PLAY AREA
PROPOSED 2.5m WIDE COLOURED PEDESTRIAN PATHWAY AND 2.5m WIDE CYCLIST PATHWAY
CONCEPT PLAN
SCALE 1:200
CITY OF PARRAMATTA COUNCIL
ROYAL SHORES, ERMINGTON
FROM ERIC PRIMROSE RESERVE TO GEORGE KENDALL RESERVE
CYCLEWAY AND ASSOCIATED WORKS
CONCEPT PLAN
PLAN NUMBER
18035
DRAFT


ATC
PROPOSED 1m WIDE CONCRETE PATHWAY EXTENSION
EXISTING TREES IN RED TO BE REMOVED
PROPOSED NEW 3m WIDE CONCRETE PATHWAY WITH 2m WIDE COLOURED SURFACE TREATMENT TO PEDESTRIAN PATHWAY AND 3m WIDE SHARED PATHWAY
ROCK EMBANKMENT
PARRAMATTA RIVER
CONTINUED ON SHEET 3
CONTINUED ON SHEET 4
CONCEPT PLAN
SCALE 1:200
UNDERGROUND SERVICES NOTES:
ENDEAVOUR ENERGY
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2. WARNING THIS EXCAVATION IS IN THE VICINITY OF ENDEAVOUR ENERGY TRANSMISSION, PILOT, COMMUNICATION OR FIBRE OPTIC CABLES PLEASE RING 9853 7121 OR MOBILE 0407 865 626 4 DAYS BEFORE COMMENCING WORK.
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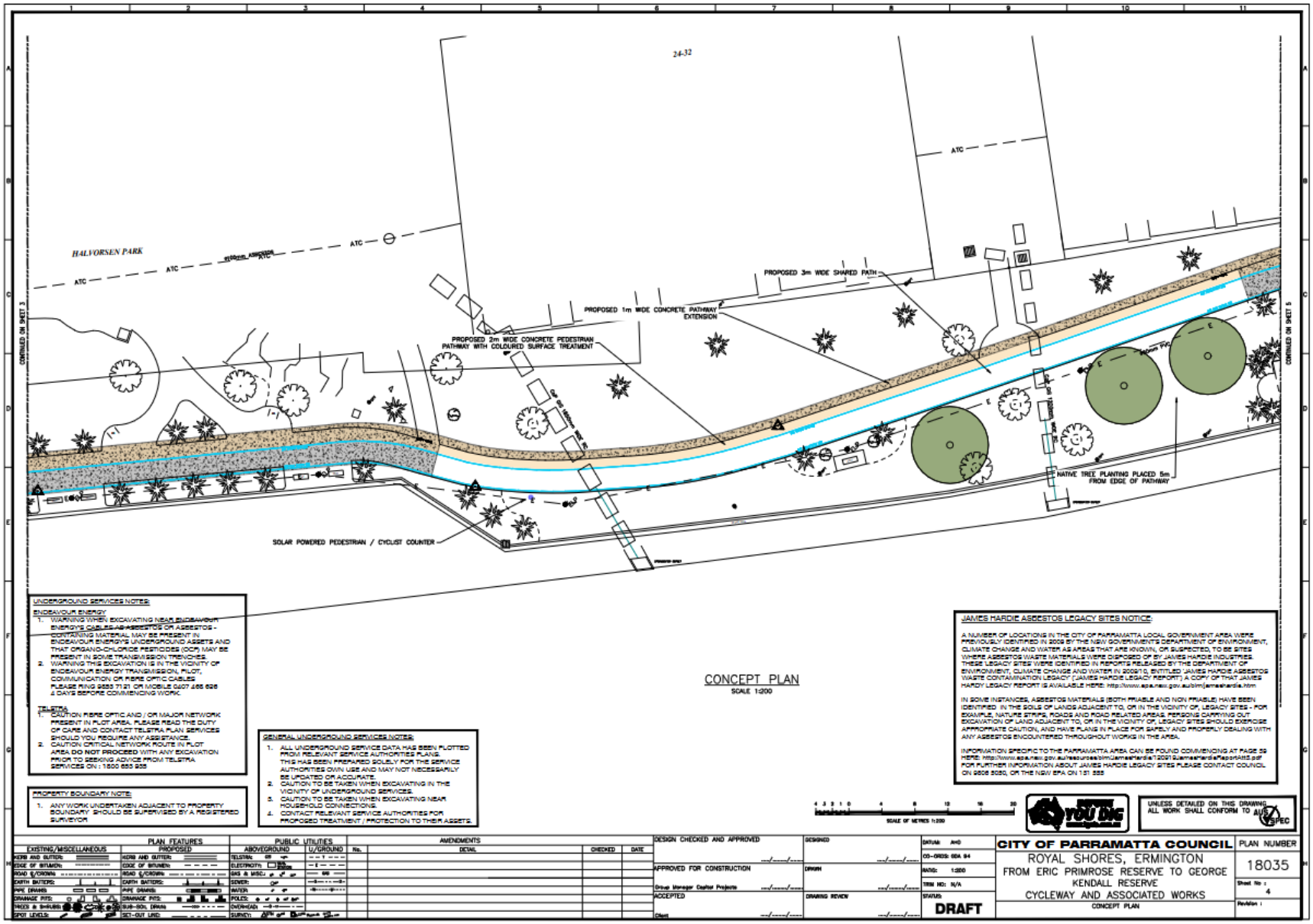
SCALE OF METRES 1:200
BEFORE YOU DIG
UNLESS DETAILED ON THIS DRAWING ALL WORK SHALL CONFORM TO AUSPEC
PLAN FEATURES
EXISTING/MISCELLANEOUS
PROPOSED
KERB AND GUTTER:
EDGE OF BITUMEN:
ROAD C/ROWNS
EARTH BATTERS:
PIPE DRAINS:
DRAINAGE PITS:
TREES & SHRUBS
SPOT LEVELS:
PUBLIC UTILITIES
ABOVEGROUND
U/GROUND
TELSTRA:
ELECTRICITY:
GAS & MISC:
SEWER:
WATER:
POLICE:
OVERHEAD:
SURVEY:
AMENDMENTS
No.
DETAIL
CHECKED
DATE
DESIGN CHECKED AND APPROVED
APPROVED FOR CONSTRUCTION
Group Manager Capital Projects
ACCEPTED
Client
DESIGNED
DRAWN
DRAWING REVIEW
DATUM: AHD
CO-ORDS: GDA 94
SCALE: 1:200
TRIM NO: N/A
STATUS
DRAFT
CITY OF PARRAMATTA COUNCIL
ROYAL SHORES, ERMINGTON
FROM ERIC PRIMROSE RESERVE TO GEORGE KENDALL RESERVE
CYCLEWAY AND ASSOCIATED WORKS
CONCEPT PLAN
PLAN NUMBER
18035
Sheet No : 3
Revision :


HALVORSEN PARK
ATC
PROPOSED 3m WIDE SHARED PATH
PROPOSED 1m WIDE CONCRETE PATHWAY EXTENSION
PROPOSED 2m WIDE CONCRETE PEDESTRIAN PATHWAY WITH COLOURED SURFACE TREATMENT
NATIVE TREE PLANTING PLACED 5m FROM EDGE OF PATHWAY
SOLAR POWERED PEDESTRIAN / CYCLIST COUNTER
CONCEPT PLAN
SCALE 1:200
UNDERGROUND SERVICES NOTES:
PROPERTY BOUNDARY NOTE:
GENERAL UNDERGROUND SERVICES NOTES:
JAMES HARDIE ASBESTOS LEGACY SITES NOTICE:
CITY OF PARRAMATTA COUNCIL
ROYAL SHORES, ERMINGTON
FROM ERIC PRIMROSE RESERVE TO GEORGE KENDALL RESERVE
CYCLEWAY AND ASSOCIATED WORKS
CONCEPT PLAN
PLAN NUMBER
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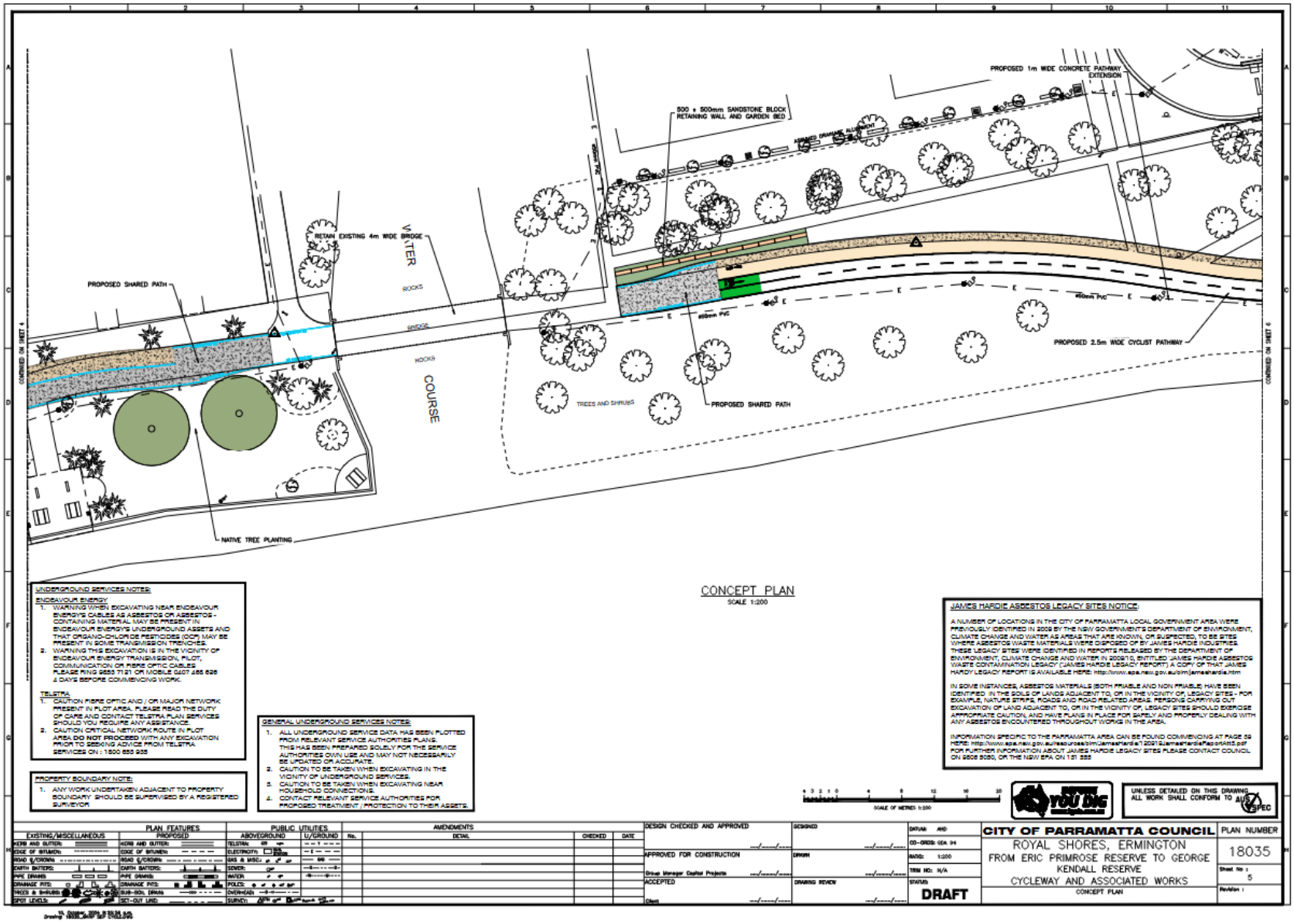
DRAFT


PROPOSED 1m WIDE CONCRETE PATHWAY EXTENSION
500 x 500mm SANDSTONE BLOCK RETAINING WALL AND GARDEN BED
RETAIN EXISTING 4m WIDE BRIDGE
PROPOSED SHARED PATH
WATER
ROCKS
BRIDGE
COURSE
TREES AND SHRUBS
PROPOSED 2.5m WIDE CYCLIST PATHWAY
NATIVE TREE PLANTING
CONCEPT PLAN
SCALE 1:200
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ABOVEGROUND
U/GROUND
AMENDMENTS
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DETAIL
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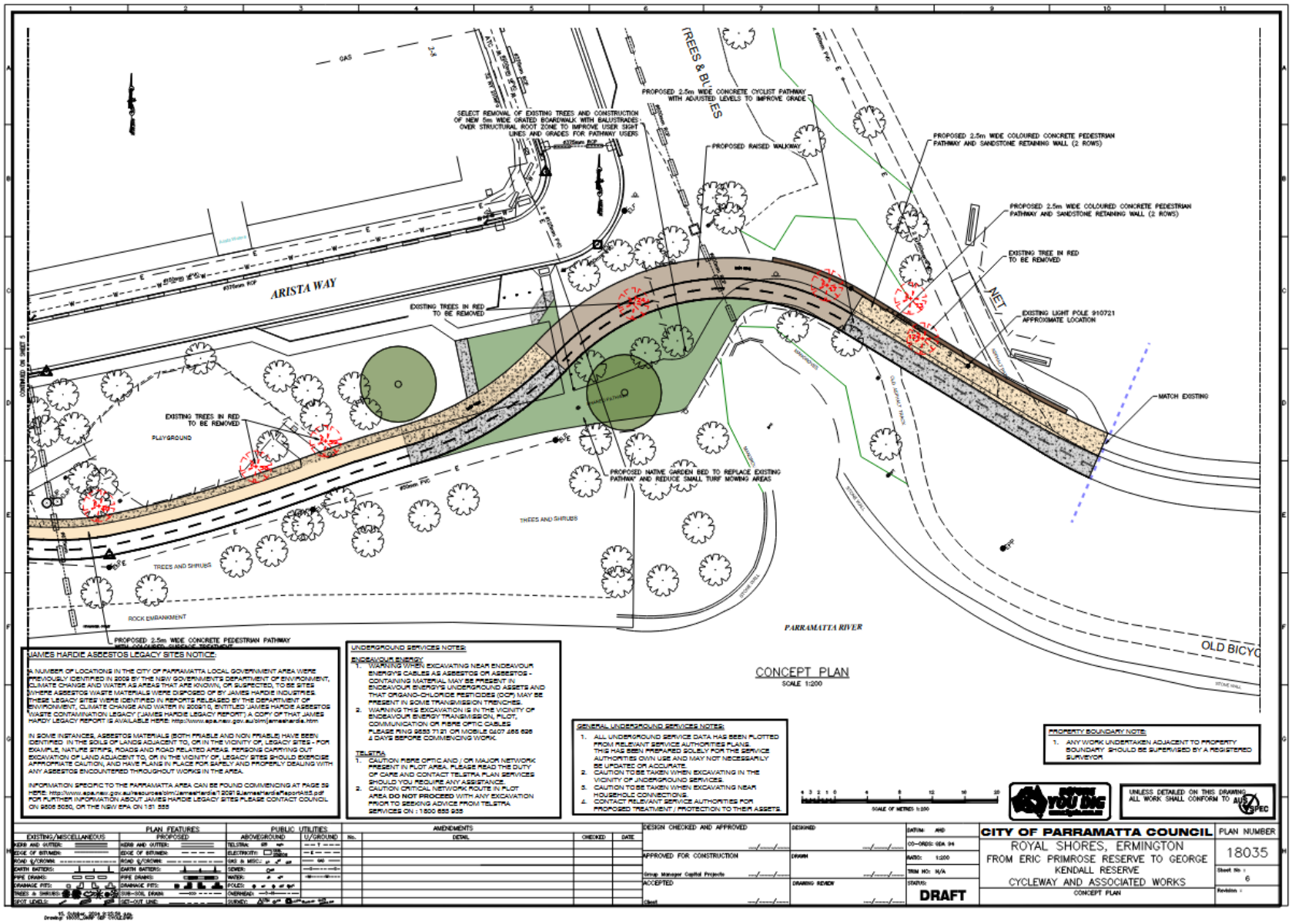
DESIGN CHECKED AND APPROVED
APPROVED FOR CONSTRUCTION
Group Manager Capital Projects
ACCEPTED
Client
DESIGNED
DRAWN
DRAWING REVIEW
DATUM: AHD
CO-ORDS: GDA 94
SCALE: 1:200
TRIM NO: N/A
STATUS
DRAFT
CITY OF PARRAMATTA COUNCIL
ROYAL SHORES, ERMINGTON
FROM ERIC PRIMROSE RESERVE TO GEORGE KENDALL RESERVE
CYCLEWAY AND ASSOCIATED WORKS
CONCEPT PLAN
PLAN NUMBER
18035
Sheet No : 5
Revision :


ARISTA WAY
PROPOSED 2.5m WIDE CONCRETE CYCLIST PATHWAY WITH ADJUSTED LEVELS TO IMPROVE GRADE
SELECT REMOVAL OF EXISTING TREES AND CONSTRUCTION OF NEW 5m WIDE GRATED BOARDWALK WITH BALUSTRADES OVER STRUCTURAL ROOT ZONE TO IMPROVE USER SIGHT LINES AND GRADES FOR PATHWAY USERS
PROPOSED RAISED WALKWAY
PROPOSED 2.5m WIDE COLOURED CONCRETE PEDESTRIAN PATHWAY AND SANDSTONE RETAINING WALL (2 ROWS)
EXISTING TREE IN RED TO BE REMOVED
EXISTING LIGHT POLE 910721 APPROXIMATE LOCATION
MATCH EXISTING
EXISTING TREES IN RED TO BE REMOVED
PLAYGROUND
PROPOSED NATIVE GARDEN BED TO REPLACE EXISTING PATHWAY AND REDUCE SMALL TURF MOWING AREAS
TREES AND SHRUBS
ROCK EMBANKMENT
PARRAMATTA RIVER
CONCEPT PLAN
SCALE 1:200
JAMES HARDIE ASBESTOS LEGACY SITES NOTICE:
UNDERGROUND SERVICES NOTES:
GENERAL UNDERGROUND SERVICES NOTES:
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CITY OF PARRAMATTA COUNCIL
ROYAL SHORES, ERMINGTON
FROM ERIC PRIMROSE RESERVE TO GEORGE KENDALL RESERVE
CYCLEWAY AND ASSOCIATED WORKS
CONCEPT PLAN
PLAN NUMBER
18035
DRAFT

Appendix B. Assessment of likely occurrence of threatened species within the Subject Land.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
Acacia pubescens	V	V	Concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravely soils, often with ironstone. Grows in open woodland and forest, in a variety of plant communities, including Cooks River-Castlereagh Ironbark forest, Shale-Gravel Transition forest and Cumberland Plain woodland.	56	Low. A targeted survey was undertaken during the recognised survey period and this species was absent from the Subject Land. No further assessment is required.
Callistemon linearifolius	V	-	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Recorded in 2000 at Coalcliff in the northern Illawarra. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. Grows in dry sclerophyll forest on the coast and adjacent ranges.	6	Low. A targeted survey was undertaken during the recognised survey period and this species was absent from the Subject Land. No further assessment is required.
Dillwynia tenuifolia	V	-	The core distribution is the Cumberland Plain from Windsor to Penrith east to Deans Park. Other populations in western Sydney are	2	Low. A targeted survey during the site assessment did not identify this species. If present, this species would

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			recorded from Voyager Point and Kemps Creek in the Liverpool LGA, Luddenham in the Penrith LGA and South Maroota in the Baulkham Hills Shire. Disjunct localities include: the Bulga Mountains at Yengo in the north, Kurrajong Heights and Woodford in the Lower Blue Mountains. In western Sydney, may be locally abundant particularly within scrubby-dry heath areas within Castlereagh Ironbark forest and Shale Gravel Transition forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum woodland. At Yengo, is reported to occur in disturbed escarpment woodland on Narrabeen sandstone.		have been easily identified during the December 2024 survey (at least to genus level). No further assessment is required.
Epacris purpurascens var. purpurascens	V	-	Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. Found in a range of habitat types, most of which have a strong shale soil influence.	52	Low. A targeted survey during the site assessment did not identify this species. If present, this species would have been easily identified during the December 2024 survey (at least to genus level). No further assessment is required.
Grammitis stenophylla	E	-	Moist places, usually near streams, on rocks or in trees, in rainforest and moist eucalypt forest.	1	Unlikely. Appropriate habitat for this species was absent from within the Subject Land.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
					No further assessment is required.
Isotoma fluviatilis subsp. fluviatilis	-	X	Known from only two adjacent sites on a single private property at Erskine Park in the Penrith LGA. Previous sightings are all from western Sydney, at Homebush and at Agnes Banks. Grows in damp places, on the Cumberland Plain, including freshwater wetland, grassland/alluvial woodland and an alluvial woodland/shale plains woodland (Cumberland Plain Woodland) and related vegetation types/. May be an early successional species that benefits from some disturbance. Possibly out competed when overgrown by some species such as Cyndon dactylon.	2	Unlikely. This species is assumed extinct. A targeted survey during the site assessment did not identify this species. If present, this species would have been easily identified during the December 2024 survey (at least to genus level). No further assessment is required.
Macadamia integrifolia	-	V	Macadamia Nut occurs from Mt Bauple, near Gympie, to Currumbin Valley in the Gold Coast hinterland, south-east Queensland. The species was known to occur in north-east New South Wales; was described from 1850-60 specimens collected from Camden Haven, and there are specimens also from Lismore. This species grows in remnant rainforest, including complex mixed notophyll forest,	2	Low. A targeted survey was undertaken during the recognised survey period and this species was absent from the Subject Land. No further assessment is required.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			and prefers partially open areas such as rainforest edges.		
Persicaria elatior	V	V	This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	1	Low. A targeted survey was undertaken during the recognised survey period and this species was absent from the Subject Land. No further assessment is required.
Pimelea curviflora var. curviflora	V	V	Confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. Former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Occurs on shaley-lateritic soils over sandstone and shale-sandstone transition soils on ridgetops and upper slopes amongst woodlands.	9	Low. A targeted survey was undertaken during the recognised survey period and this species was absent from the Subject Land. No further assessment is required.
Pimelea spicata	E	E	Once widespread on the Cumberland Plain, the Spiked Rice-flower occurs in two disjunct areas; the Cumberland Plain (Narellan, Marayong, Prospect Reservoir areas) and the Illawarra (Landsdowne to Shellharbour to northern Kiama). In both the Cumberland Plain and Illawarra environments this species is found on well-structured clay soils. On the inland Cumberland Plain sites it is associated	2	Low. A targeted survey was undertaken during the recognised survey period and this species was absent from the Subject Land. No further assessment is required.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			with grey box and Ironbark. In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a better developed shrub and grass understorey.		
Pomaderris prunifolia (Endangered population)	E	-	Known from only three sites within the listed local government areas, at Rydalmere, within Rookwood Cemetery and at The Crest of Bankstown. At Rydalmere it occurs along a road reserve near a creek, among grass species on sandstone. At Rookwood Cemetery it occurs in a small gully of degraded Cooks River - Castlereagh Ironbark forest on shale soils.	8	Low. A targeted survey during the site assessment did not identify this species. If present, this species would have been easily identified during the December 2024 survey (at least to genus level). No further assessment is required.
Rhodamnia rubescens	CE	CE	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	4	Low. A targeted survey was undertaken during the recognised survey period and this species was absent from the Subject Land. No further assessment is required.
Syzygium paniculatum	E	V	Found only in NSW, in a narrow, linear coastal strip from Bulahdelah to Conjola State forest. On the south coast the species occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral rainforest. On the central coast it occurs on gravels, sands, silts	6	Low. A targeted survey during the site assessment did not identify this species. If present, this species would have been easily identified during the December 2024 survey (at least to genus level).

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			and clays in riverside gallery rainforests and remnant littoral rainforest communities		No further assessment is required.
Tetratheca glandulosa	V	-	Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gymea, Lambert and Faulconbridge. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches. Soils are generally shallow, consisting of a yellow, clayey-sandy loam. Stony lateritic fragments are also common in the soil profile on many of these ridgetops. Vegetation structure varies from heaths and scrub to woodlands-open woodlands, and open forest.	1	Low. A targeted survey during the site assessment did not identify this species. If present, this species would have been easily identified during the December 2024 survey (at least to genus level). No further assessment is required.
Triplarina imbricata	E	E	Found only in a few locations in the ranges south-west of Glenreagh and near Tabulam in north-east NSW. Along watercourses in low open forest with water gum.	4	Low. A targeted survey was undertaken during the recognised survey period and this species was absent from the Subject Land. No further assessment is required
Wahlenbergia multicaulis	E	-	Found in disturbed sites and grows in a variety of habitats including forest, woodland, scrub, grassland and the edges of watercourses and wetlands. Typically occurs	8	Low. A targeted survey was undertaken during the recognised survey period and this species was absent from the Subject Land.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
(Endangered population)			in damp, disturbed sites (with natural or human disturbance of various forms), typically amongst other herbs rather than in the open.		No further assessment is required
Wilsonia backhousei	V	-	In NSW Narrow-leaf Wilsonia is found on the coast between Mimosa Rocks National Park and Wamberal north of Sydney. This is a species of the margins of salt marshes and lakes.	100	Low. A targeted survey was undertaken during the recognised survey period and this species was absent from the Subject Land. No further assessment is required
Zannichellia palustris	E	-	Grows in fresh or slightly saline stationary or slowly flowing water. NSW populations behave as annuals, dying back completely every summer.	6	Low. A targeted survey was undertaken during the recognised survey period and this species was absent from the Subject Land. No further assessment is required
Anthochaera phrygia	CE	CE	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. The distribution of the species has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and	7	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
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			the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years flocks converge on flowering coastal woodlands and forests.		
Artamus cyanopterus cyanopterus	V	-	The Dusky Woodswallow is widespread in eastern, southern and southwestern Australia. In New South Wales it is widespread from coast to inland, including the western slopes of the Great Dividing Range and farther west. It is sparsely scattered in, or largely absent from, much of the Upper Western region. The Dusky Woodswallow is often reported in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests. At sites where Dusky Woodswallows are recorded the understorey is typically open with sparse eucalypt saplings, acacias and other shrubs, including heath. The ground cover may consist of grasses, sedges or open	35	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			ground, often with coarse woody debris (Higgins and Peter 2002). Birds are also often observed in farm land, usually at the edges of forest or woodland or in roadside remnants or wind breaks with dead timber.		
Botaurus poiciloptilus	E	E	The Australasian Bitterns is widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes and spikerushes.	13	Low. This highly mobile species may be an occasional visitor, but habitat constraints required for this species are absent within the Subject Land. This species has not been recorded within the locality in the last 10-years. No further assessment is required.
Calidris canutus	E	CE	The Red Knot is common in all the main suitable habitats around the coast of Australia. Very large numbers are regularly recorded in north-west Australia, with 80 Mile Beach and Roebuck Bay being particular strongholds. The only places it is not found in significant numbers are the northern part of the Great Australian Bight in South Australia and Western Australia, and along much of the NSW coast, where wader habitat is rather scarce (excluding the Hunter Estuary). It is widespread along the coast south of	14	Low. This highly mobile species may be an occasional visitor, but habitat constraints required for this species are absent within the Subject Land. No further assessment is required.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			Townsville and along the coasts of NSW and Victoria.		
Calidris ferruginea	E	CE	The Curlew Sandpiper is distributed around most of the coastline of Australia. It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes the inland	438	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.
Calidris tenuirostris	V	V	In NSW, the species has been recorded at scattered sites along the coast to about Narooma. It has also been observed inland at Tullakool, Armidale, Gilgandra and Griffith. Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby, sandy spits and islets and sometimes on exposed reefs or rock platforms.	2	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.

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	BC Act	EPBC Act			
Calyptorhynchus lathami lathami	V	V	Inhabits forest with low nutrients, characteristically with key Allocasuarina spp. Tends to prefer drier forest types with a middle stratum of Allocasuarina below Eucalyptus or Angophora. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead. Endangered population in the Riverina.	3	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.
Chalinolobus dwyeri	E	E	Located in a variety of drier habitats, including the dry sclerophyll forests and woodlands to the east and west of the Great Dividing Range. Can also be found on the edges of rainforests	3	Low. This highly mobile species may be an occasional visitor, but habitat constraints required for this species are absent within the Subject Land. No further assessment is required.
Circus assimilis	V	-	The Spotted Harrier occurs throughout the Australian mainland, except in densly forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. Occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over	12	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.

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	BC Act	EPBC Act			
			open habitats including edges of inland wetlands.		
Daphoenositta chrysoptera	V	-	Inhabits wide variety of dry eucalypt forests and woodlands, usually with either shrubby under storey or grassy ground cover or both, in all climatic zones of Australia. Usually in areas with rough-barked trees, such as stringybarks or ironbarks, but also in paperbarks or mature Eucalypts with hollows.	4	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.
Dasyurus maculatus	V	E	Spotted-tailed Quoll are found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered common. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	3	Low. Suitable breeding habitat is absent from the Subject Land. This species may occasionally forage within the Subject Land, however, are unlikely to rely upon these areas given the more appropriate foraging habitat available within the broader locality. No further assessment is required.
Epthianura albifrons (Endangered population)	E	-	Low vegetation in salty coastal and inland areas and crops. Runs along ground and is found in local flocks in Winter.	437	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
					No further assessment is required.
Epthianura albifrons	V	-	Low vegetation in salty coastal and inland areas and crops. Runs along ground and is found in local flocks in Winter.	437	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.
Falco subniger	V	-	The Black Falcon is found along tree-lined watercourses and in isolated woodlands, mainly in arid and semi-arid areas. It roosts in trees at night and often on power poles by day.	1	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. This species has not been recorded within the locality in the last 10-years. No further assessment is required.
Falsistrellus tasmaniensis	V	-	Inhabit sclerophyll forests, preferring wet habitats where trees are more than 20 m high. Two observations have been made of roosts in stem holes of living eucalypts. There is debate about whether or not this species moves to lower altitudes during winter, or	11	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			whether they remain sedentary but enter torpor. This species also appears to be highly mobile and records showing movements of up to 12 km between roosting and foraging sites.		periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.
Gallinago hardwickii	V	V	Latham's Snipe is a non-breeding migrant to the south east of Australia including Tasmania, passing through the north and New Guinea on passage. Latham's Snipe breed in Japan and on the east Asian mainland. seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration.	1965	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.
Glossopsitta pusilla	V	-	Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly in living, smooth-barked	21	Moderate. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			eucalypts. Most breeding records come from the western slopes.		
Haematopus longirostris	E	-	The Pied Oystercatcher inhabits marine littoral habitats, including islands. It occupies muddy, sandy, stony or rocky estuaries, inlets and beaches, particularly intertidal mudflats and sandbanks in large marine bays.	1	Unlikely. Suitable habitat for the species is absent from the Subject Land. No further assessment is required.
Haliaeetus leucogaster	V	-	Inhabits coastal and near coastal areas, building large stick nests, and feeding mostly on marine and estuarine fish and aquatic fauna.	743	Moderate. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.
Hieraaetus morphnoides	V	-	Most abundant in lightly timbered areas with open areas nearby. Often recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. May nest in farmland, woodland and forest in tall trees.	18	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
Hirundapus caudacutus	V	-	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges.	51	Moderate. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.
Ixobrychus flavicollis	V	-	Usually found on coastal plains below 200 m. Often found along timbered watercourses, in wetlands with fringing trees and shrub vegetation. The sites where they occur are characterized by dense waterside vegetation.	6	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.
Lathamus discolor	E	CE	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects . The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW . This species is migratory, breeding in Tasmania and also nomadic,	7	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			moving about in response to changing food availability.		
Limicola falcinellus	V	-	Broad-billed Sandpipers favour sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs as feeding and roosting habitat. Occasionally, individuals may be recorded in sewage farms or within shallow freshwater lagoons. Broad-billed Sandpipers roost on banks on sheltered sand, shell or shingle beaches.	2	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.
Limosa limosa	V	E	Primarily a coastal species. Usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and-or sandflats. Further inland, it can also be found on mudflats and in water less than 10 cm deep, around muddy lakes and swamps.	17	Unlikely. Suitable habitat for the species is absent from the Subject Land. No further assessment is required.
Litoria aurea	E	V	Inhabits a very wide range of water bodies including marshes, dams and streams, particularly those containing emergent vegetation such as bullrushes or spikerushes. It also inhabits numerous types of man-made water bodies including quarries and sand extraction sites. Optimum habitat includes water-bodies that are un-shaded, free of	17069	Unlikely. Suitable habitat for the species is absent from the Subject Land. Extensive aquatic habitat more appropriate for this species will continue to be available within the Parramatta River. No further assessment is required.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			predatory fish such as Plague Minnow, have a grassy area nearby and diurnal sheltering sites available.		
Meridolum corneovirens	E	-	Primarily inhabits Cumberland Plain woodland (an EEC). This community is a grassy, open woodland with occasional dense patches of shrubs. Lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish.	3	Low. Suitable habitat for this species is available within the Subject Land however extensive more appropriate leaf litter will continue to be available in the broader locality. No further assessment is required.
Micronomus norfolkensis	V	-	Most records are from dry eucalypt forests and woodlands to the east of the Great Dividing Range. Appears to roost in trees, but little is known of this species' habits.	11	Low. This highly mobile species may be an occasional visitor, but habitat constraints required for this species are absent within the Subject Land. No further assessment is required.
Miniopterus australis	V	-	Coastal north-eastern NSW and eastern Queensland. Little Bent-wing Bat is an insectivorous bat that roost in caves, in old mines, in tunnels, under bridges, or in similar structures. They breed in large aggregations in a small number of known caves and may travel 100s km from feeding home ranges to breeding sites. Little Bent-wing Bat has a preference for moist eucalypt forest,	11	Low. This highly mobile species may be an occasional visitor. Suitable aerial foraging habitat for this species is found both within and immediately adjacent to the Subject Land. No further assessment is required.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			rainforest or dense coastal banksia scrub where it forages below the canopy for insects.		
Miniopterus orianae oceanensis	V	-	Eastern Bent-wing Bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.	96	Low. This highly mobile species may be an occasional visitor. Suitable aerial foraging habitat for this species is found both within and immediately adjacent to the Subject Land. No further assessment is required.
Myotis macropus	V	-	The Large-footed Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. Generally roost in groups of 10 – 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage.	53	Low. This highly mobile species may be an occasional visitor, but habitat constraints required for this species are absent within the Subject Land. No further assessment is required.
Neophema pulchella	V	-	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Nests in tree hollows, logs	2	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding) on habitats in the Subject Land. No hollows suitable for breeding were identified within the Subject Land.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.		No further assessment is required.
Ninox connivens	V	-	Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country.	6	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding) on habitats in the Subject Land. No hollows suitable for breeding were identified within the Subject Land. No further assessment is required.
Ninox strenua	V	-	Occupies wet and dry eucalypt forests and rainforests. Can occupy both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. It is most commonly recorded within red turpentine in tall open forests and black she-oak within open forests. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this	306	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding) on habitats in the Subject Land. No hollows suitable for breeding were identified within the Subject Land. No further assessment is required.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			species are usually emergent with a diameter at breast height of at least 100 cm.		
Numenius madagascariensis	E	CE	The Eastern curlew spends its breeding season in northeastern Asia, including Siberia to Kamchatka, and Mongolia. Its breeding habitat is composed of marshy and swampy wetlands and lakeshores. Most individuals winter in coastal Australia, with a few heading to South Korea, Thailand, Philippines and New Zealand, where they stay at estuaries, beaches, and salt marshes. It uses its long, decurved bill to probe for invertebrates in the mud. It may feed in solitary but it generally congregates in large flocks to migrate or roost. Its call is a sharp, clear whistle, cuuue-reee, often repeated.	40	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.
Oxyura australis	V	-	Widespread in NSW, but most common in the southern Murray-Darling Basin area. Birds disperse during the breeding season to deep swamps up to 300 km away. It is generally only during summer or in drier years that they are seen in coastal areas. The Blue-billed Duck prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation.	2	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. This species has not been recorded within the locality in the last 10-years.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
					No further assessment is required.
Pandion cristatus	V	-	Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water.	13	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.
Petauroides volans	E	E	The Greater Glider occurs in eucalypt forests and woodlands. Utilise tree hollows	1	Unlikely. Suitable habitat for the species is absent from the Subject Land. This species has not been recorded within the locality in the last 10-years. No further assessment is required.
Petroica boodang	V	-	The Scarlet Robin is found from SE Queensland to SE South Australia and also in Tasmania and SW Western Australia. In NSW, it occurs from the coast to the inland slopes. The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.	5	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
					No further assessment is required.
Petroica phoenicea	V	-	Flame Robins are found in a broad coastal band from southern Queensland to just west of the South Australian border. The species is also found in Tasmania. The preferred habitat in summer includes eucalyptus forests and woodland, whilst in winter prefers open woodlands and farmlands. It is considered migratory. The Flame Robin breeds from about August to January.	2	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.
Phascolarctos cinereus	E	E	Inhabits eucalypt forests and woodlands. The suitability of these forests for habitation depends on the size and species of trees present, soil nutrients, climate and rainfall .	1	Unlikely. Suitable habitat for the species is absent from the Subject Land due to the urban nature of the area and relatively fragmented nature of the habitat. No further assessment is required.
Pommerhelix duralensis	E	E	Endemic to NSW and confined to northwest fringes of the Cumberland Plain. Distribution extends as far north as St. Albans; southwest to Mulgoa, and southeast to Parrammatta. Occurs in low densities in Hawkesbury Sandstone Vegetation and Shale/Sandstone Transition Forest. Found under rocks, logs, bark and in leaf litter. Has a strong preference for shale-influenced transitional landscapes	39	Low. Suitable habitat for this species is available within the Subject Land however extensive more appropriate leaf litter will continue to be available in the broader locality. No further assessment is required.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			and has not been confirmed outside such habitats.		
Pseudophryne australis	V	-	Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks that feed into larger semi-perennial streams. After rain these creeks are characterised by a series of shallow pools lined by dense grasses, ferns and low shrubs and usually contain leaf litter for shelter. Eggs are terrestrial and laid under litter, vegetation or rocks where the tadpoles inside will reach a relatively late stage of development before waiting for flooding waters before hatching will occur.	2	Unlikely. Suitable habitat for the species is absent from the Subject Land. Extensive aquatic habitat more appropriate for this species will continue to be available within the Parramatta River. No further assessment is required.
Pteropus poliocephalus	V	V	This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Bats commute daily to foraging areas, usually within 15 km of the day roost although some individuals may travel up to 70 km.	902	High. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
Rostratula australis	E	E	In NSW, this species has been recorded at the Paroo wetlands, Lake Cowell, Macquarie Marshes and Hexham Swamp. Most common in the Murray-Darling Basin. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	10	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.
Saccolaimus flaviventris	V	-	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	14	Low. This highly mobile species may be an occasional visitor, but habitat constraints required for this species are absent within the Subject Land. No further assessment is required.
Scoteanax rueppellii	V	-	Prefer moist gullies in mature coastal forests and rainforests, between the Great Dividing Range and the coast. They are only found at low altitudes below 500 m. In dense environments they utilise natural and human-made opening in the forest for flight paths. Creeks and small rivers are favoured foraging	7	Low. This highly mobile species may be an occasional visitor, but habitat constraints required for this species are absent within the Subject Land. No further assessment is required.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			habitat. This species roosts in hollow tree trunks and branches.		
Sternula albifrons	E	-	Almost exclusively coastal, preferring sheltered environments; however may occur several hundred kilometres from the sea in harbours, inlets and rivers.	7	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.
Stictonetta naevosa	V	-	The freckled duck breeds in permanent fresh swamps that are heavily vegetated. Found in fresh or salty permanent open lakes, especially during drought. Often seen in groups on fallen trees and sand spits.	3	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. No further assessment is required.
Tringa nebularia	E	E	Habitat is diverse, both inland and coastal. Found inland on both permanent and temporary wetland- billabongs, swamps, lakes, floodplains, sewage, farms and saltwater ponds. On the coast, it uses sheltered estuaries and bays with extensive mudflats, mangrove swamps, muddy	334	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land.

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			shallows of harbours and lagoons and occasionally rocky tidal edges.		This species has not been recorded within the locality in the last 10-years. No further assessment is required.
Tyto longimembris	V	-	Found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains.	2	Low. This highly mobile species may be an occasional visitor, but habitat constraints required for this species are absent within the Subject Land. No further assessment is required.
Tyto novaehollandiae	V	-	Inhabits a diverse range of wooded habitat that provide tall or dense mature trees with hollows suitable for nesting and roosting. Mostly recorded in open forest and woodlands adjacent to cleared lands. Nest in hollows, in trunks and in near vertical spouts or large trees, usually living but sometimes dead. Nest hollows are usually located within dense forests or woodlands. Masked owls prey upon hollow-dependent arboreal marsupials, but terrestrial mammals make up the largest proportion of the diet.	3	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding) on habitats in the Subject Land. No hollows suitable for breeding were identified within the Subject Land. No further assessment is required.
Tyto tenebricosa	V	-	Often found in tall old-growth forests, including temperate and subtropical rainforests. In NSW mostly found on escarpments with a mean altitude less than	1	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding) on habitats in the

Scientific name	Status		Distribution and habitat	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			500 metres. Nests and roosts in hollows of tall emergent trees, mainly eucalypts often located in gullies. Nests have been located in trees 125 to 161 centimetres in diameter.		Subject Land. No hollows suitable for breeding were identified within the Subject Land. This species has not been recorded within the locality in the last 10-years. No further assessment is required.
Xenus cinereus	V	V	The Terek Sandpiper mostly forages in the open, on soft wet intertidal mudflats or in sheltered estuaries, embayment's, harbours or lagoons.	1	Low. This highly mobile species may be an occasional visitor, but habitat similar to the Subject Land is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the Subject Land. This species has not been recorded within the locality in the last 10-years. No further assessment is required.

Appendix C. 5-Part Tests (Tests of Significance) (BC Act).

Biodiversity Conservation Act 2016 – Test of Significance (5-part Test) for Threatened Ecological Communities	
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and Southeast Corner Bioregions (Endangered)	
Species Ecology (Scientific Committee, 2011)	Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and Southeast Corner bioregions is the name given to the ecological community associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. Swamp Sclerophyll Forest on Coastal Floodplains generally occurs below 20 m (though sometimes up to 50 m) elevation, often on small floodplains or where the larger floodplains adjoin lithic substrates or coastal sand plains in the NSW North Coast, Sydney Basin and Southeast Corner bioregions. The structure of the community is typically open forest, although partial clearing may have reduced the canopy to scattered trees. In some areas the tree stratum is low and dense, so that the community takes on the structure of scrub. The community also includes some areas of fern land and tall reed land or sedgeland, where trees are very sparse or absent. Typically, these forests, scrubs, fenlands, Redlands and sedgelands form mosaics with other floodplain forest communities and treeless wetlands, and often they fringe treeless floodplain lagoons or wetlands with semi-permanent standing water.
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	Not applicable.

Biodiversity Conservation Act 2016 – Test of Significance (5-part Test) for Threatened Ecological Communities		
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and Southeast Corner Bioregions (Endangered)		
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	**(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**	No. The proposed activity is unlikely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction. Only 31 trees, representative of the EEC, will be impacted to facilitate the proposal. This TEC is represented within the vegetation to be retained surrounding the Subject Land will continue to adjoin to areas of high-quality habitat within the broader locality based on information provided within the current State Vegetation Type Map (NSW DCCEEW, 2024d).
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	The proposed activity is not likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction. The proposed activity will impact 31 trees which constitute a part of the EEC. Of these, all species are well represented elsewhere within the Subject Land and in other adjoining parks and properties, which are not impacted. It is not expected that the proposed activity will cause the permanent loss of any complexity or unique floristic

Biodiversity Conservation Act 2016 – Test of Significance (5-part Test) for Threatened Ecological Communities		
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and Southeast Corner Bioregions (Endangered)		
		components of the ecological community, such that it is likely to be placed at risk of extinction.
(c) in relation to the habitat of a threatened species or ecological community:	**(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**	The proposed activity will require the removal of 31 trees serving as habitat. This 'habitat' constitutes a negligible portion of the TEC within the local occurrence.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	Minor increased fragmentation will occur as a result of the proposed activity, however within the existing landscape context, the select removal of planted trees that reflect this TEC is not likely to constitute a significant impact to the TEC.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	All areas which support viable patches are important. Given the patches of habitat available in the vicinity, it is not expected that the development will impact the long-term survival of the EEC.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	The activity proposed is not likely to have an adverse effect on any declared area of critical habitat, directly or indirectly.	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The following Key Threatening Processes (KTPs) are documented to impact upon the survival of the ecological community: • Clearing of native vegetation	

Biodiversity Conservation Act 2016 – Test of Significance (5-part Test) for Threatened Ecological Communities
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and Southeast Corner Bioregions (Endangered)
Conclusion There will be no significant impact on these species therefore the proposed action should not warrant the preparation of a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR).

Appendix D. Assessment of Significant Impact Criteria under the EPBC Act.

Commonwealth Environment Protection and Biodiversity Conservation Act 1999– Assessment of Significant Impact Criteria for Coastal Swamp Sclerophyll Forest of New South Wales and Southeast Queensland	
EPBC Act Status: Endangered	
Significant Impact Criteria **An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:**	
▪ **Reduce the extent of an ecological community;**	The proposed activity will not result in very low impacts to the Coastal Swamp Sclerophyll Forest mapped within the Subject Land. Vegetation to be impacted characteristic of the EEC is planted and of low value within the area. Subject to mitigation measures, no other areas of vegetation will be impacted by the proposal. It is therefore not considered likely that the extent of the ecological community will be reduced.
▪ **Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines;**	Coastal Swamp Sclerophyll Forest within the area is already fragmented due to the urban nature of the landscape. No increased fragmentation will occur, and connectivity is expected to remain the same extent within the Subject Land.
▪ **Adversely affect habitat critical to the survival of an ecological community;**	Minimal Coastal Swamp Sclerophyll Forest requires removal to facilitate the works (31 trees 0.09ha). Subject to mitigation measures, it is considered unlikely that the proposed activity would adversely affect habitat critical to the survival of this community.
▪ **Modify or destroy abiotic (non-living) factors (such as water, nutrients or soil) necessary for an ecological community's survival including reduction of groundwater levels or substantial alteration of surface water drainage patterns;**	It is not expected that the proposed activity will modify or destroy abiotic factors (such as water, nutrients, or soil) that is necessary for the survival of this ecological community. No reduction in groundwater levels, or substantial alterations of surface water drainage patters are anticipated as a result of the proposed activity.

Commonwealth Environment Protection and Biodiversity Conservation Act 1999– **Assessment of Significant Impact Criteria for Coastal Swamp Sclerophyll Forest of New South Wales and Southeast Queensland**	
EPBC Act Status: Endangered	
▪ **Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting;**	The proposed activity will require clearing of 0.09ha of Coastal Swamp Sclerophyll Forest. The 0.09ha of vegetation to be removed are all exceedingly common native canopy species; (*Angophora costata, Melaleuca quinquenervia, Eucalyptus spp., Melaleuca styphelioides, Casuarina glauca, Corrymbia maculata*). These species do not contribute to unique species compositions of this EEC. It is considered unlikely that the proposal will cause a substantial change in the species composition of the occurrence of the ecological community.
▪ **Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:** **i. assisting invasive species, that are harmful to the listed ecological community, to become established** **ii. causing regular mobilisation of fertilisers, herbicides, or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community;**	The proposed activity will not cause a substantial reduction in the quality or integrity of the occurrence of this EEC. i. The proposed activity will not assist invasive species to become established as the Coastal Swamp Sclerophyll Forest, subject to appropriate management. No harmful, invasive species were identified within the Subject Land; and ii. The proposed activity is not expected to cause the regular mobilisation of fertilisers, herbicides, or other chemicals or pollutants.
▪ **Interfere with the recovery of an ecological community.**	It is not anticipated that the proposed activity will interfere with the recovery of the EEC. The anticipated impacts are both minimal and highly insignificant in the context of the surrounding landscape. Appropriate habitat for the EEC will remain available in the broader locality. As such, it is not expected that the proposed activity will interfere with the recovery of this ecological community.

Commonwealth Environment Protection and Biodiversity Conservation Act 1999– Assessment of Significant Impact Criteria for Coastal Swamp Sclerophyll Forest of New South Wales and Southeast Queensland
EPBC Act Status: Endangered
Conclusion There will be no significant impact on the ecological community therefore the proposed action should not warrant the producing of a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR).

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Report

Rangihou Reserve – Drainage Investigation and Flood Impact Assessment Report

24 June 2025

City of Parramatta Council

QUALITY ASSURANCE STATEMENT

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DOCUMENT CONTROL

ISSUE	DATE	ISSUE DETAILS	AUTHOR	CHECKED	APPROVED
00	10/06/2025	FINAL	DM	DJ	-
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Rangihou Reserve - Drainage And Flood Report (Revision 01).Docx

Contents

Tables

Figures

1 Introduction

This report has been prepared by City of Parramatta Council to analyse the drainage components and flood impact assessment associated with the proposed pedestrian and cyclist pathway design at Rangihou Reserve between Macarthur Street and Alfred Street Bridge. This report will include assessment of the following:

- Hydrological and Hydraulic Analysis
- Design Drainage Considerations
- Flood Impact Assessment

1.1 Project Description

The proposal involves construction of a shared pedestrian and cyclist pathway within Rangihou Reserve, extending between Macarthur Street and Alfred Street Bridge. The proposed works, illustrated in Figure 1 includes widening of the existing pedestrian path to a total width of 5 metres, incorporating new pavement and supporting Infrastructure.

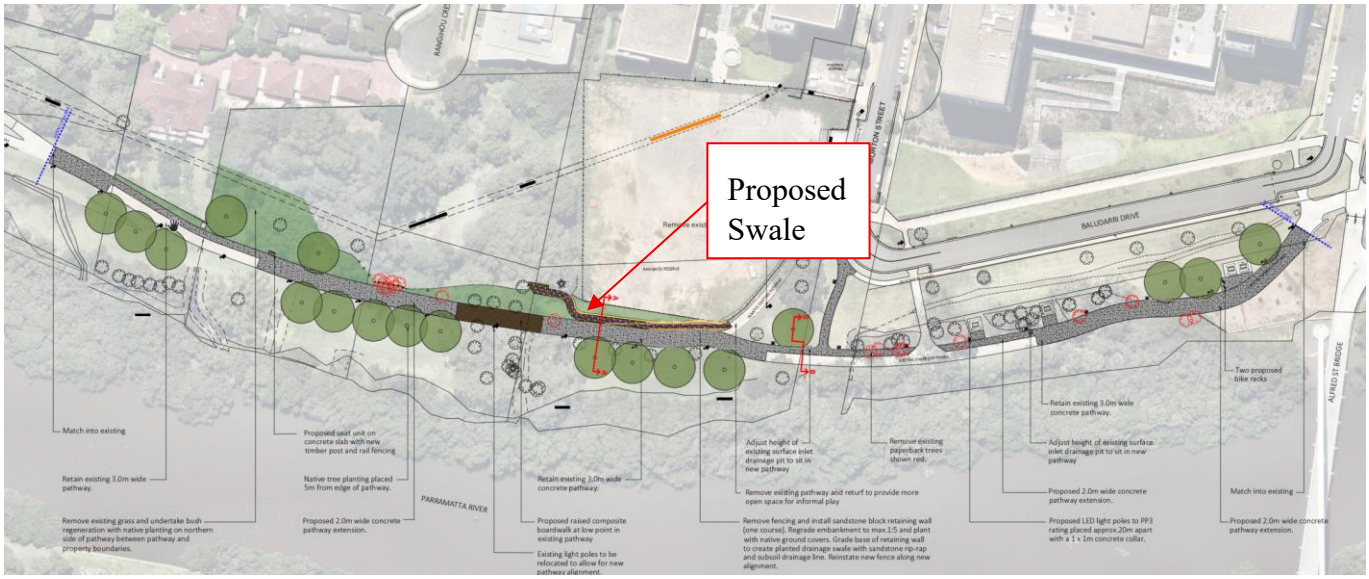


Figure 1: Proposed Pedestrian and Cyclist Pathway

As part of the design, a swale has been incorporated along the section of the footpath adjacent to proposed pedestrian pathway to capture upstream runoff as shown in Figure 1.

1.2 Existing Stormwater Drainage Network

The existing stormwater drainage infrastructure along the developmental area has been extracted from the council's asset database and is illustrated in Figure 2 below.

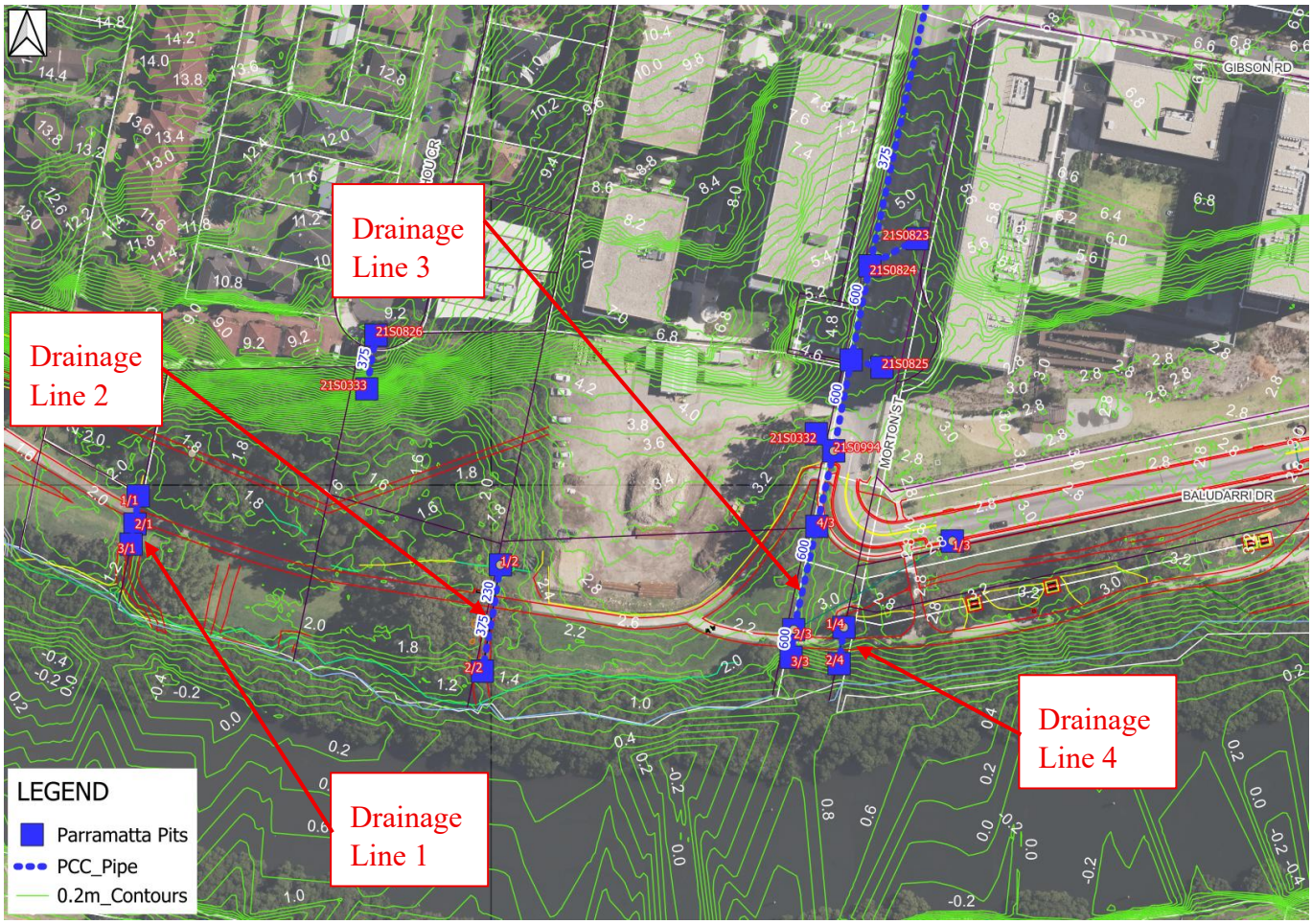


Figure 2: Existing Stormwater Drainage Network

Runoff from the upstream catchment is currently collected by the existing drainage network presented in Figure 2 and convey to Parramatta River across the existing 3m wide shared pathway. The details on the existing stormwater drainage network conveying stormwater runoff across the existing shared pathway is presented in Table 1 below.

Table 1: Drainage Network across Existing Footpath

Drainage Network	Pipe	Description
Line 1	1\1 – 3\1	Ø375mm
Line 2	1\2 – 2/2	Combination of PVC Ø225mm and RCP Ø300mm
Line 3	2\3 – 3\3	Ø600mm
Line 4	1\4 – 2\4	RCBC 900x420mm

The site investigation has been carried out to analyse the state of the existing stormwater drainage network. Below are the findings from site investigation.

1. **Line 1\1** - Pit 1\1 in Figure 2 is the junction pit with concrete lid. The lid has been lifted to allow stormwater runoff into the pit preventing any runoff across the existing 3m wide pathway by placing the wooden block as shown in Figure 3. The block seems to be holding the lid and providing the opening, but it is hazardous for the visitor using the pathway specifically children.

Figure 3: Junction Pit 1\1 provided with opening

Furthermore, the outlet Culvert is 75% blocked with sediment as shown in Figure 4 which is required to be cleaned.

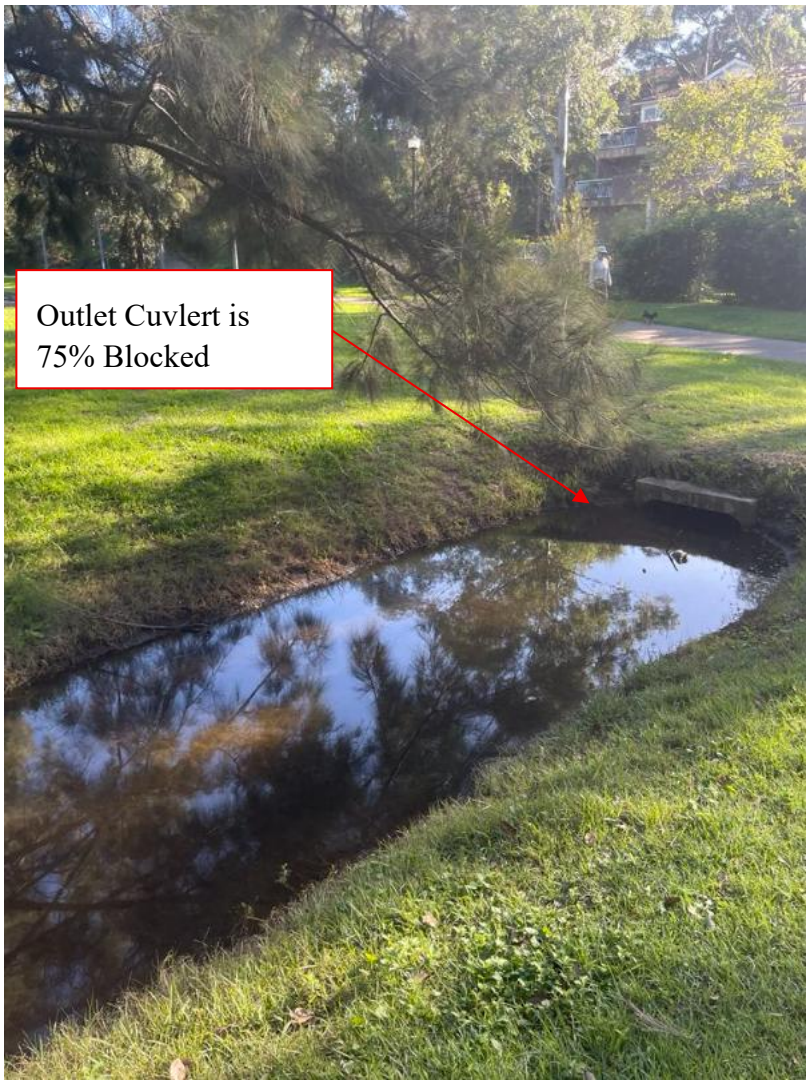


Figure 4: Drainage Network Line 1 Blocked Outlet

2. **Line 2\2** – No headwall is provided at the inlet, and site observations confirm that the inlet pipe is a Ø225mm uPVC pipe. At the downstream end, the outlet pipe is Ø300mm pipe, indicating an upgrade from Ø225mm to Ø300mm somewhere along the line.

Figure 5: uPVC 225mm Pipe without Headwall at Inlet of Line 2

To confirm the location and length of the transition between pipe sizes, a CCTV investigation was conducted. The footage shows that the first 3 metres of the pipe from the inlet is Ø225mm, after which it transitions to Ø300mm. Additionally, a significant blockage caused by a concrete obstruction shown in Figure 6 was observed approximately 10metres from the upstream end.

Figure 6: CCTV footage showing Concrete Block inside existing pipe

2 Hydrological and Hydraulic Model

The hydrological and hydraulic analysis has been conducted using stormwater drainage design software DRAINS and 1D/2D flood modelling software TUFLOW. The DRAINS model was used to design the stormwater drainage system, while TUFLOW was employed to simulate flood behaviour.

2.1 DRAINS Model

The DRAINS model was developed to quantify flow rates across the defined catchments and to assess the hydraulic capacity of the stormwater pipes and pits. The model also identifies overflow rates at each pits and headwalls under various storm events.

Rainfall inputs were based on 2016 Intensity-Frequency-Duration (IFD) data from Australian Rainfall and Runoff and adjusted for site-specific conditions. The ILSAX hydrological model was applied to simulate flows under both existing and proposed conditions for the 5-year and 20-year Average Recurrence Interval (ARI) storm event.

The computer model also contained the following parameters:

- Paved (impervious) area depression storage (mm) = 1
- Supplementary area depression storage (mm) = 1
- Grassed (pervious) area depression storage (mm) = 5
- Soil Type = 3
- AMC (Antecedent Moisture Condition) = 3

2.1.1 Existing Scenario

The catchments associated with each existing drainage network shown in Figure 2 were delineated using CatchmentSIM software, based on LiDAR data obtained from ELVIS website. The delineated catchments are shown in Figure 7 below.

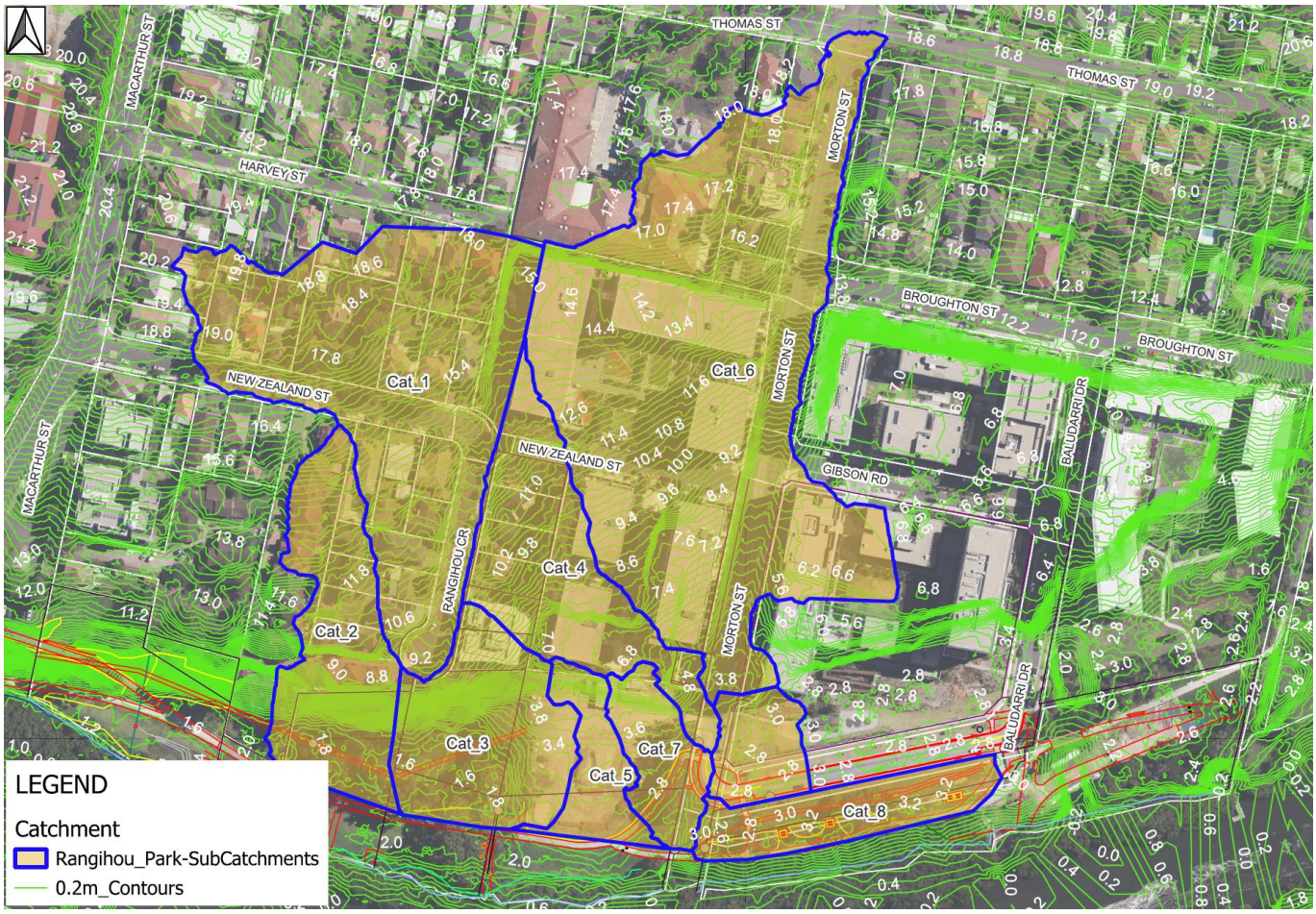


Figure 7: Catchment Map

The details of associated sub-catchments and corresponding drainage line are summarised in Table 1 .

Table 2: Drainage Network across Existing Pathway

Catchment	Area	Associated Drainage Network
Cat_1	1.616	Line 2
Cat_2	0.6344	Line 1
Cat3	0.5975	Line 2
Cat_4	0.6667	Line 3
Cat_5	0.2086	Overflow to Existing Pathway
Cat_6	2.6637	Line 3

Cat_7	0.2321	Line 3
Cat_8	0.3247	Line 3
Cat_9	0.1912	Line 4

A DRAINS model was developed to represent the existing drainage network configuration shown in Figure 2 with the layout presented in Figure 8 below.

Figure 8: DRAINS Model Layout - Existing Scenario

The results from DRAINS model for 5-year and 20-year ARI event without considering tailwater effect is shown in Figure 9 and Figure 10 below.

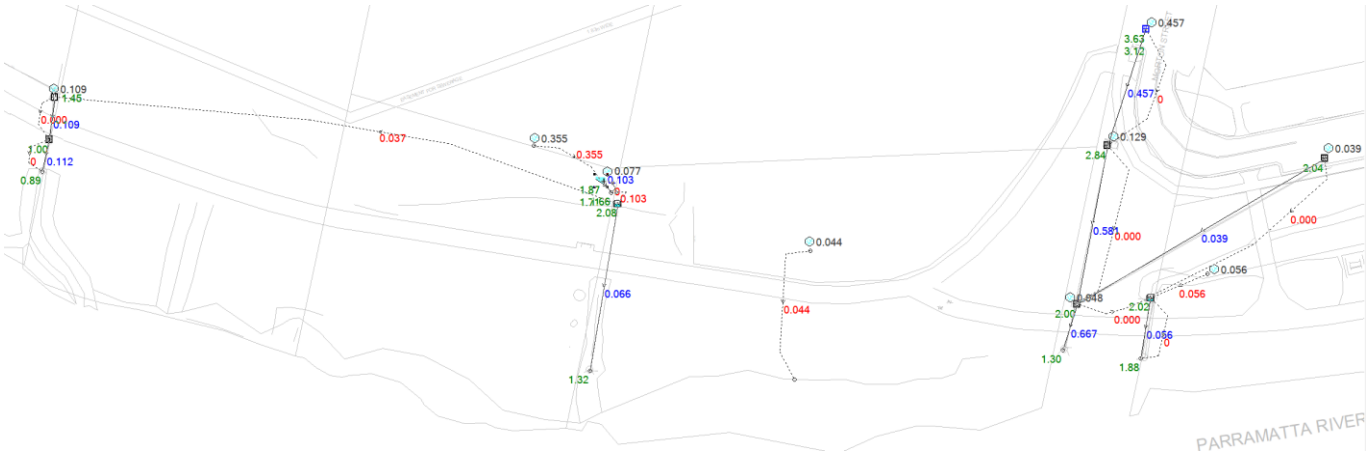


Figure 9: 20% AEP (5-year ARI) DRAINS Results - Existing Scenario

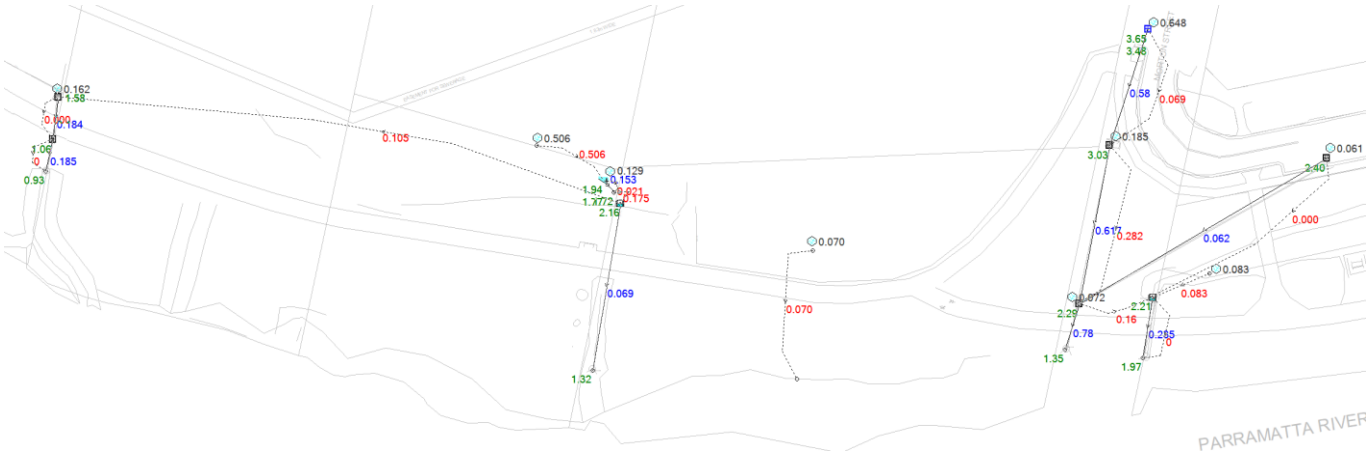


Figure 10: 5% AEP (20-year ARI) DRAINS Results - Existing Scenario

Key Outcomes from the DRAINS model for the existing scenario are summarised below:

- **Drainage Network - Line 1:**

  Overland stormwater flow from the upstream catchment crosses the existing pedestrian pathway and is intercepted by the existing letterbox pit (Pit 2\1). The captured flow is then conveyed via a 750 mm x 375 mm box culvert towards the Parramatta River. Currently, the junction pit (Pit 1\1) includes a makeshift opening formed using a wooden block, as illustrated in Figure 3.

- **Drainage Network - Line 2:**
  Runoff from upstream catchments, including New Zealand Street and Rangihou Crescent, is conveyed via a pit and pipe network to a marshland area that functions as temporary storage. From there, flow is directed into Line 2. However, the existing Ø225mm uPVC pipe lacks adequate capacity to convey runoff downstream during both 5-year and 20-year ARI storm events. As a result, water ponds in the marshland up to a depth of approximately 200mm before redirected to Pit 1\1 – a modified junction pit equipped with a wooden block to assist in flow management.

- **Drainage Network - Line 3 and Line 4:**
  Runoff from upstream areas will be collected by drainage area line 3 with subsequent conveyance via a pit and pipe system (Ø600mm) to Parramatta River. During the 5-year ARI event, the network effectively conveys all upstream runoff without overflow. For the 20-year ARI event, overflow of approximately 0.16m^3/s will be directed towards swale where it is captured by headwall 4\1 and safely directed across via 900x420mm headwall without any overtopping to the concrete pathway.

2.2 Proposed Stormwater Drainage Network

As part of the proposed development, modification and upgrades to the existing drainage system have been undertaken. These improvements include the installation of new stormwater pits and pipes, with some new components integrated by connecting into the existing pipe network. The proposed modification is summarised below.

1. Pit 1\1 has been upgraded from Junction Pit to a grated surface inlet pit to improve surface runoff capture.

2. A formalised headwall be constructed at the location of Pit 2\1 to enhance the existing inlet condition.
3. A swale will be constructed to capture overland flow from Catchment 5 and direct it towards Headwall 2\1.
4. A Ø300 Class 4 RCP will replace the existing Ø225mm uPVC pipe and a section of the existing Ø300 RCP between headwalls 2\1 and2\2. This upgrade will provide a continuous Ø300 RCP connection and significantly increasing the system's capacity.
5. Pit 2\3 will be converted into a junction pit and an additional surface inlet pit with a letterbox grate will be installed upstream to improve overland flow capture efficiency.

The DRAINS model layout for proposed scenario is presented in Figure 11 below.

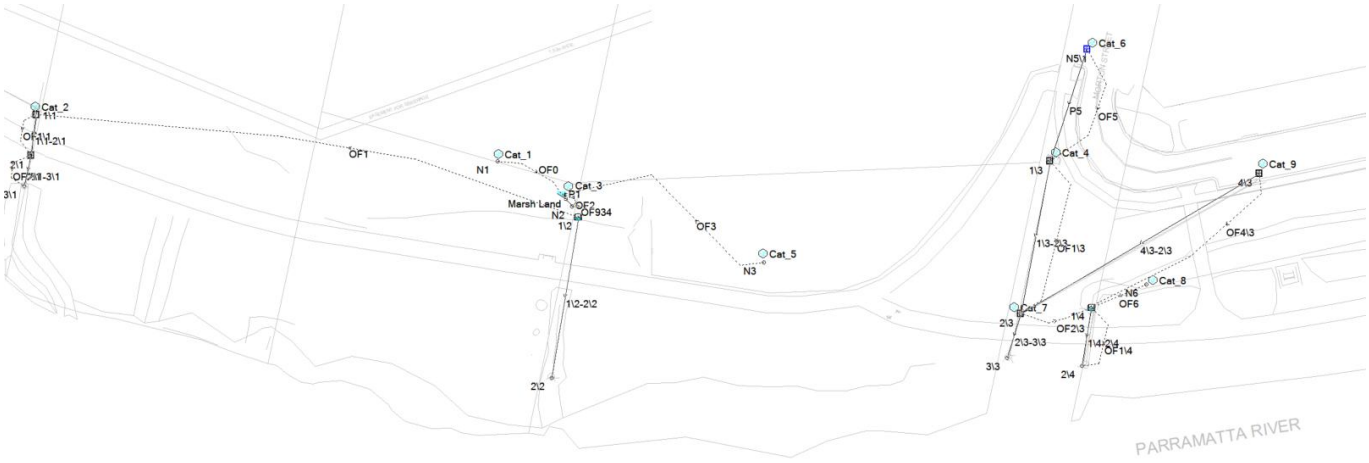


Figure 11: DRAINS Model Layout - Proposed Scenario

The results from DRAINS model for 5-year and 20-year ARI event with considering tailwater effect is shown in Figure 12 and Figure 13 below.

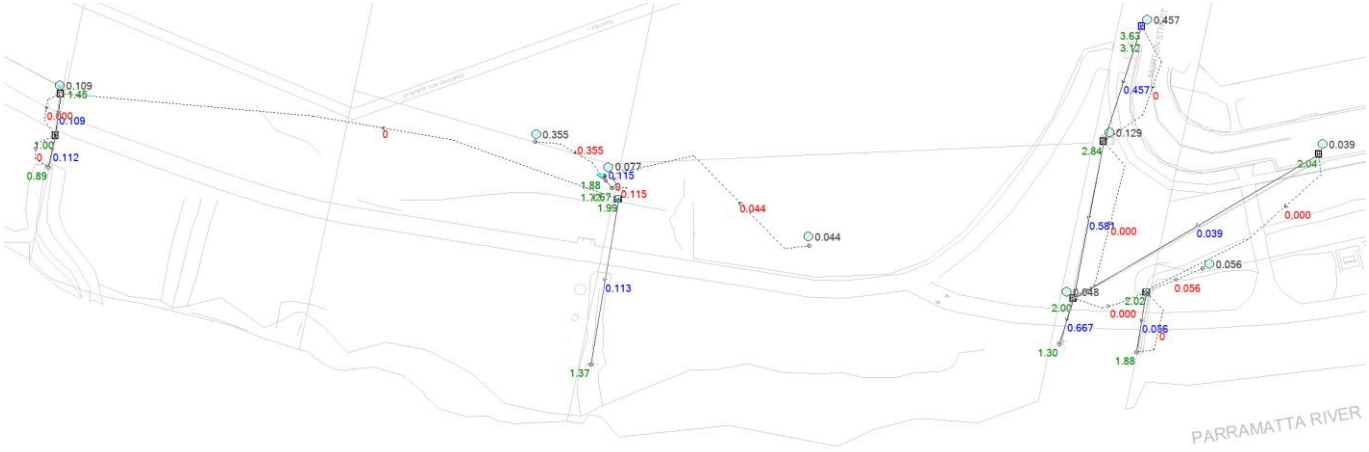


Figure 12: 20% AEP (5-year ARI) DRAINS Results - Proposed Scenario

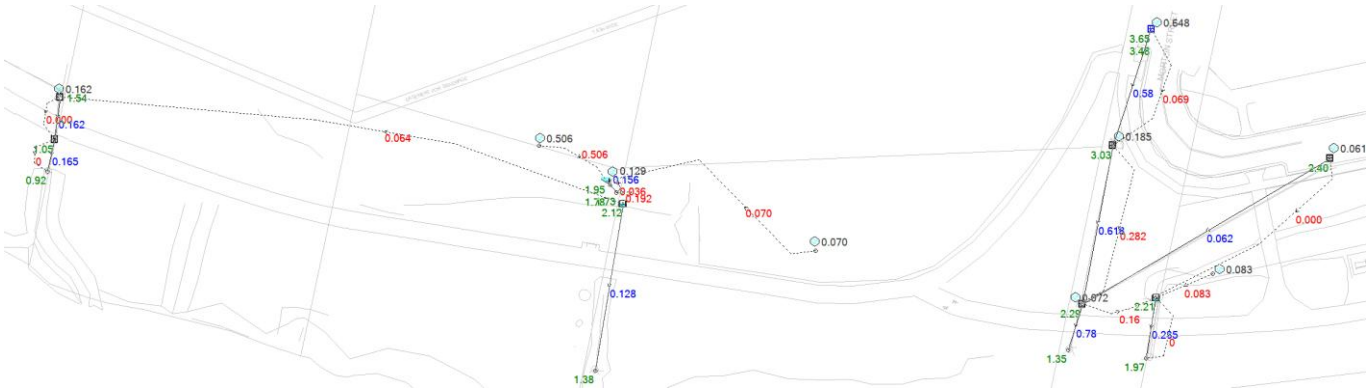


Figure 13: 5% AEP (20-year ARI) DRAINS Results - Proposed Scenario

Key Outcomes from the DRAINS model for the existing scenario are summarised below:

- **Drainage Network - Line 1:**

  Stormwater overland flow from the upstream catchment will now be collected by the proposed grated surface inlet Pit1\1, effectively preventing any overflow across the proposed shared pathway during both 5-year and 20-year ARI rainfall events.

- **Drainage Network - Line 2:**
  Runoff from upstream catchments (including New Zealand Street and Rangihou Crescent) will continue to be directed towards the marshland, which serves as temporary storage. Additionally, overland flow from Catchment 5 will be intercepted by the proposed swale and conveyed to the newly constructed Headwall 1\2. The proposed Ø300mm Class 4 RCP will safely convey the flow from upstream areas during 5-year and lesser storm events.

  During 20-year ARI event, ponding upto 200mm is expected within the marshland, after which approximately 64L/s of overland flow will be redirected to Pit1/1. This flow will be safely captured by new grated surface inlet pit (Pit 1\1) and conveyed downstream via the existing drainage network.

  The flood depth map presented in Figure A1 (Appendix A) shows that, during the 20-year ARI event, the marshland and the section along Line 1 and Line 2 become inundated by floodwaters from the Parramatta River, with depths reaching up to 670 mm. Based on this, the installation of the proposed Ø300 mm RCP is considered acceptable and appropriate for the site's flood conditions.

- **Drainage Network - Line 3 and Line 4:**
  Similar to the existing condition, Runoff from upstream areas will be collected by drainage area line 3 with subsequent conveyance via a pit and pipe system (Ø600mm) to Parramatta River. During the 5-year ARI event, the network effectively conveys all upstream runoff without overflow. For the 20-year ARI event, overflow of approximately 0.16m^3/s will be directed towards swale where it is captured by headwall 4\1 and safely directed across via 900x420mm headwall without any overtopping to the concrete pathway. Furthermore, regrading of the surrounding land to direct stormwater toward the new pit with a letterbox grate will enhance overall stormwater management in the area.

2.3 TUFLOW Model

TUFLOW Model has been used to simulate the prevailing flooding issue and to analyse impact of the proposed development on the flooding issues. The flood investigation has been carried out using TUFLOW flood modelling software (Build 2020-10-AA). The flood model for Parramatta River Flood Study supplied by STANTEC to City of Parramatta Council has been used for this analysis.

2.3.1 Overview of Hydrological and Hydraulic Analysis in the Parramatta River Flood Study (PRFS)

The Parramatta River Flood Study encompasses a comprehensive hydrological and hydraulic analysis of a 51km^2 area, utilising advanced modelling techniques to assess flood behaviour and risks. Due to the study area size, a staged approach was adopted for developing TUFLOW hydraulic model divided into the following stages:

- Stage 1 – Mainstream Parramatta River and Toongabbie Creek
- Stage 2 – Tributary Models
- Stage 3 – Overland Flow

The different stages of TUFLOW Model are shown in Table 3 below.

Table 3: Stages of TUFLOW Model

Stage	TUFLOW Model
Mainstream	Model 1 – Parramatta River and Toongabbie Creek
Tributary and Overland Flow	Model 2 – Clay Cliff Creek
	Model 3 - Darling Mills, The Ponds, Subiaco, Vineyard and Brickfield Creeks
	Model 4 – Finlaysons, Coopers and Milsons Creeks
	Model 5 – Pendle Hill and Greystanes Creek
	Model 6 – Quarry Branch Creek
	Model 7 – Terrys and Devlins Creek

The study area highlighting Parramatta River and its tributaries is shown in Figure 14 below.

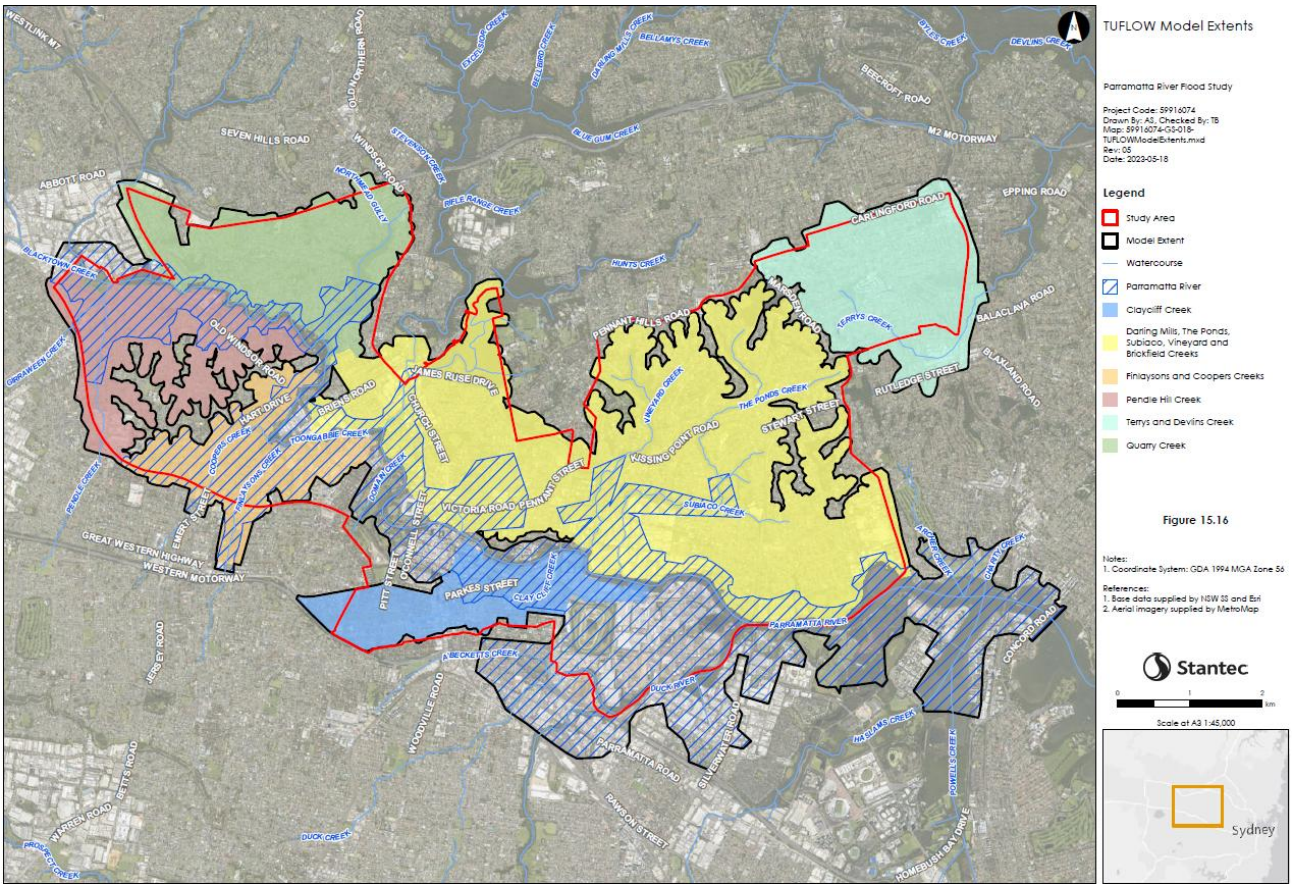


Figure 14: Parramatta River and Tributaries Study Area Extent

The sub-catchment associate with Parramatta River and Tributaries TUFLOW Model shown in Figure 14 is presented in Figure 15 below.

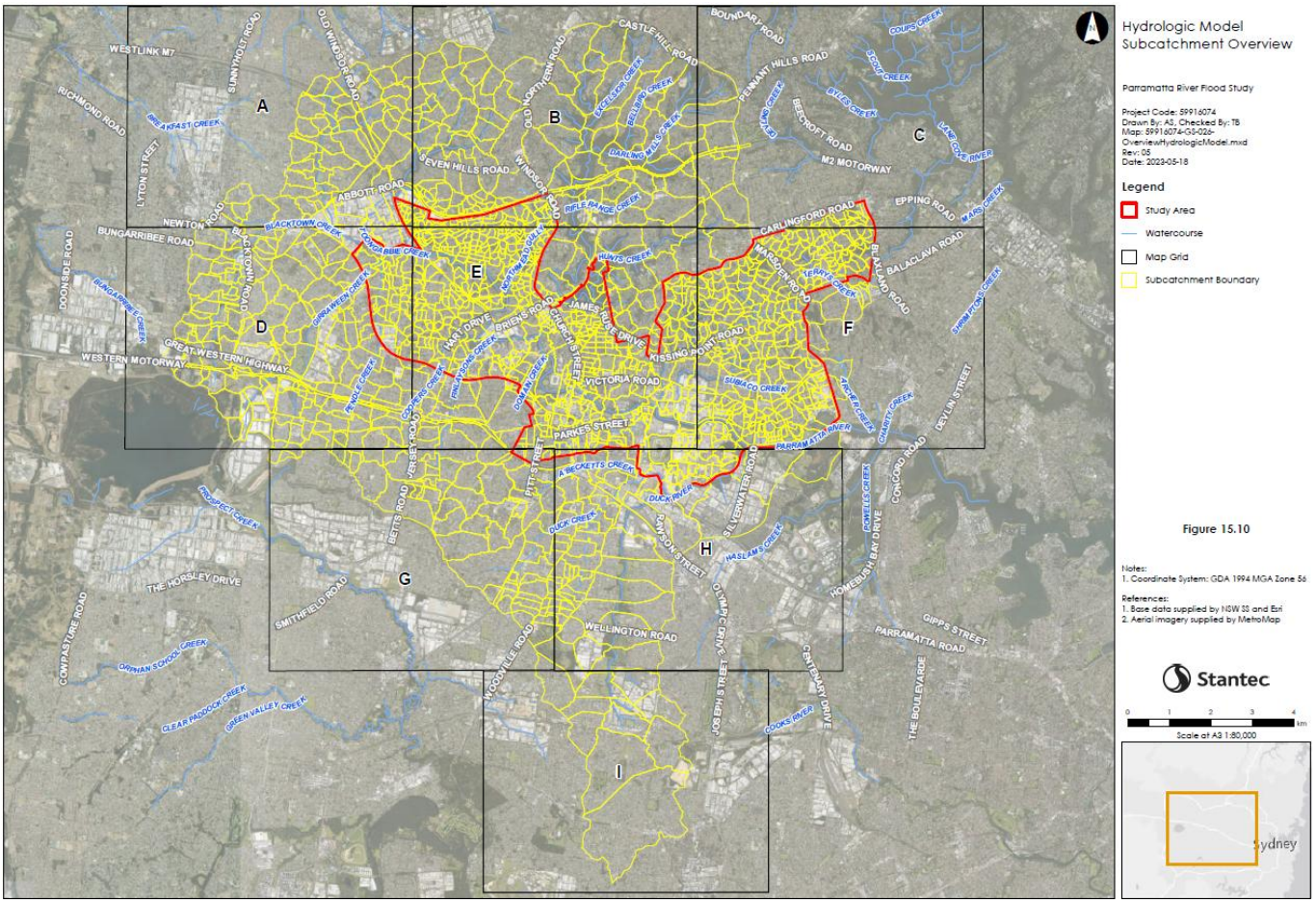


Figure 15: Sub-catchment Overview for the Parramatta River Flood Study

2.3.2 Methodology

As part of the Parramatta River Flood Study (PRFS), Stantec developed a hydrologic and hydraulic model using XPRAFTS and TUFLOW Model. For this assessment, a hydrological XPRAFTS model and TUFLOW model (Model 1) supplied by Stantec is used to estimate flood levels, depths, and velocities along Parramatta River and Toongabbie Creek and its associated catchments.

2.3.2.1 Model setup and Inputs

The TUFLOW model used in Model 1 of original PRFS was utilised to assess the impact of the proposed development. The data inputs used for flood modelling are listed below.

2.3.2.1.1 Topographic Data

Initial topographic data supplied with TUFLOW Model 1 of PRFS has been used without any modification. In addition to the initial topographic data, survey terrain was read into the model for the development site proximity. Furthermore, for the developed scenario, the design surface for the shared pedestrian and cyclist pathway and associated infrastructures were modelled in Civil Site Design and was extracted as DEM to be read into the model over initial topographic data and survey data.

2.3.2.1.2 Building Footprint

The footprint of the building in the original Model 1 of PRFS has been used without modification. In the model building footprints were digitised and removed from the active domain to prevent floodwater entering buildings and so represent the flow characteristics.

2.3.2.1.3 Hydraulic Structures

The hydraulic structures used in Model 1 of the Parramatta River flood study is used as it is for the analysis of the existing and proposed scenarios without any modification provided.

The Model 1 of PRFS contains stormwater drainage network that are Ø600mm or greater. The upgraded Ø300mm Pipe has not been modelled for the proposed scenario as this is less than Ø600mm. The parameters used for 1d network in TUFLOW are listed below.

- Pit inlets are modelled as 1D nodes with rectangular inlets, using dimensions from Council's stormwater pit and pipe database or field survey.
- Pits are linked to culverts, modelled as 1D elements, using 0.5 entry loss and 1.0 exit loss.
- A Manning's 'n' value of 0.015 has been assigned to all pipes.

2.3.2.1.4 Fences

Fences that cross major flow paths or influence flooding as presented in Model 1 (PRFS) have been included in the model as 2D Layered Flow Constraint Shapes (2D_lfcsh), with 80% blockage.

2.3.2.1.5 Surface Roughness

Manning's 'n' values have been assigned based on the original TUFLOW Model 1 (PRFS) as shown in Table 4.

Table 4: TUFLOW Materials Roughness

TUFLOW Material Type	Manning's 'n'	Material Description	Corresponding Council LEP Zoning
1	0.02	Watercourse	-
2	0.08	Low Density Industrial	General Industrial IN1
3	0.1	Moderate Density Industrial, substantial building with little permeability	General Industrial IN2
4	0.2	High Density Industrial, substantial building with almost no permeability	General Industrial IN3
5	0.06	Channel banks, moderate vegetation	-
6	0.08	Channel banks, dense vegetation	-
7	0.04	Low Density Residential	Low Density Residential R2

TUFLOW Material Type	Manning's 'n'	Material Description	Corresponding Council LEP Zoning
8	0.04	Medium Density Residential	Medium Density Residential R3
9	0.04	High Density Residential	High Density Residential R4
10	0.1	High Density Development	Neighbouring Centre B1
11	0.1	High Density Development	Local Centre B3
12	0.1	High Density Development	No Description B3
13	0.1	High Density Development	Mixed Use B4
14	0.1	High Density Development	Business Development B5
15	0.1	High Density Development	Enterprise Corridor B6
16	0.04	Parks, Grass and Some Trees	Public Recreation RE1 and RE2
17	0.015	Concrete Channel	-
18	0.1	High Density Development	Special Activities SP1
19	0.1	High Density Development	Infrastructures SP2
22	0.02	Road	-
23	0.03	Smooth Paved Ground, Carparks	-
24	0.1	Industrial Site – Paved Ground with Low Density Structures	-
25	0.045	Grass with medium density trees	-
26	0.035	Grass Only	-
27	0.07	Dense Trees with under brushes	-

2.3.2.1.6 Boundary Conditions

2.3.2.1.6.1 Inflows

Hydrological modelling was undertaken in XPRAFTS model and hydrographs have been extracted to be used in TUFLOW which was supplied by Stantec. As in the original Model 1 of PRFS hydrologic sub-catchment delineation methodology has been used for the analysis.

Inflow hydrographs were extracted from the hydrologic model and applied in the hydraulic model as inflow polygons. This approach assumes that runoff from a sub-catchment is concentrated into a small area with the sub-catchment, typically at the catchment outlets. In general, flows are applied at the downstream low points of each sub-catchment, except for the most upstream sub-catchments where a flow is applied at the centroid of the sub-catchment along the main drainage line. At the upstream boundaries, flows are input as a total flow from the hydrologic model derived for the upstream

catchments. These are input as either a 1d inflow for 1d channels or as a rectangular 2d_SA polygon and lines for 2d areas to distribute flow behaviour. For sub-catchments within a model, a local flow from that sub-catchment is applied to the hydraulic model. The inflows applied for this analysis is shown in Figure 16

In areas where the Mainstream and Tributary models overlap, inflow locations were adjusted to maintain hydraulic consistency and avoid artificial flow anomalies.

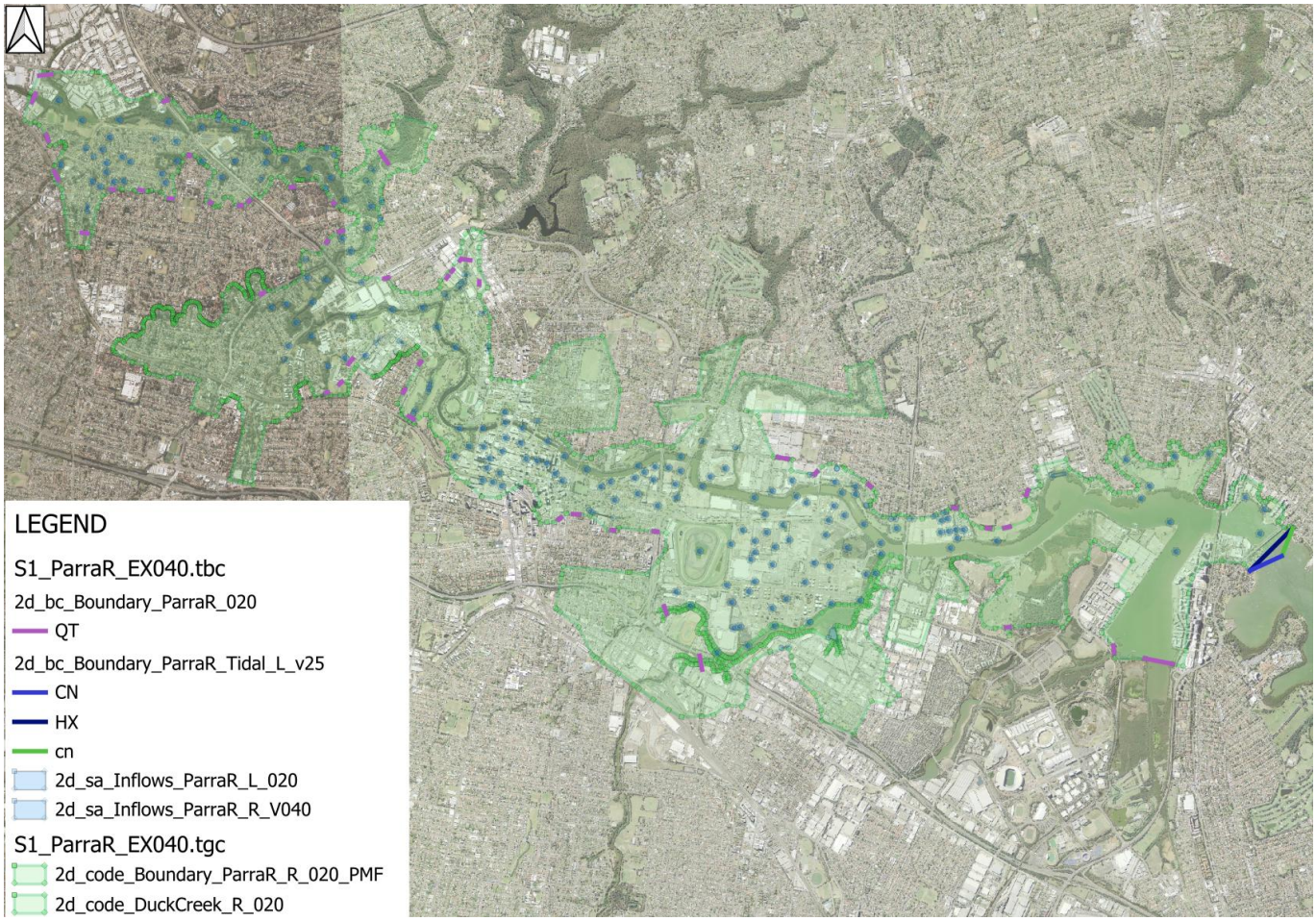


Figure 16: Boundary Conditions and Study Area

2.3.2.1.6.2 Downstream Boundary and Tailwater Conditions

The downstream boundary condition are listed as Tidal Constant represented by 2d_bc_Boundary_ParraR_Tidal_L_v25 in Figure 16 is used for this analysis.

2.4 Flood Events Simulations

TUFLOW model was run for the 5% AEP (20-year ARI) and 1% AEP (100-year ARI) event. Accordingly, flood maps were generated.

2.5 Flood Impact Analysis

After generating flood maps, the changes in water were analysed for 1% AEP flood events to assess any potential adverse impacts caused by the proposed development.

2.6 Flood Hazard Classification

The flood hazard also known as product of flood depth velocity generally provides baseline information for floodplain assessment study. In such a preliminary assessment of risks or as part of a constraint's analysis for strategic land use planning, a combined set of hazard vulnerability curves presented in Figure 17, Figure 18 and Table 5 can be used as general classification of flood hazard on site.

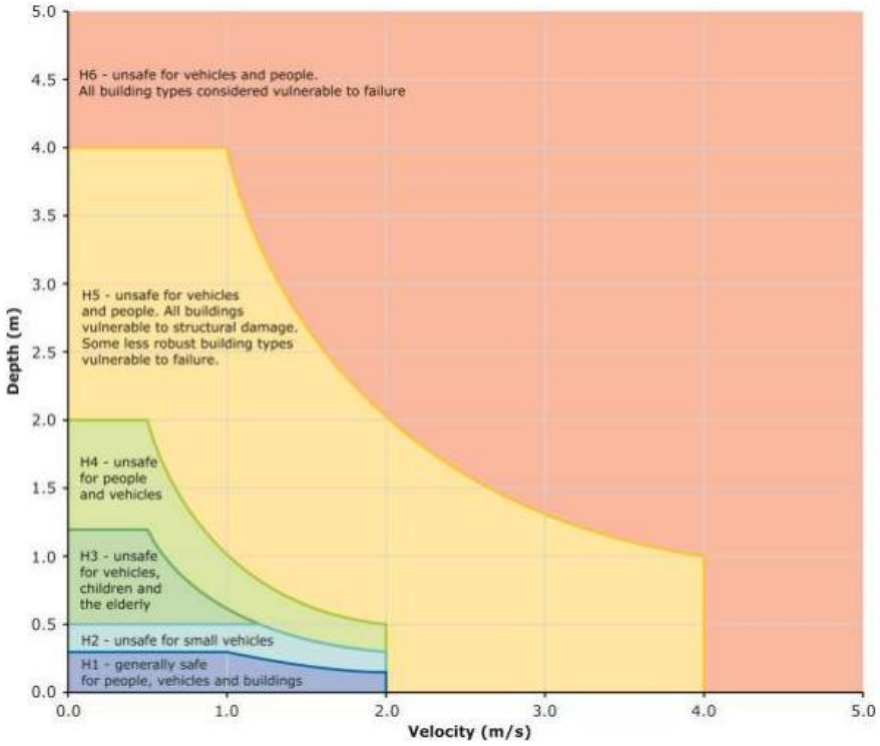


Figure 17: Flood Hazard Curve as per ARR Guideline

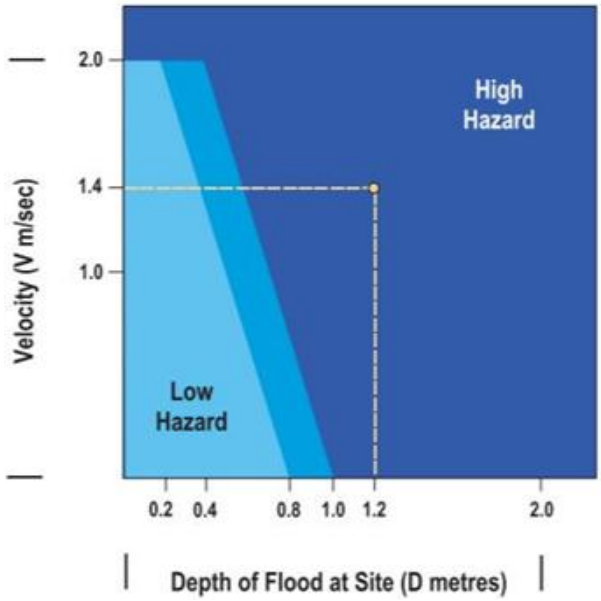


Figure 18: Flood Hazard Curve by Floodplain Development Manual (FDM)

The combined flood hazard curves presented in Figure 17 and Figure 18 sets hazard thresholds that relate to the vulnerability to the community when interacting with flood waters. Table 5 below shows the limits for the classifications provided in Figure 17.

Table 5: Combined Hazard Curves - Vulnerability thresholds classification limits

Hazard Vulnerability Classification	Classification limit (D and V in combination) m^2/s	Limiting still water depth (D) m	Limiting velocity (V) m/s
H1	D*V ≤ 0.3	0.3	2.0
H2	D*V ≤ 0.6	0.5	2.0
H3	D*V ≤ 0.6	1.2	2.0
H4	D*V ≤ 1.0	2.0	2.0
H5	D*V ≤ 4.0	4.0	4.0
H6	D*V > 4.0	-	-

3 Flood Modelling Outcome

TUFLOW model provides information on water level, depth, velocity and hazard that will occur from stormwater runoff. The results for 20-year and 100-year ARI event have been extracted and presented as flood maps in Appendix A.

3.1 Pre-Development Peak Flood Depth, Velocity, and Hazard Classification

The flood map shows that the proposed development location is affected by flooding from Parramatta River.

The flood maps presented in Figures A1 to A4 (Appendix A) illustrate the existing flood conditions for the 20-year ARI event, including flood extent, levels, depths, velocities, and hazard classification. Figure A1 indicates that the project site is subject to maximum flood level of 2.40m AHD. Figure A1 also shows that existing pathway will be affected by flood depth of up to 670mm. Figure A2 indicates that the maximum flood velocity reaches 0.21 m/s along the existing shared pathway. Figure A3 demonstrates that the depth-velocity product in the project vicinity along the existing pathway remains below 0.2 m^2/s. Figure A4 shows that the site vicinity falls within Flood Hazard Category H3.

The flood maps presented in Figures A5 to A8 (Appendix A) illustrate the existing flood conditions for the 100-year ARI event, including flood extent, levels, depths, velocities, and hazard classification. Figure A5 indicates that the project site is subject to maximum flood level of 4.35m AHD. Figure A5 also shows that existing pathway will be affected by flood depth of up to 2.62m. Figure A6 indicates that the maximum flood velocity reaches 0.64 m/s along the existing shared path. Figure A7 demonstrates that the depth-velocity product in the project vicinity along the existing pathway exceed 1 m^2/s. Figure A8 shows that the site vicinity falls within Flood Hazard Category H5.

3.2 Post -Development Peak Flood Depth, Velocity, and Hazard Classification

Figures A9 to A12 in Appendix A present the proposed flood conditions for the 100-year ARI event, corresponding to the same parameters adopted for the existing scenario with only addition of design surface to the existing model. Across most of the study area, flood characteristics in the proposed scenario remain unchanged from the existing conditions, including levels, velocities, and hazard categories.

3.3 Flood Impact Assessment

3.3.1 Impact on Peak Flood Levels

Figure A13 illustrate the predicted changes in peak flood levels along the vicinity of the proposed development due to construction of proposed development and associated civil infrastructure for the 1% AEP events. The model results indicate that there will not be any negative impact to the neighbouring properties due to construction of proposed shared pedestrian walkway.

3.3.2 Comparison Between Existing and Proposed Scenario

To determine the effect of the proposed development on the existing flooding scenario, the parameters of flood have been abstracted at comparison points shown in Figure 19. Table 6 show comparison of parameters (Water Surface Elevation, Depth, Velocity and Hazard) at these points during the existing and proposed scenarios.

Figure 19: Comparison Points for Flooding Parameters

Table 6: Comparison Table for 20-year ARI Storm Event

Points	Plan	W.S. Elev (m)	Depth (m)	Velocity (m/s)	Hazard (D x V)	Hazard Category (FDM)	Hazard Category (ARR Guidelines 2016)
1	Existing	4.36	2.61	0.41	1.0701	HIGH	H5
1	Proposed	4.36	2.61	0.40	1.044	HIGH	H5
2	Existing	4.36	2.62	0.64	1.6768	HIGH	H5
2	Proposed	4.36	2.60	0.64	1.664	HIGH	H5
3	Existing	4.36	2.58	0.62	1.5996	HIGH	H5
3	Proposed	4.36	2.59	0.62	1.6058	HIGH	H5
4	Existing	4.35	2.46	0.59	1.4514	HIGH	H5
4	Proposed	4.35	2.46	0.59	1.4514	HIGH	H5
5	Existing	4.35	2.28	0.61	1.3908	HIGH	H5
5	Proposed	4.35	2.01	0.60	1.206	HIGH	H5
6	Existing	4.35	2.40	0.62	0.0287	HIGH	H5
6	Proposed	4.35	2.39	0.55	0.0288	HIGH	H5
7	Existing	4.32	1.99	0.97	1.9303	HIGH	H5
7	Proposed	4.32	1.90	0.96	1.824	HIGH	H5
8	Existing	4.30	1.63	0.93	1.5159	HIGH	H5
8	Proposed	4.30	1.71	0.94	1.6074	HIGH	H5
9	Existing	4.29	1.44	0.90	1.296	HIGH	H5
9	Proposed	4.29	1.41	0.88	1.2408	HIGH	H5
10	Existing	4.28	1.33	0.68	0.9044	HIGH	H4
10	Proposed	4.28	1.31	0.68	0.8908	HIGH	H4
11	Existing	4.26	1.32	0.79	1.0428	HIGH	H5
11	Proposed	4.26	1.23	0.80	0.984	HIGH	H5
					1.0701		
12	Existing	4.24	1.27	0.66	1.044	HIGH	H4
12	Proposed	4.24	1.26	0.65		HIGH	H4

The comparison in Table 6 above illustrate that the flood level will remain same for all the points which is positive outcome. However, it is seen that the flood depth varies from the existing scenario which is due to change level in design surface of the pedestrian shared pathway.

4 Conclusion and Recommendations

The hydrological and hydraulic analysis demonstrates that the proposed shared pedestrian and cycleway design and associated drainage works, do not adversely impact runoff management across the study area. The flood impact assessment for the 100-year ARI event indicates that flood characteristics remain largely unchanged throughout the catchment, with no negative impacts identified within private property boundaries.

Flood modelling under the 20-year ARI event shows that the shared pathway is subject to a maximum flood depth of approximately 670 mm. Under the more extreme 100-year ARI event, the flood depth increases significantly, with depths reaching up to 2.62 m along the shared pathway.

The DRAINS modelling further demonstrates that the proposed drainage modifications will significantly improve the conveyance capacity of the existing network, thereby enhancing stormwater management under both minor and major rainfall events. Based on this investigation, the following recommendations are provided for implementation:

1. **Upgrading Pit 1\1 to Grated Surface Inlet Pit:** Replace existing concrete lid of Pit 1\1 with a grated surface inlet to improve efficiency of surface runoff capture and prevent surface runoff across the proposed shared pathway.
2. **Construct a formalised Headwall at 2\1:** Install a properly designed and constructed headwall at 2\1 to enhance inlet capacity, reduce erosion, and improve hydraulic performance at this location.
3. **Install Ø300 mm Class 4 RCP between Headwalls 2\1 and 2\2:**

   Replace the existing Ø225 mm uPVC pipe and a portion of the existing Ø300 mm RCP located beneath the proposed shared pathway with a Ø300 mm Class 4 reinforced concrete pipe (RCP). This upgrade will provide increased discharge capacity and sufficient structural strength in areas with low cover beneath the proposed shared pathway. It will significantly enhance hydraulic performance and improve durability, thereby reducing the risk of blockages or structural failure.

   The existing Ø300 mm RCP downstream of the shared pathway will be retained to minimise disturbance to established trees. To further reduce environmental impact, installation is proposed to be undertaken using hand digging methods to avoid damage to nearby tree root systems and preserve surrounding vegetation.
4. **Upgrade Pit 2\3 and Install Additional Inlet Pit:** Convert Pit 2/3 into a junction pit and install an additional surface inlet pit with a letterbox grate upstream. This will improve overland flow interception and ensure effective drainage of upstream catchments.
5. **Install Flood Depth Signage in Flood-Prone Areas:** Flood depths signage should be installed in areas where modelled flood depths exceed 500mm, as a public safety measures to warn pedestrian and cyclist of potential flood hazards.

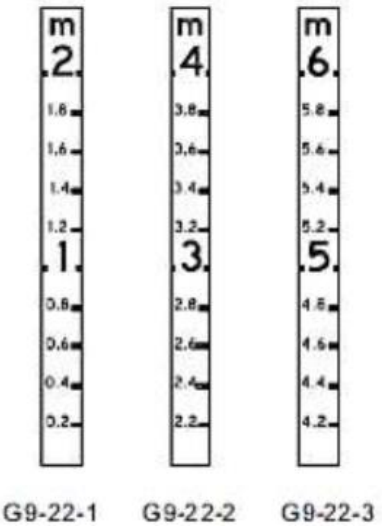


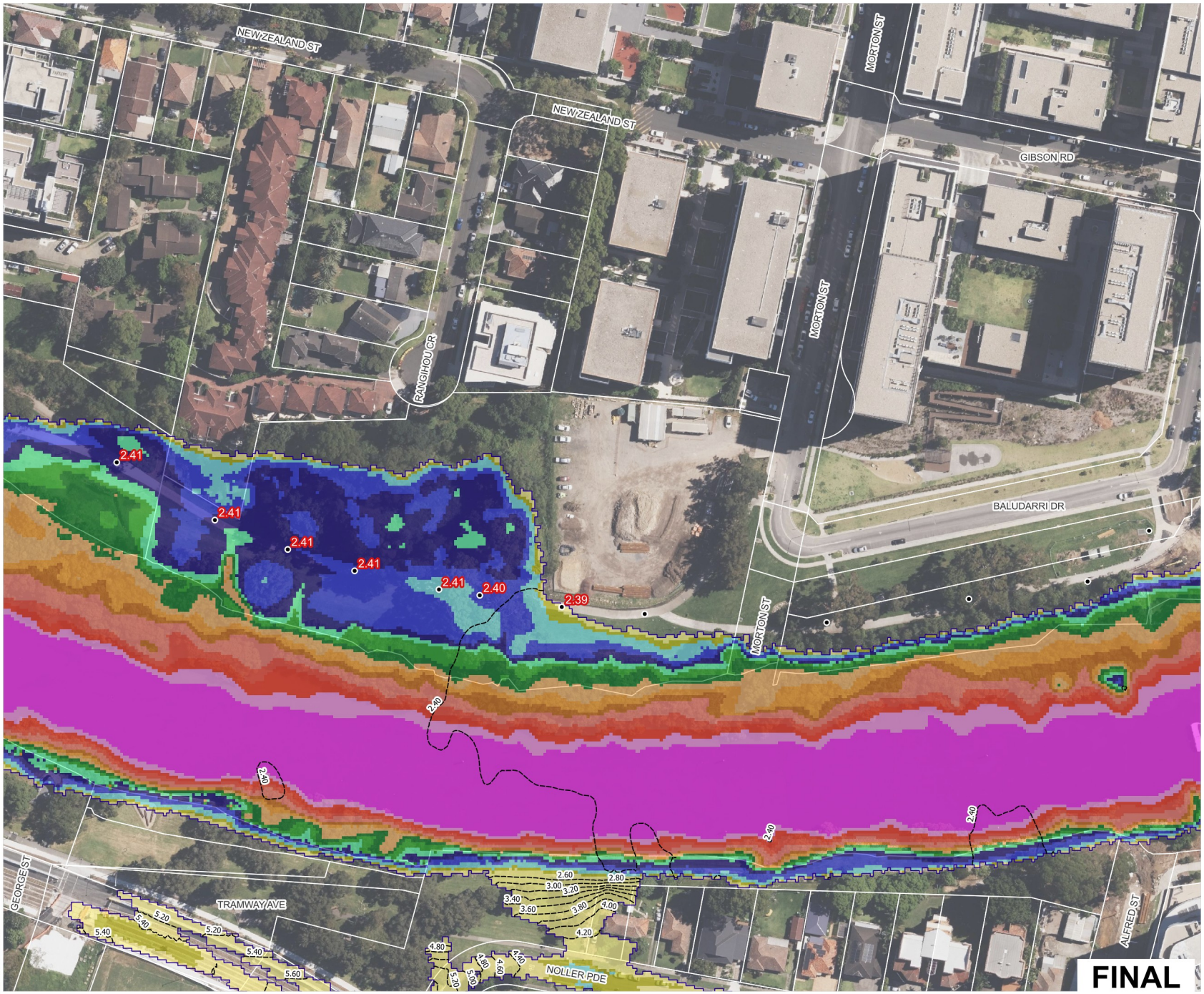
Figure 20: Flood Depth Signage to be implemented

- **Drainage Network - Line 2:**
  Runoff from upstream catchments (including New Zealand Street and Rangihou Crescent) will continue to be directed towards the marshland, which serves as temporary storage. Additionally, overland flow from Catchment 5 will be intercepted by the proposed swale and conveyed to the newly constructed Headwall 1\2. The proposed Ø300mm Class 4 RCP will safely convey the flow from upstream areas during 5-year and lesser storm events.

  During 20-year ARI event, ponding upto 200mm is expected within the marshland, after which approximately 64L/s of overland flow will be redirected to Pit1/1. This flow will be safely captured by new grated surface inlet pit (Pit 1\1) and conveyed downstream via the existing drainage network.

  The flood depth map presented in Figure A1 (Appendix A) shows that, during the 20-year ARI event, the marshland and the section along Line 1 and Line 2 become inundated by floodwaters from the Parramatta River, with depths reaching up to 670 mm. Based on this, the installation of the proposed Ø300 mm RCP is considered acceptable and appropriate for the site's flood conditions.

APPENDIX A 5% AEP (20-YEAR ARI) and 1% AEP (100-YEAR ARI) FLOOD MAPS



CITY OF PARRAMATTA

LEGEND

- 20pc_Existing_Max_H_Contour
- 20pc_Existing_Max_Fld_Lvl
- 20pc_Existing_Fld_Extent

20pc_4.5hr_Existing_Fld_Depth_Max

Band 1

- <= 0.10
- 0.10 - 0.20
- 0.20 - 0.40
- 0.40 - 0.60
- 0.60 - 0.80
- 0.80 - 1.00
- 1.00 - 1.20
- 1.20 - 1.40
- 1.40 - 1.60
- 1.60 - 1.80
- 1.80 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- > 4.00

NOTES:
1. REFER TO RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY FLOOD IMPACT ASSESSMENT REPORT BY CITY OF PARRAMATTA COUNCIL.

2. ALL LEVELS PRESENTED ARE IN METRES FROM AUSTRALIAN HEIGHT DATUM (mAHD).

10 0 10 20 30 m

1:1,250 (A3)

N

PROJECT:
RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY

CLIENT:

DRAWING TITLE:
EXISTING SCENARIO
5YR ARI STORM EVENT
MAXIMUM FLOOD DEPTH

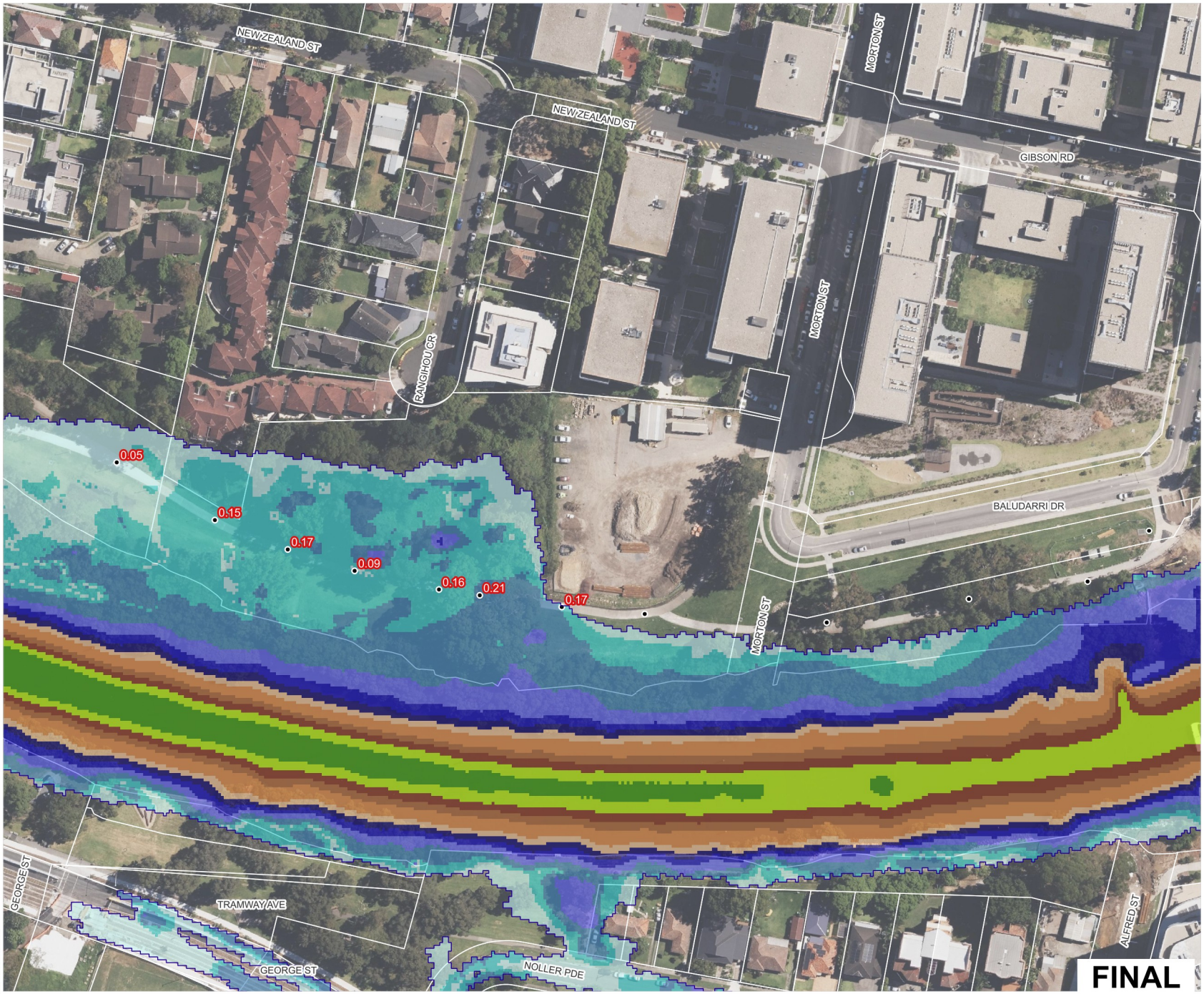
FIGURE: **A1**

ISSUE: **A**

ISS	BY	CHK	DATE	DETAILS
A	DM		29.05.25	FINAL
B				
C				
D				
E				

Z:\DM\PROJECTS\Rangihou_&_Reid\QGIS\Rangihou Reserve.qgz

COORDINATE REFERENCE SYSTEM: GDA1994 / MGA ZONE 56 HEIGHT DATUM: GDA1994



CITY OF PARRAMATTA

LEGEND

- 20pc_Existing_Fld_Extent
- 20pc_Existing_Max_Fld_Velocity

20pc_4.5hr_Existing_Velocity_Max
Band 1

- <= 0.10
- 0.10 - 0.20
- 0.20 - 0.40
- 0.40 - 0.60
- 0.60 - 0.80
- 0.80 - 1.00
- 1.00 - 1.20
- 1.20 - 1.60
- 1.60 - 1.80
- 1.80 - 2.00
- 2.00 - 2.20
- 2.20 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 5.00
- > 5.00

NOTES:
1. REFER TO RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY FLOOD IMPACT ASSESSMENT REPORT BY CITY OF PARRAMATTA COUNCIL.

2. ALL LEVELS PRESENTED ARE IN METRES FROM AUSTRALIAN HEIGHT DATUM (mAHD).

10 0 10 20 30 m

1:1,250 (A3)

N

PROJECT:
RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY

CLIENT:

DRAWING TITLE:
EXISTING SCENARIO 5YR ARI STORM EVENT MAXIMUM FLOOD VELOCITY

FIGURE: A2

ISSUE: A

ISS	BY	CHK	DATE	DETAILS
A	DM		29.05.25	FINAL
B				
C				
D				
E				

Z:\DM\PROJECTS\Rangihou_&_Reid\QGIS\Rangihou Reserve.qgz

COORDINATE REFERENCE SYSTEM: GDA1994 / MGA ZONE 56 HEIGHT DATUM: GDA1994