

SIMTA Stage 1 Biodiversity Assessment Report

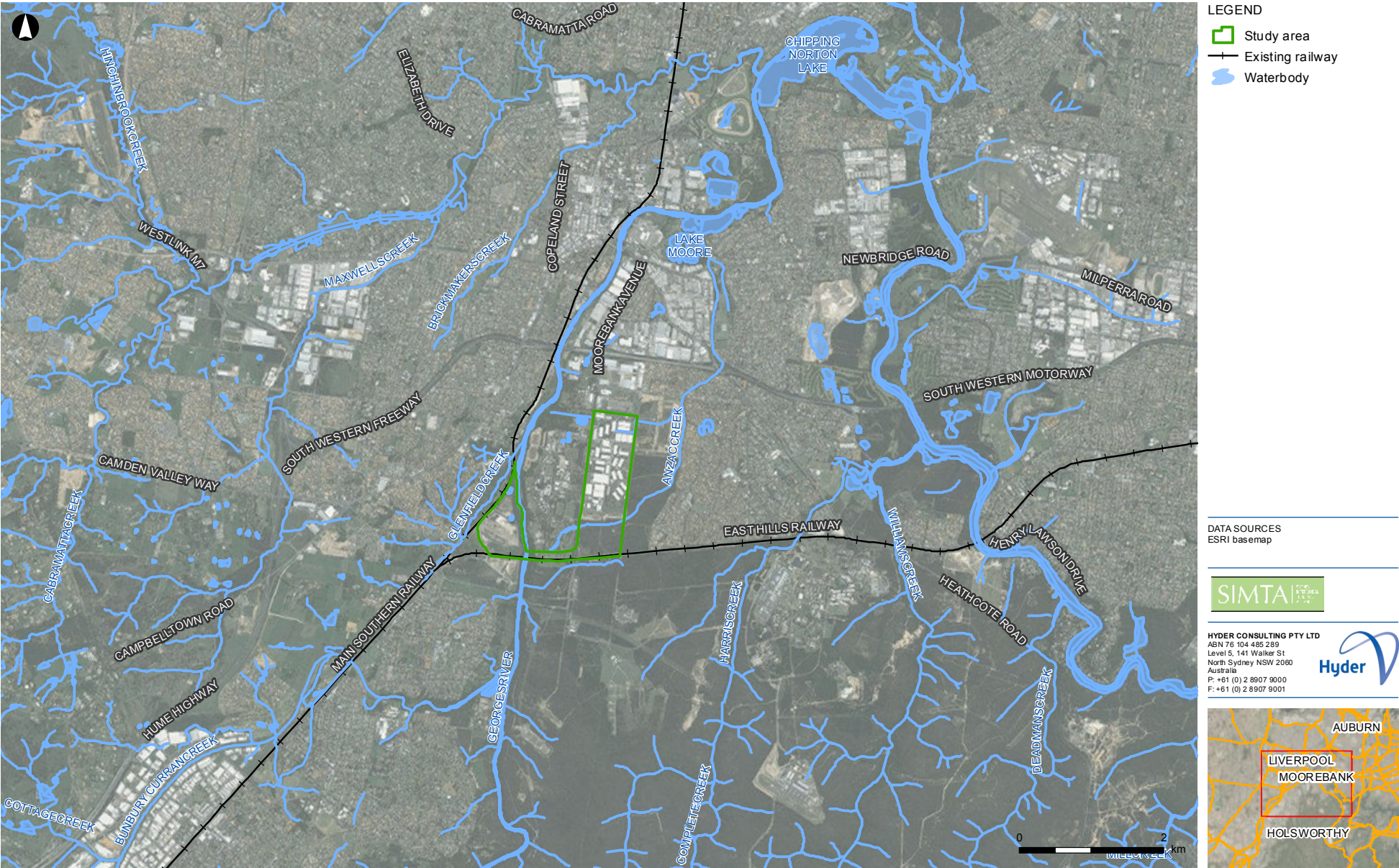


Figure 10: Watercourses and wetlands in the locality

3.4 LANDSCAPE VALUE SCORE

The landscape value has been calculated from the site-based methodology outlined in Appendix 4 of the *Framework for Biodiversity Assessment* (OEH 2014) (FBA) by determining the following:

1. Percent native vegetation cover in the landscape – percentage of all land within the inner and outer assessment circles that contains native vegetation is to be calculated for the current extent of cover and future extent of cover once clearing for the development has occurred.
2. Connectivity value – the value determined by identifying connecting links and state or regional biodiversity links. Where the development will impact on more than one connecting link, a connectivity value must be determined for each link based on the linkage widths and conditions. State significant biodiversity links have a connectivity value of 12 and regionally significant biodiversity links have a connectivity value score of 9.
3. Patch size score – determined from the percentage of native vegetation that has been cleared within the Mitchell landscape in which most of the development occurs and the patch size class. The patch size class considers the largest patch of native vegetation occurring within or connecting to the study area and attributing a size class between nil or small to extra large, dependent on the size of the patch in hectares and the percentage of native vegetation cleared.

A discussion of each of these determining factors in relation to the study area is provided below.

Native vegetation cover in landscape

Two assessment circles were mapped to determine the percent current extent of native vegetation cover within and adjacent to the development site. In accordance with the allowable combinations of inner and outer assessment circles in Table 8 of the FBA, an inner circle of 200 hectares and an outer circle of 2000 hectares were used. Both circles were centred on the area of greatest native vegetation loss in the study area, with the inner assessment circle placed to capture most of the native vegetation in the development site.

The native vegetation cover in the landscape was determined with reference to the regional vegetation mapping by DECCW (2009). All native vegetation types mapped by DECCW (2009) within the inner and outer assessment circles were considered to represent the current native vegetation cover. The future native vegetation cover was determined by subtracting the area of native vegetation to be cleared for the Proposal from the current summed native vegetation cover in each circle. Native vegetation cover percentages were calculated as a proportion of all land within each assessment circle that contains native vegetation. The current and future percentage of native vegetation cover in the inner and outer assessment circles has been provided in Table 10. Scores for each percent cover was then determined using the score criteria in Table 9, Appendix 4 of the FBA.

Table 10 Scores for the assessment of landscape value

Criteria	Assessment circle	% cover	Score
Current native vegetation cover	Inner assessment circle	31-35	8.45
	Outer assessment circle	31-35	8.45
Future native vegetation	Inner assessment circle	31-35	8.45

Criteria	Assessment circle	% cover	Score
cover	Outer assessment circle	31-35	8.45

Connectivity value

Two connecting links have been identified on the Stage 1 site - the link to native vegetation surrounding the Southern Boot Land and the Georges River. The vegetation in both locations represent native vegetation in moderate to good condition (although the riparian vegetation adjoining the Georges River is degraded), have a patch size greater than 1 hectare and minimal cleared or hostile land features between patches of vegetation.

The Cumberland Plain Priority Conservation Lands are located within and adjacent to the Boot Land, including a portion of the Rail Corridor (Southern Boot Land). These lands are considered to be a regionally significant biodiversity link by OEH and are shown in Figure 1 and Figure 3. The corresponding connectivity value is 9.

The Georges River is a 6th order stream and as such the riparian buffer 50 metres either side is considered to be a state significant biodiversity link in accordance with Appendix 4 of the FBA. This link is also shown in Figure 1 and Figure 3. The corresponding connectivity value is 12.

The higher of the two connectivity scores is considered to be the final connectivity score. This would therefore be a score of 12.

No further assessment of connectivity value is required for the Major Project calculator assessment. Further general discussion on fauna habitat connectivity is provided in Section 4.8.3.

Patch size

The Georges River Alluvial Plain is the Mitchell landscape that covers the largest part of the construction area (Figure 1). Using the DECCW (2009) mapping of the Sydney Metropolitan Catchment Management Area (SMCMA), the percent native vegetation cleared in the Georges River Alluvial Plain Mitchell landscape is calculated to be 86%. The size of the largest patch of native vegetation occurring in the study area is the riparian corridor adjoining the Georges River, which covers approximately 167 hectares within the Georges River Alluvial Plain landscape. The Boot Land also covers an area of 90.5 hectares, including land outside the study area. In accordance with the criteria in Table 15 of Appendix 4 of the FBA, the patch size class is considered to be *extra large* with a corresponding patch size score of 12.

4 NATIVE VEGETATION

4.1 BACKGROUND

4.1.1 MAPPING DATASETS

Benson (1992) mapped the vegetation of the Penrith 1:100 000 map sheet. The SIMTA site was mapped as “Cleared”, the associated lands were mapped as “map unit 14a: Castlereagh Scribbly Gum Woodland” and the strip of vegetation adjoining the Georges River was mapped as “map unit 9b: River-flat Forest”.

Five different plant communities were mapped in the study area in the NPWS (2002)/Tozer (2003) mapping of the Cumberland Plain (Figure 7) as follows:

- Alluvial Woodland
- Castlereagh Scribbly Gum Woodland
- Castlereagh Swamp Woodland
- Cooks River Castlereagh Ironbark Forest
- Riparian Forest

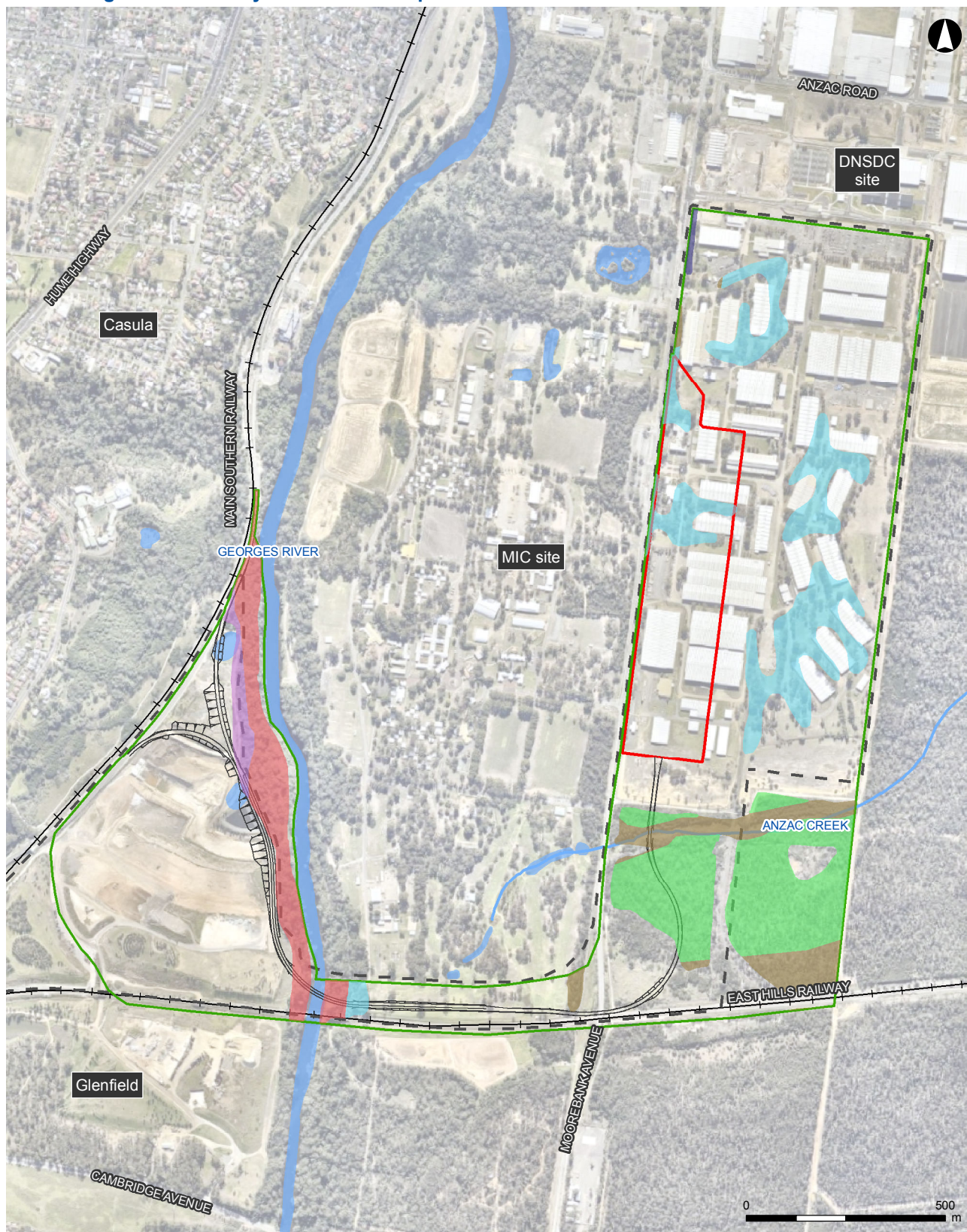
All plant communities correspond with threatened ecological communities (TECs) listed under the TSC Act. The mapped TECs and their threatened status are listed in Table 7.

The conservation significance assessment by NPWS (2002b) mapped the vegetation in the study area as follows (Figure 8):

- Core habitat: two patches of Cooks River Castlereagh Ironbark Forest in the north-west and west of the SIMTA site, the large patch of Castlereagh Scribbly Gum Woodland and Castlereagh Swamp Woodland to the south of the SIMTA site within the Rail Corridor, the strip of Cooks River Castlereagh Ironbark Forest adjoining the eastern edge of the MIC site, and the patches of Riparian Forest adjoining the Georges River.
- Support to core habitat: Alluvial Woodland and Riparian Forest adjoining the north-eastern boundary of the Glenfield Waste Facility and extending on to the northern tip of this site.
- Other remnant vegetation: the small patch of Shale Plains Woodland that falls partially within the south-western corner of the study area.
- Urban remnant trees (critically endangered community): two patches of Cooks River Castlereagh Ironbark Forest in the east of the SIMTA site.

DECCW (2009) mapped the vegetation of the Sydney Metropolitan Catchment Management Authority (CMA) Area. The Sydney CMA area encompasses the eastern portions of the Sydney Metropolitan, extending from the coastline to the catchments that flow to the Parramatta, Georges and Hacking River.

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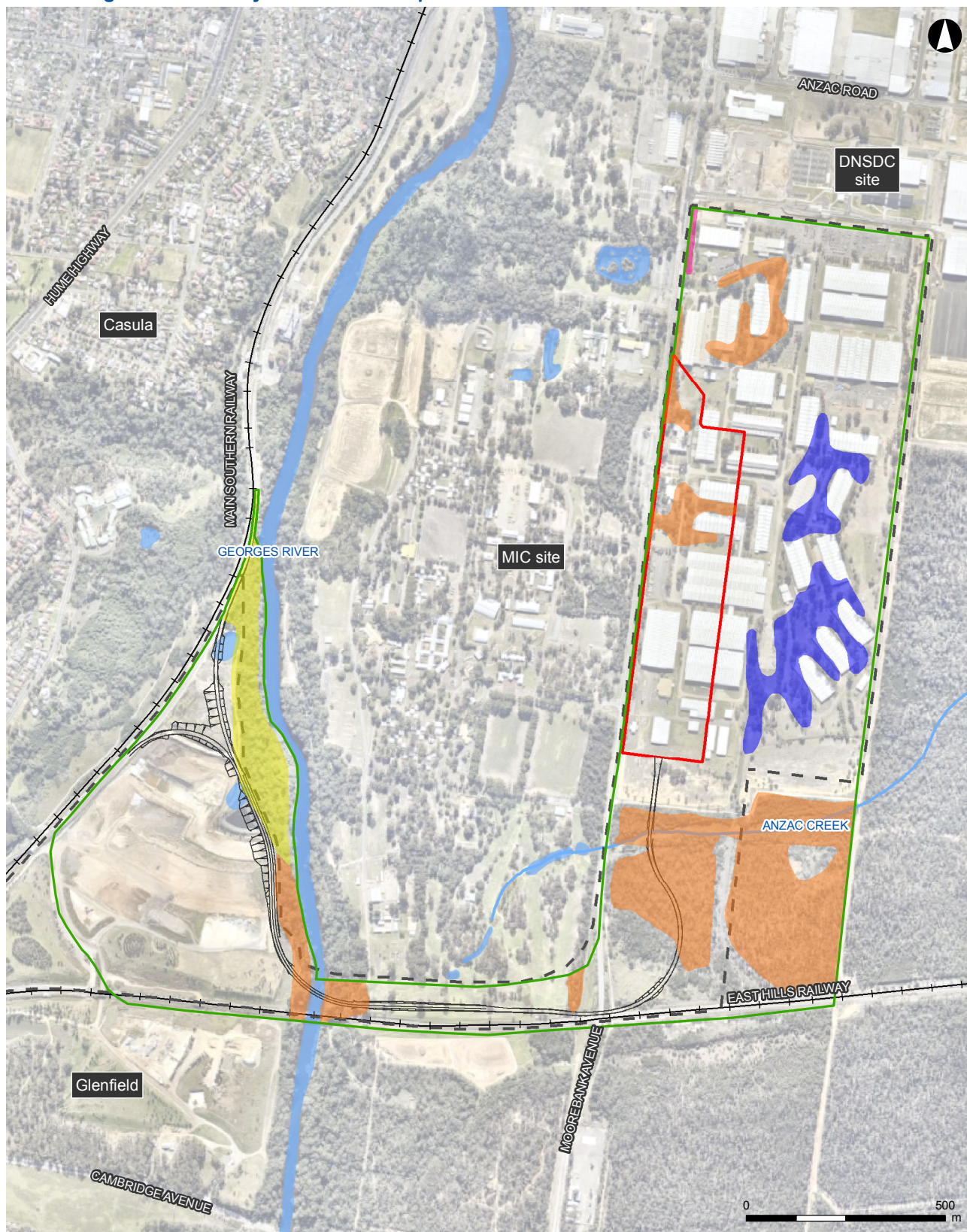
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|-------------------------|--|---|
| Project site | Vegetation communities (NPWS 2002/Tozer 2003) | Cooks River Castlereagh Ironbark Forest |
| Operational area | Alluvial Woodland | Riparian Forest |
| Proposed rail alignment | Castlereagh Scribbly Gum Woodland | Shale Plains Woodland |
| Study area | Castlereagh Swamp Woodland | Shale/Gravel Transition Forest |

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Figure 11: NPWS (2002)/Tozer (2003) vegetation mapping in development site

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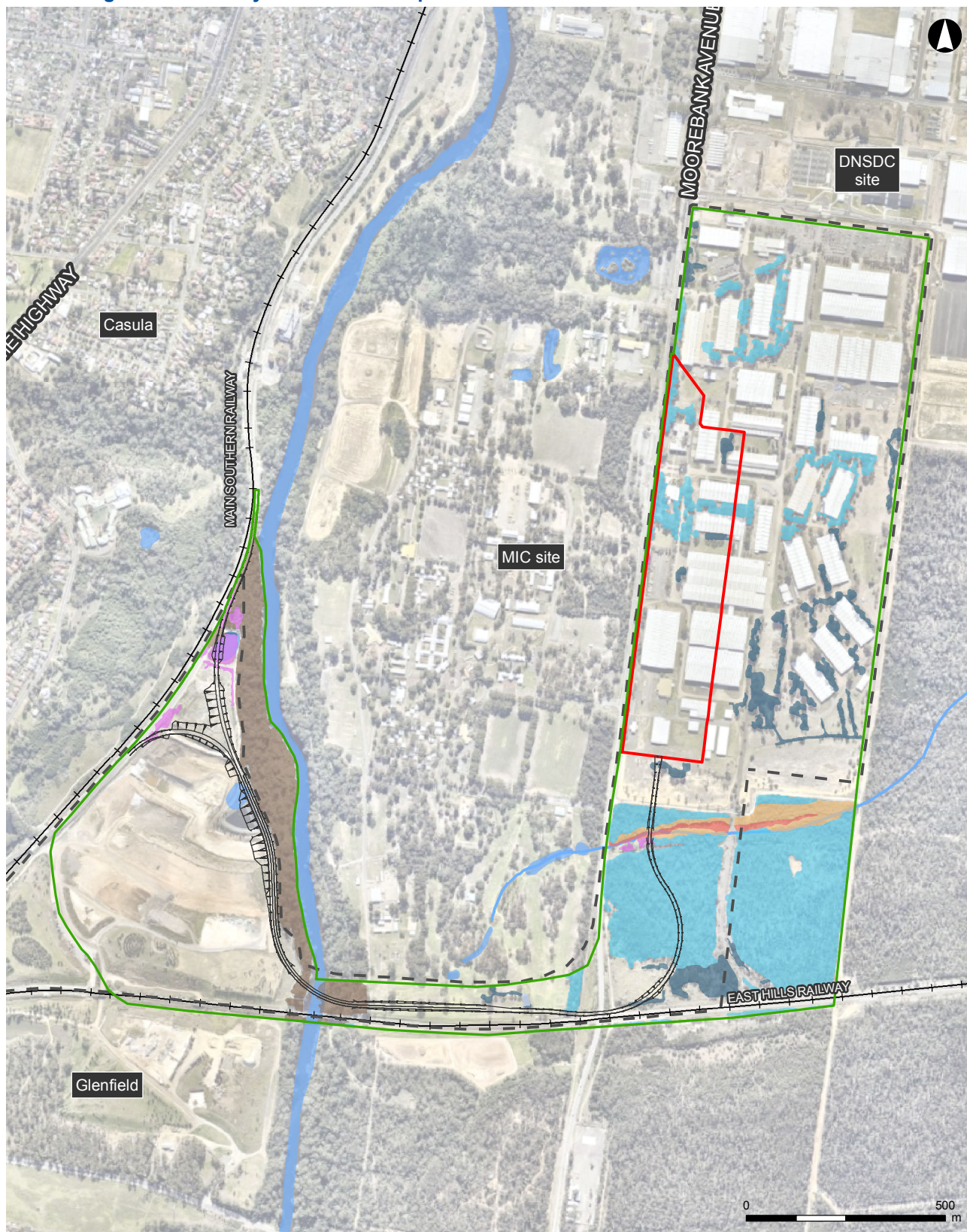
- | | | |
|-------------------------|---------------------------------------|---|
| Project site | Conservation Significance (NPWS 2002) | Other Remnant Vegetation |
| Operational area | Core Habitat | Urban Remnant Trees (Critically Endangered Community) |
| Proposed rail alignment | Support to Core Habitat | |
| Study area | | |

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Figure 12: NPWS (2002) Conservation significance mapping in development site

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LEGEND

- | | | |
|-------------------------|-----------------------------------|-----------|
| Project site | Castlereagh Scribbly Gum Woodland | Urban E/N |
| Operational area | Castlereagh Swamp Woodland | Weed Ex |
| Proposed rail alignment | River Flat Eucalypt Forest | Water |
| Study area | Coastal Freshwater Reedland | |

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Figure 13: DECCW (2009) vegetation mapping in development site

Four different native vegetation communities were mapped within the study area (Figure 9); all correspond with threatened ecological communities under the TSC Act (Table 11).

Table 11 Vegetation communities mapped by DECCW (2009) and corresponding TECs

Vegetation map unit (DECCW 2009)	Corresponding TEC	EPBC Act Status	TSC Act Status
Castlereagh Scribbly Gum Woodland	Castlereagh Scribbly Gum Woodland in the Sydney Basin bioregion	Endangered	Vulnerable
Castlereagh Swamp Woodland	Castlereagh Swamp Woodland	Not listed	Endangered
Coastal Freshwater Reedland	Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Not listed	Endangered
Hinterland Flats Eucalypt Forest	River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Not listed	Endangered

The vegetation mapping of NPWS (2002)/Tozer (2003) and DECCW (2009) in the study area was compared (Table 12).

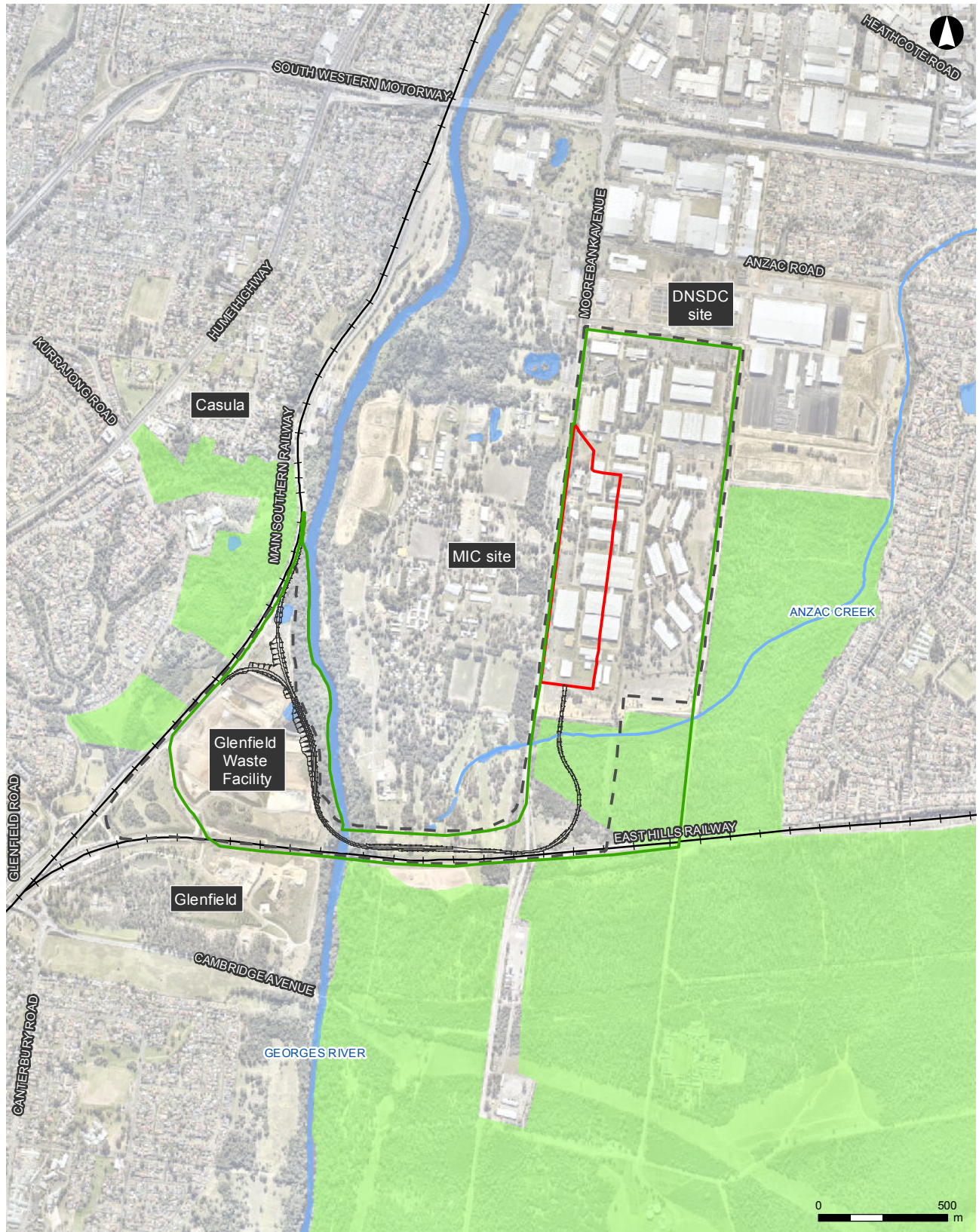
Table 12 Comparison of vegetation mapping in the study area

Vegetation community	Area of vegetation community mapped within study area (hectares)			
	NPWS 2002/ Tozer (2003)		DECCW (2009)	
	>10% Canopy cover	<10% Canopy cover	Low to moderate disturbance	High to very high disturbance/ not assessed
Alluvial Woodland	1.52	0.02	N/A	N/A
Castlereagh Ironbark Forest	8.87	4.45	N/A	N/A
Castlereagh Swamp Woodland	5.07	0.50	1.32	0.55
Castlereagh Scribbly Gum Woodland	14.98	N/A	18.87	7.29
Riparian Woodland/Hinterland Flats Eucalypt Forest	4.18	2.92	N/A	8.81
Shale/Gravel Transition Forest	0.25	N/A	N/A	N/A
Coastal Freshwater Reedland	N/A	N/A	N/A	0.66
Urban/Exotic vegetation	N/A	N/A	N/A	7.28

Vegetation community	Area of vegetation community mapped within study area (hectares)			
	NPWS 2002/ Tozer (2003)		DECCW (2009)	
	>10% Canopy cover	<10% Canopy cover	Low to moderate disturbance	High to very high disturbance/ not assessed
Total vegetation mapped	34.86	7.88	20.19	24.6

The mapping by NPWS (2002)/Tozer (2003) and DECCW (2009) is similar, with the major difference being the classification of patches on the SIMTA site as Cooks River Castlereagh Ironbark Forest by NPWS (2002)/Tozer (2003) whereas DECCW (2009) classifies these areas as “Urban E_N” and Castlereagh Scribbly Gum Woodland.

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LEGEND

- Project site
- Operational area
- Proposed rail alignment
- Study area
- Existing railway
- Watercourse
- Cumberland Plain Priority Conservation Lands

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Figure 14: Priority Conservation Lands of the Cumberland Plain

4.2 FIELD SURVEY EFFORT

Terrestrial flora surveys of the study area have been conducted over a total of eighteen days between May 2011 and March 2015. Quadrat sampling of vegetation communities was initially undertaken in May 2011 and May 2012, with quadrats resampled in November 2014, January 2015 and March 2015 to assess any changes in vegetation condition and maintain consistency with the methodology required by the FBA.

In order to comprehensively describe the structure and floristics of each sampled plant community, plot-based surveys were used. Plot-based surveys also provide a concentrated search area for the detection of inconspicuous plant species that may be present at a particular site. The surveys were conducted in accordance with the guidelines in Section 5 of the FBA. The structure and floristics of each plant community present in the study area were sampled using twelve 0.1 hectare quadrats. The quadrats were in the form of a 20 metre x 50 metre plot with a nested 20 metre x 20 metre plot (Figure 15).

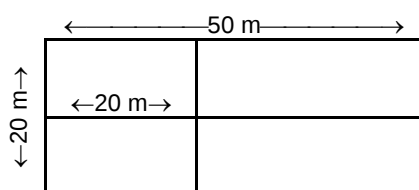


Figure 15 Flora quadrat layout

The extent of vegetation sampling required was established through review of regional vegetation mapping and site reconnaissance to determine the vegetation type and condition. Once preliminary vegetation zones were identified and mapped, the minimum number of quadrats for each zone was identified with reference to Table 3 of the FBA. Plots were established randomly within each vegetation zone, with some plots placed deliberately to sample any observed variation in vegetation structure within a vegetation zone. The quadrat locations are shown on Figure 16.

Floristic data were collected from each plot in accordance with the Table 1 of the FBA (Table 13).

Table 13 Data collected from vegetation plots

Variable	Data collected
Stratum (and layer)	Stratum and layer in which each species occurs
Growth form	Growth form for each recorded species
Species name	Scientific name and common name (where applicable)
Cover	A measure or estimate of the appropriate cover measure for each species recorded within the 20 m x 20 m plot. Recorded from 1–5% and then to the nearest 5%. If the cover of a species is less than 1% and the species is considered important, then the estimated cover is entered (e.g. 0.4)

Variable	Data collected
Abundance rating	A relative measure of the number of individuals or shoots of a species within the 20 m x 20 m plot using the following intervals (numbers above about 20 are estimates only): 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required

During the terrestrial flora survey the vegetation condition was assessed and rated according to the degree to which it resembled relatively natural, undisturbed vegetation. The initial condition assessment was based on visual assessment of the current habitat condition for each of the PCTs identified in the study area.

Site attribute data were collected from each plot in accordance with Table 2 of the FBA (Table 14).

Table 14 Site attribute data collected from vegetation plots

Site attribute	Data collected
Indigenous plant species richness	Number of indigenous plant species within 20 m x 20 m plot
Native over-storey cover	Estimate of percent foliage cover at 10 points (every 5 m) along the 50 m transect
Native mid-storey cover	Estimate of percent foliage cover at 10 points (every 5 m) along the 50 m transect
Native ground cover (grasses)	At 50 points along the 50 m transect (every 1 m), recorded whether native grass intersects that point.
Native ground cover (shrubs)	At 50 points along the 50 m transect (every 1 m), recorded whether native ground cover (shrub) intersects that point.
Native ground cover (other)	At 50 points along the 50 m transect (every 1 m), recorded whether native ground cover (other) intersects that point.
Exotic plant cover	Measured as total percent foliage cover of all exotics in all strata; exotic cover measured using the same method as for native over-storey, mid-storey and ground cover.
Number of trees with hollows	Count of the number of living and dead trees within the 50 m x 20 m plot that have at least one hollow.
Regeneration	Measured as the proportion of over-storey species present in the zone that are regenerating (i.e. with diameter at breast height < 5 cm).
Total length of fallen logs	Total length of logs at least 10 cm in diameter and at least 0.5 m long.

The vegetation condition data obtained for each vegetation community in quadrats was used to obtain site attribute scores and given a weighting as per Table 2 in the FBA. The scores were assessed against the Vegetation Type Benchmarks for the identified vegetation types in the VIS classification database.

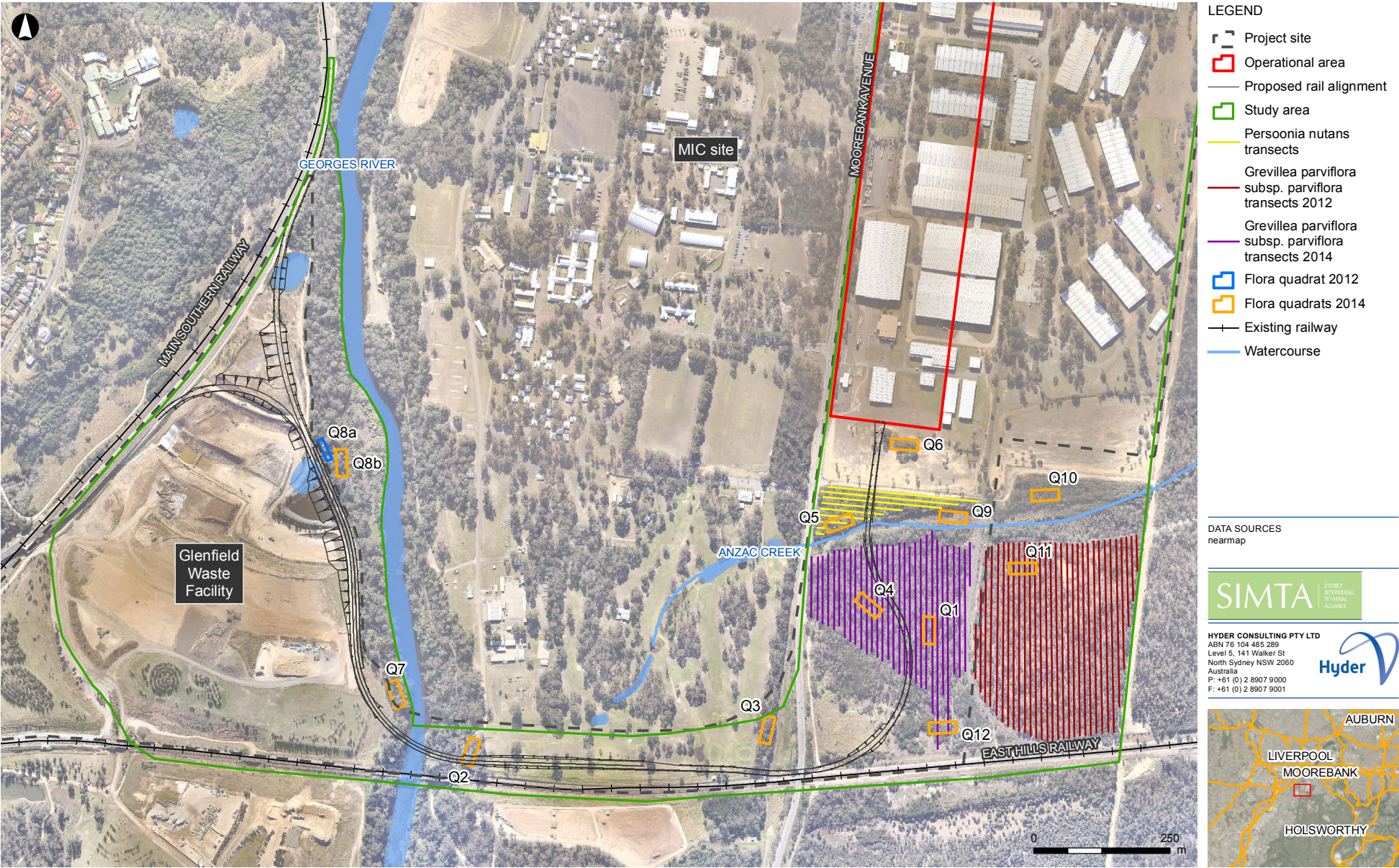


Figure 16: Flora survey effort

4.3 VEGETATION OBSERVATIONS

A total of 310 vascular plant species were recorded in the study area, comprising 213 local native species, eight non-local native species (mainly planted trees) and 89 exotic species. A list of plant species recorded in the study area is provided in Appendix D.

SIMTA site

The SIMTA site was formerly used for the Defence National Storage and Distribution Centre (DNSDC). The site contains numerous large warehouse buildings and is covered by a network of roads, carparks and other hardstand areas. The site was largely developed between 1939 and 1945 and trees were probably planted at or shortly after this time, as there are distinct rows of tree crowns visible on the 1955 aerial photograph. Further development occurred in the early 1990s (Artefact 2015), whereupon additional plantings or landscaping would have occurred.

There are currently mature and mainly healthy trees lining the roads and paved areas (Plate 1, Plate 2). Planted tree species are typical of cultivated eucalypts that are commonly found as mature street trees in suburban Sydney, with *Eucalyptus microcorys* (Tallowwood), *E. saligna* (Sydney Blue Gum), *Corymbia maculata* (Spotted Gum) and *C. citriodora* (Lemon-scented Gum) frequently recorded. The results of the tree survey are provided in greater detail in Section 4.3.1.



Plate 1. Mature trees of *Eucalyptus saligna* and *Corymbia maculata* on SIMTA site



Plate 2. Mature trees of *Eucalyptus microcorys* on SIMTA site

The ground layer in the non-paved areas of the SIMTA site consisted of mown grass lawns, dominated by *Cynodon dactylon* (Couch), *Pennisetum clandestinum* (Kikuyu) and other exotic grass species; there was a native grass component persisting in some locations, with native grasses observed including *Paspalidium distans*, *Austrodanthonia* sp. (Wallaby Grass) and *Eragrostis leptostachya* (Paddock Lovegrass) as well as some small native herbs.

In the south of the SIMTA site is a network of drainage channels with some tree plantings and some apparent tree and shrub regeneration. The channels supported a mixture of native, non-local native and exotic trees and shrubs including *Eucalyptus saligna*, *E. tereticornis* (Forest Red Gum), *Corymbia maculata*, *Melaleuca quinquenervia* (Broad-leaved Paperbark), *Casuarina glauca* (Swamp Oak) and *Eucalyptus parramattensis* (Parramatta Red Gum).

There was one area adjoining the disused rail line in the south-east of the SIMTA site that supported native understorey (Plate 3, Plate 4); it is possible that this area has been subject to management as there were mesh tree guards around the bases of two trees. This area supported mature trees of *Eucalyptus sclerophylla* (Hard-leaved Scribbly Gum) and numerous shrubs of *Acacia* spp., *Allocasuarina littoralis* (Black She-oak), *Hakea salicifolia* (Willow Hakea) and *Melaleuca nodosa* (Ball Honey-myrtle). The ground layer was characterised by native

grasses including *Aristida ramosa* (Wiregrass), *Entolasia stricta* (Wiry Panic), *Paspalidium distans* and *Themeda australis* (Kangaroo Grass) and there were a number of small groundlayer herb and shrub species including *Astroloma humifusum* (Cranberry Heath), *Laxmannia gracilis* (Slender Wire Lily), *Pimelea linifolia* (Slender Rice Flower) and *Lomandra* spp. Exotic cover was low, with *Eragrostis curvula* (African Lovegrass) dominating in patches.



Plate 3. Native regrowth near existing rail line in SIMTA site



Plate 4. Native regrowth near rail spur in southern part of the SIMTA site

East of SIMTA site (Boot Land)

The area to the east of the SIMTA site, although outside of the current study area, was inspected during the current survey. An approximately 20 to 25 metre wide cleared powerline easement adjoins the eastern boundary of the SIMTA site. The vegetation beneath the powerline consists largely of slashed grassland dominated by the exotic perennial grass *Eragrostis curvula*, with scattered eucalypt and shrub regrowth (Plate 5). A dirt track runs north-south beneath the powerline.

The bushland to the east of the powerline easement consists of an open forest of *Eucalyptus crebra* (Narrow-leaved Ironbark), *E. fibrosa* (Red Ironbark), *Corymbia maculata* and *E. tereticornis* with a midlayer of *Acacia decurrens* (Black Wattle), *Allocasuarina littoralis* and *Melaleuca decora* (White Cloud Tree). Common species observed in the shrub layer included *Bursaria spinosa* (Boxthorn), *Daviesia ulicifolia* (Gorse Bitter-pea) and *Exocarpos cupressiformis* (Cherry Ballart), and the ground layer was grassy and herbaceous with *Themeda australis*, *Austrostipa pubescens* (Speargrass), and *Aristida vagans* (Threeawn Speargrass) frequently observed. The edge of the forest adjoining the cleared easement was disturbed, with incursions of *Eragrostis curvula* observed in some areas (Plate 6).



Plate 5. Looking south along powerline easement to east of SIMTA site



Plate 6. Bushland to east of SIMTA site

Former DNSDC South

Immediately to the south of the SIMTA site in the Former DNSDC South is a large area of mown grassland with waterlogged soils in patches. There are scattered large trees of *Eucalyptus sclerophylla* to 16 metres in height as well as some *E. parramattensis* in this area, most with native shrubs and groundcover species growing around the bases (Plate 7, Plate 8). These trees are visible on the 1951 aerial photograph where they appear to be much smaller; the surrounding area in the south was cleared and filled between 1930 and 1951 and appears as mostly bare soil on aerial photographs from 1961 to 1994 (Table 6). This area presently supports patchy grassland and boggy, waterlogged soils.

The largest patch of native understorey was sampled in Quadrat 6. It is not clear whether this area has been planted or managed as a landscape area; there were a few cut logs around 1 metre in length placed around the edges of the patch, and it has not been mown or slashed recently, whereas surrounding areas have been. The shrub and groundcover species are all local natives that also occur in the bushland to the south, including *Kunzea ambigua* (Tick-bush), *Astroloma humifusum*, *Aristida ramosa* and *Microlaena stipoides* (Weeping Grass). The endangered species *Persoonia nutans* (Nodding Geebung) was recorded in the shrub layer beneath two trees in the west of this area.



Plate 7. *Eucalyptus sclerophylla* as scattered trees with patches of native understorey south of SIMTA site



Plate 8. Native groundlayer species growing at base of *E. sclerophylla* to south of SIMTA site

Southern Boot Land

To the south of the SIMTA site is a fenced area of bushland bordered by the existing rail spur to the east, and Moorebank Avenue to the west. Anzac Creek runs from west to east in the northern portion of this bushland.

The section of Anzac Creek within the study area consists of a shallow muddy waterbody, with limited standing water observed at the time of survey, supporting dense stands of *Typha orientalis* (Broad-leaf Cumbungi) and *Bolboschoenus fluviatilis* (Club-rush) with *Alternanthera philoxeroides* (Alligator Weed) abundant in the lower stratum. In 2011 and 2012, a dense infestation of *Salvinia molesta* (Salvinia) was observed on the creek surface immediately to the west of the railway line (Plate 9, Plate 10). This was not observed during vegetation surveys in 2014.



Plate 9. Anzac Creek to west of existing rail spur, showing *Salvinia molesta* infestation in foreground and native sedges and rushes further upstream



Plate 10. Ground layer of wetland in Anzac Creek

Fringing Anzac Creek is a narrow band of swamp woodland dominated by *Melaleuca linariifolia* (Flax-leaved Paperbark); the understorey of this forest varied from sedges, especially *Leptocarpus tenax* which dominated in patches, to ferns, grasses and dense shrubs. To the south of the eastern part of Anzac Creek there were occasional emergent trees of *Angophora subvelutina* (Broad-leaved Apple) and *Eucalyptus sclerophylla*.

Adjoining the southern bank of the western section of Anzac Creek the vegetation is disturbed and dominated by exotic vegetation, with a large stand of *Phyllostachys aurea* (Golden Bamboo), thickets of *Acacia decurrens* (Black Wattle) and *Pennisetum clandestinum* forming a carpet over a raised, uneven ground surface, likely to be fill material deposited in this location decades ago (Plate 11). Exposed soil beneath a fallen tree showed soil mixed with broken concrete tiles (Plate 12). *Agave americana* (Century Plant) and *Aloe maculata* (Common Soap Aloe) were also growing in this location, suggesting dumped landscape or garden waste.



Plate 11. Disturbed area south of Anzac Creek: *Pennisetum clandestinum*, *Agave americana* and *Phyllostachys aurea*



Plate 12. Exposed fill material in disturbed area

South of Anzac Creek there is an access track, relatively open in the west but overgrown in the east. Along the track, and in the bushland to the north is a quantity of dumped rubble, mainly building materials including concrete slabs, bricks, and strips of metal (Plate 13, Plate 14). A lot of this material was overgrown by vegetation, suggesting it had been there for some time.



Plate 13. Piled bricks and rubble at edge of bushland south of Anzac Creek



Plate 14. Concrete slabs and bricks next to overgrown fill piles at edge of bushland south of Anzac Creek

To the south of the track adjoining the disturbed area is a large tract of relatively intact woodland. The woodland is dominated by *Eucalyptus sclerophylla* and *E. parramattensis* with a subcanopy of *Angophora bakeri* (Narrow-leaved Apple) and *Melaleuca decora* (White Cloud Tree). The understorey varies in structure from relatively open in the mid-layer with dense grass and low shrubs (Plate 15) to dense shrubs and a sparse shrub and grass understorey (Plate 16). The shrub and ground layers have a high level of species diversity.



Plate 15. Woodland with open, grassy understorey



Plate 16. Woodland with dense shrubby understorey

In the south near the existing rail line the woodland adjoins degraded areas that have previously been subject to clearing and disturbance (Plate 17). In the south-west is a large fenced area that was not accessible during any of the surveys. Based on observations from outside the fence and analysis of current and historical aerial photographs, this fenced area consists of scattered trees and tall shrubs – mainly *Acacia decurrens* and/or *A. parramattensis* (Parramatta Green Wattle) – and a disturbed groundlayer dominated by exotic grasses and pasture weeds (Plate 18).



Plate 17. Disturbed grassland with thickets of *Acacia* spp. near existing rail line



Plate 18. Fenced area in south of Rail Corridor lands

MIC site

The vegetation of the MIC site, including the SME Golf Course, is characterised by regularly mown greens and fairways and managed rough areas with rows of planted trees between fairways. Adjoining the eastern edge of the SME Golf Course within the Rail Corridor was a thin strip of bushland approximately 25 metres wide. The canopy was composed of *Eucalyptus sclerophylla*, *E. parramattensis* and *Angophora bakeri* to a height of approximately 10 m; there was a dense shrub layer in the understorey, with *Pultenaea villosa* (Hairy Bush-pea), *Kunzea ambigua*, *Bursaria spinosa* (Blackthorn), *Lambertia formosa* (Mountain Devil) and *Micrantheum ericoides* all common (Plate 19).

Despite its width and the large edge to area ratio, this vegetation was in relatively good condition with a low number of exotic species recorded in the drier parts of the bushland. In the south of the strip of bushland was a large pool of standing water (Plate 20) fringed by *Melaleuca linariifolia* and *M. nodosa* with native rushes and herbs including *Leptocarpus tenax* and *Persicaria decipiens* (Slender Knotweed) at the water's edge. Adjoining the north-eastern section of the waterbody was a large bank of disturbed, mounded soil supporting a dense cover of *Pennisetum clandestinum* (Kikuyu).



Plate 19. Bushland adjoining eastern boundary of SME Golf Course



Plate 20. Standing water in south of bushland adjoining eastern boundary of SME Golf Course

Banks of Georges River

To the west of the MIC site, the land within approximately 100 metres of the eastern bank of the Georges River supports forest vegetation. On the steep slope adjacent to the riverbank was severely degraded riparian vegetation, currently reduced to mature trees of *Eucalyptus saligna* x *botryoides* (Blue Gum/Bangalay hybrid) and *E. longifolia* (Woollybutt) with an understorey dominated by *Ligustrum sinense* (Small-leaved Privet) and smothered by exotic weeds, mainly

Cardiospermum grandiflorum (Balloon Vine), *Lantana camara* (Lantana) and *Delairea odorata* (Cape Ivy) (Plate 21, Plate 22).

The vegetation was less disturbed upslope and included a mixed native and exotic understorey with mature trees of *E. saligna* x *botryoides*. Given the relatively low native diversity coupled with low exotic cover in upslope areas, it is likely that there has been weed removal in this area and that the native understorey is regenerating.



Plate 21. Degraded riparian vegetation on eastern bank of Georges River



Plate 22. Degraded riparian vegetation

On the western bank of the Georges River, adjacent to the Glenfield Waste Facility, the vegetation was similar in structure and condition to that on the eastern bank. The southern part of the riparian forest on the study area supported a canopy dominated by *Eucalyptus saligna* x *botryoides* to 20 metres in height (Plate 23).

The understorey on the river flats near the existing rail bridge consisted of a mixture of local native shrub, herb and grass species and some dense stands of *Olea europaea* subsp. *cuspidata* and *Lantana camara*, with *Tradescantia fluminensis* dominating the ground layer in some areas.

In the northern parts of the riparian corridor, the landform changes, with the very steep slopes above the river flats. The steep slopes support trees of *Eucalyptus saligna* x *botryoides* and *E. baueriana* over a dense shrub layer of *Olea europaea* subsp. *cuspidata*, *Ligustrum lucidum* and *Lantana camara* (Plate 24). The native small tree species *Backhousia myrtifolia* (Grey Myrtle) and *Melaleuca decora* occurred sporadically.



Plate 23. Edge of riparian vegetation on western bank of Georges River in south of study area



Plate 24. Riparian vegetation on western bank of Georges River with dense weed understorey

At the base of the steep slope on the west side of the Georges River, there were wetlands on the river flats dominated by exotic species including *Ludwigia peruviana* (Peruvian Primrose) and *Alternanthera philoxeroides* (Alligator Weed), with scattered occurrence of the native reed *Typha orientalis*. A stand of *Salix alba* (White Willow) dominated the centre of this area (Plate 25).

Closer to the bank, most areas were covered in a dense carpet of weedy vines, predominantly *Delairea odorata* and *Cardiospermum grandiflorum*, with *Pennisetum clandestinum* dominating the ground layer (Plate 26).



Plate 25. Wetlands at base of slope on west side of Georges River



Plate 26. Weed-infested vegetation on western banks of Georges River

Glenfield Waste Facility

Most of the area of Glenfield Waste Facility within the study area is currently an active quarry and landfill site (Plate 27). The natural landform has been excavated and the vegetation consists of weedy exotic herbs and grasses and some native shrubs and small trees, some of which may have been planted as part of revegetation of constructed slopes (Plate 28). The native trees and shrubs *Angophora floribunda*, *Acacia decurrens* and *Acacia binervia* were abundant on the slope adjoining the eastern haul road.



Plate 27. View of Glenfield Waste Facility from eastern haul road



Plate 28. Native shrubs planted on slopes.

4.3.1 TREE SURVEY

A total of 590 trees were identified on the SIMTA site in 2011 based on field interpretation of tree locations on the site survey plan prepared by Hard and Forester dated 3 August 2010. It

should be noted that not all of the trees on the plan were identified due to survey limitations; it was also observed that there were numerous trees on site not included on the survey plan.

A total of 43 different tree species were recorded on the SIMTA site (Table 15). The most frequently recorded tree was *Eucalyptus microcorys*, followed by *Eucalyptus tereticornis*, *Corymbia maculata* and *Corymbia citriodora*. Most of the trees were assessed as being in good health.

Table 15 Tree species recorded on the SIMTA site

Botanical name	Common name	Count
<i>Acacia binervia</i>	Coast Myall	1
<i>Acacia parramattensis</i>	Parramatta Green Wattle	6
<i>Angophora bakeri</i>	Small-leaved Apple	1
<i>Angophora costata</i>	Sydney Red Gum	2
<i>Angophora floribunda</i>	Rough-barked Apple	7
<i>Araucaria heterophylla</i>	Norfolk Island Pine	1
<i>Callistemon linearis</i>	Narrow-leaved Bottlebrush	1
<i>Callistemon salignus</i>	White Bottlebrush	2
<i>Casuarina glauca</i>	Swamp Oak	3
<i>Cinnamomum camphora</i>	Camphor-laurel	3
<i>Corymbia citriodora</i>	Lemon-scented Gum	54
<i>Corymbia eximia</i>	Yellow Bloodwood	1
<i>Corymbia maculata</i>	Spotted Gum	55
<i>Cupressus sempervirens</i>	Pencil Pine	4
<i>Erythrina x sykesii</i>	Coral Tree	1
<i>Eucalyptus amplifolia</i>	Cabbage Gum	3
<i>Eucalyptus botryoides</i>	Bangalay	2
<i>Eucalyptus camaldulensis</i>	River Red Gum	13
<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	28
<i>Eucalyptus fibrosa</i>	Red Ironbark	9
<i>Eucalyptus longifolia</i>	Woollybutt	14
<i>Eucalyptus microcorys</i>	Tallowwood	152
<i>Eucalyptus moluccana</i>	Grey Box	14
<i>Eucalyptus parramattensis</i>	Parramatta Red Gum	3
<i>Eucalyptus punctata</i>	Grey Gum	6
<i>Eucalyptus racemosa</i>	Snappy Gum	1
<i>Eucalyptus saligna</i>	Sydney Blue Gum	30
<i>Eucalyptus sclerophylla</i>	Scribbly Gum	30

Botanical name	Common name	Count
<i>Eucalyptus sideroxylon</i>	Mugga	14
<i>Eucalyptus</i> sp. (unidentified)	N/A	25
<i>Eucalyptus tereticornis</i>	Forest Red Gum	57
<i>Grevillea robusta</i>	Silky Oak	3
<i>Jacaranda mimosifolia</i>	Jacaranda	1
<i>Liquidambar styraciflua</i>	Liquidambar	2
<i>Lophostemon confertus</i>	Brush Box	28
<i>Melaleuca decora</i>	White Cloud Tree	2
<i>Nerium oleander</i>	Oleander	1
<i>Pinus</i> sp.	Pine	1
<i>Quercus palustris</i>	Pin Oak	2
<i>Sorbus</i> sp.	Rowan, Service Tree	2
<i>Syncarpia glomulifera</i>	Turpentine	1
<i>Triadica sebifera</i>	Chinese Tallow Tree	4
Total		590

4.4 PLANT COMMUNITY TYPES OF THE STUDY AREA

Based on the results of the field assessment, the vegetation communities in the study area are generally consistent with the vegetation mapping of DECCW (2009), with the exception that the vegetation within the SIMTA site consists almost entirely of planted trees with a mown or managed groundlayer dominated by exotic grasses, or fragmented regrowth and plantings along drainage lines.

The vegetation communities identified in the study area were assigned to the equivalent or best fit Plant Community Type (PCT) according to the NSW PCT classification as described in the Vegetation Information System (VIS) database. The estimated percent cleared value of each PCT in the Sydney Metro CMA was sourced from the VIS database (9 March 2015). The PCTs in the study area are listed in Table 16 and shown on Figure 17.

Table 16 Plant community types (PCTs) identified in the study area

Vegetation class (Keith 2004)	PCT ID	Plant Community Type	Estimated clearance of PCT since European settlement	Area (ha) in study area	Area (ha) in development site
Sydney Sand Flats Dry Sclerophyll Forest	ME003	Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin	50%	20.27	10.42

Vegetation class (Keith 2004)	PCT ID	Plant Community Type	Estimated clearance of PCT since European settlement	Area (ha) in study area	Area (ha) in development site
Cumberland Dry Sclerophyll Forests	ME005	Parramatta Red Gum woodland on moist alluvium of the Cumberland Plain, Sydney Basin	45%	4.08`	0.94
Coastal Valley Grassy Woodlands	ME018	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin	95%	7.13	7.08
Coastal Freshwater Lagoons	ME007	Coastal freshwater lagoons of the Sydney Basin and South-east Corner	70%	0.67	0.42

PCTs were identified following review of existing regional mapping (NPWS 2002/Tozer 2003, DECCW 2009), soil and geology attributes, landscape position and structural and floristic attributes recorded during site assessments. The justification for assigning PCTs in the study area is provided in Table 17.

Table 17 Justification for identification of PCTs in the study area

PCT	Species relied upon for ID of PCT	Justification of evidence used to identify a PCT
Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin	<i>Eucalyptus sclerophylla</i> <i>Eucalyptus parramattensis</i>	Previous regional mapping as an equivalent vegetation type Landscape position Characteristic tree species present Structure and species composition is consistent with descriptions in VIS database and published references.
Parramatta Red Gum woodland on moist alluvium of the Cumberland Plain, Sydney Basin	<i>Eucalyptus parramattensis</i> <i>Melaleuca linariifolia</i> <i>Melaleuca decora</i>	Previous regional mapping as an equivalent vegetation type Landscape position Characteristic tree species present Structure and species composition is consistent with descriptions in VIS database and published references.
Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin	<i>Eucalyptus saligna x botryoides</i> <i>Eucalyptus longifolia</i>	Previous regional mapping as an equivalent vegetation type Landscape position Absence of any other appropriate equivalent PCT in the VIS database

PCT	Species relied upon for ID of PCT	Justification of evidence used to identify a PCT
Coastal freshwater lagoons of the Sydney Basin and South-east Corner	<i>Typha orientalis</i> <i>Bolboschoenus fluviatilis</i>	Previous regional mapping as an equivalent vegetation type Landscape position Structure and species composition is consistent with descriptions in VIS database and/or published references.

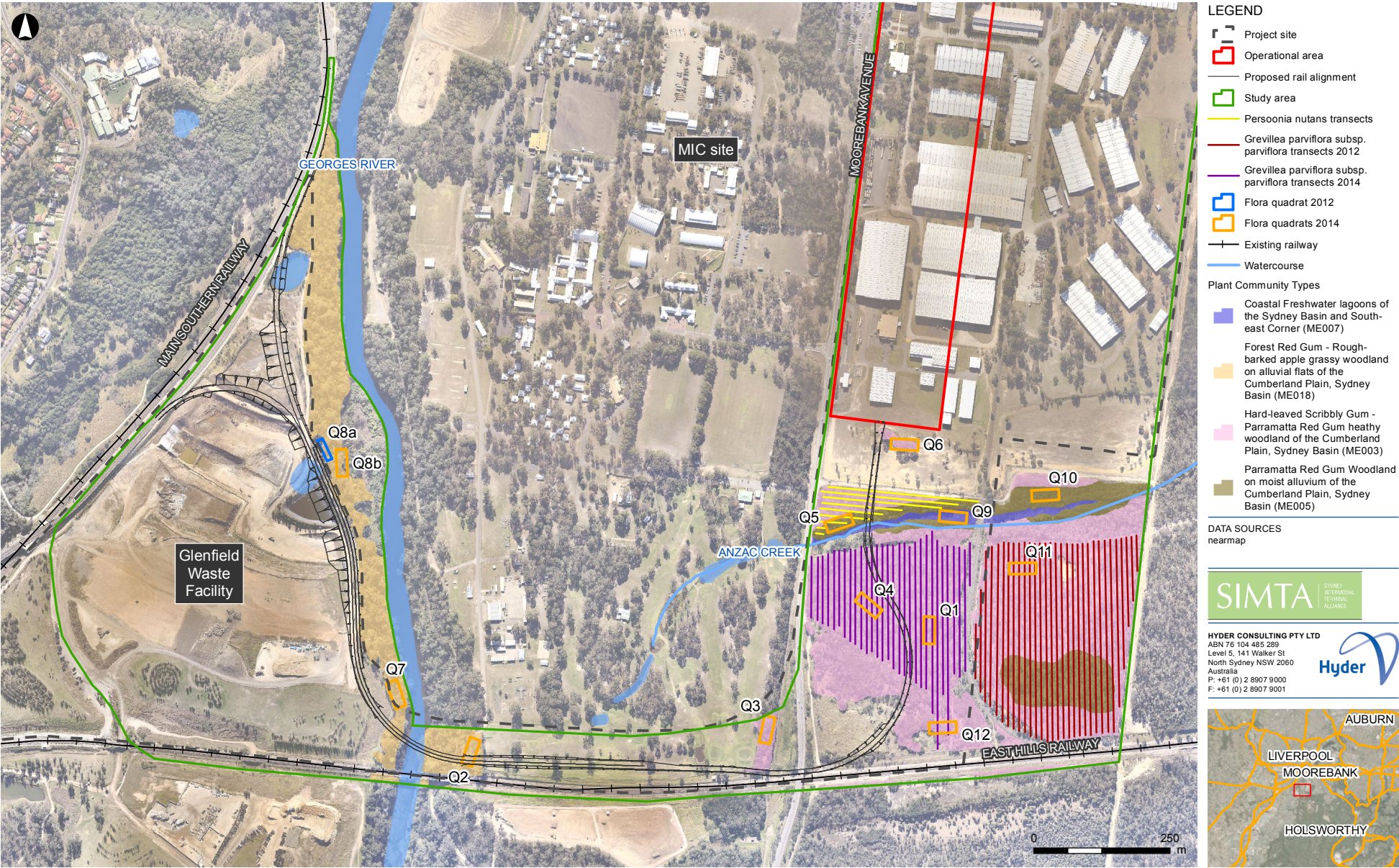


Figure 17: Plant Community Types identified in the study area

4.4.1 ENDANGERED ECOLOGICAL COMMUNITIES

The four PCTS identified in the study area fall within the definitions of threatened ecological communities listed under the TSC Act as per Table 18 and are mapped in Figure 18.

Table 18 Threatened ecological communities recorded in the study area

Plant Community Type	Equivalent TEC	TSC Act Status
Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin	Castlereagh Scribbly Gum Woodland in the Sydney Basin bioregion	Vulnerable
Parramatta Red Gum woodland on moist alluvium of the Cumberland Plain, Sydney Basin	Castlereagh Swamp Woodland	Endangered
Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin	River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South-east Corner bioregions	Endangered
Coastal freshwater lagoons of the Sydney Basin and South-east Corner	Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South-east Corner bioregions	Endangered

Based on the results of the field assessment, the extent of these communities is generally consistent with the vegetation mapping of DECCW (2009), with the exception that the vegetation within the SIMTA site consists almost entirely of planted trees with a mown or managed groundlayer, and does not meet the criteria for any threatened ecological communities. The extent of Castlereagh Swamp Woodland in the study area is difficult to assess as this community intergrades with Castlereagh Scribbly Gum Woodland.

Castlereagh Scribbly Gum Woodland

This community occurs in the Rail Corridor lands to the south of the SIMTA site, and in a narrow strip adjoining the eastern edge of the MIC site. The community was of woodland structure and canopy dominants were *Eucalyptus sclerophylla*, *E. parramattensis* and *Angophora bakeri*. The understorey ranged from densely shrubby to relatively open with grasses and low shrubs dominant.

There were also remnant scattered *E. sclerophylla* over patches of shrub and grass cover in the cleared grassland immediately south of the SIMTA site. Although the trees and groundcover species in these patches are characteristic of Castlereagh Scribbly Gum Woodland, it is difficult to determine whether these fragments meet the criteria for the vulnerable ecological community. It is not known whether the scattered trees of *Eucalyptus sclerophylla* were planted or regenerated following clearing in the 1950s, and if planted, whether the stock was sourced from the local bushland.

It is considered more likely that these trees regenerated from the seedbank, given the species are the same as those in bushland to the south, and the regeneration of the native understorey suggests that the natural soils are intact in these locations. The application of the precautionary principle would require consideration of this area as regrowth, highly fragmented Castlereagh Scribbly Gum Woodland.

Castlereagh Swamp Woodland

The vegetation adjoining Anzac Creek grades from Castlereagh Swamp Woodland to Castlereagh Scribbly Gum Woodland. There is no clear boundary between the communities, and much of the vegetation could be considered transitional.

Based on interpretation of the 'Final Determination' for Castlereagh Swamp Woodland and reference to vegetation community descriptions in Tozer (2003) and DECCW (2009), it was concluded that the thin strips of *Melaleuca*-dominated woodland with occasional *Eucalyptus parramattensis* and *Angophora subvelutina* adjoining the banks of Anzac Creek were most consistent with this community.

River-flat Eucalypt Forest on Coastal Floodplains

The degraded riparian vegetation adjoining the Georges River loosely meets the criteria for River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South-east Corner bioregions.

The riparian vegetation in the study area consists of remnant trees of *Eucalyptus botryoides* x *saligna* and *Eucalyptus longifolia* and scattered small trees of *Acacia implexa* (Hickory Wattle) and *Hakea salicifolia* with an understorey was dominated by dense cover of *Ligustrum sinense* and *Cardiospermum grandiflorum*, which was smothering the shrub and ground layer. Further upslope were areas of riparian forest with higher native diversity and lower exotic cover.

Freshwater Wetlands on Coastal Floodplains

Anzac Creek supported a wetland dominated by *Typha orientalis* and *Bolboschoenus fluviatilis*. The wetland was in poor to moderate condition with a dense infestation of the noxious weed *Alternanthera philoxeroides* in the lower stratum and the aquatic weed *Myriophyllum aquaticum* (Parrots Feather) also abundant. This wetland meets the criteria for Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South-east Corner bioregions.