ANNE CLEMENTS & ASSOCIATES PTY. LIMITED
(ABN 41 077 242 365, ACN 077-160-939)
Environmental and Botanical Consultants
PO Box 1623, North Sydney 2059
Phone: (02) 9955 9733, Facsimile: (02) 9957 4343
Email: mail@acabotanic.com

25 May 2011

Summary of the Flora Assessment:

Lot 103, DP 1070029; Lot 1, DP 85111; and Lots 21 and 22, DP 733092; 180 Nuwarra Road, Moorebank; and Lot 2210, DP1090818; and Lot 52, DP717957; Cantello Avenue, Hammondville.

Prepared by:

Dr AnneMarie Clements
Polly Simmonds

Prepared for:

New Brighton Golf Course
180 – 184 Nuwarra Road,
Moorebank, NSW, 2170

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1.0 Introduction

This report summarises the main findings of the Flora Assessment (Clements *et al*. 2011) for the current New Brighton Golf Course to the north of the M5 Motorway, and the former Greenwood Golf Course to the south of the M5 Motorway (and including part of Lt. Cantello Reserve; Figure 1).

The Site is on the western bank of the Georges River (Figure 1), with the landform generally less than 10 m AHD, except in the northwest. The low-lying land has been modified on both the former Greenwood Golf Course and on the New Brighton Golf Course, with buggy ways, fairways and greens tending to be higher than between-fairway vegetation.
Most of the Site, generally excluding the existing and most of the former fairways (but not all), is mapped as Environmentally significant land (Liverpool City Council 2008) (Figure 2). The location of former fairways is based on an orthotopo map provided by a club member (Figure 3), and is relatively consistent with the clearing pattern on the 1970 aerial photograph.

On the New Brighton Golf Course, there are cut drains in the between fairway vegetation (Figure 4). The dams on the New Brighton Golf Course have recently been enlarged to irrigate the golf fairways above 10 m AHD (OzGreen 2004). The former Greenwood Golf Course had two dams surrounded by constructed batters, of which, one remains. During the surveys, the fairways on the New Brighton Golf Course were in use and the fairways on the former Greenwood Golf Course were being colonised by mainly exotic species with scattered native species. Vegetation of the former Greenwood Golf Course is generally highly degraded and the between fairway vegetation on the New Brighton Golf Course was degraded.

2.0 The Planning Proposal

The planning proposal is to:

- Develop the elevated land (approximately 16 ha) on the existing New Brighton Golf Club for residential purposes;
- Upgrade the golf course with the upgraded fairways, golf holes and tees restricted to the existing fairway and former golf courses;
- Carry out improvements to the club facilities; and
- Dedicate a foreshore reserve along the Georges River as part of the proposal.

3.0 Flora survey and main findings

A total of 349 species (216 native, 120 exotic and 13 non-local Australian native species) were recorded from 34 quadrats (Quadrat 1 to 34) and 40 Spot locations (A to Z, AA to NN) during 2003, 2004, 2006, 2009 and 2011, generally on land located between existing and former fairways (Figure 5).

Acacia pubescens, listed as vulnerable under the National and State legislation, was recorded on the top of a fill embankment adjacent to the new Hammondville housing estate, immediately north of the Greenwood Golf Course boundary (Spot location K). This location is outside the area where any works will occur as part of the proposal. No other threatened species were recorded despite targeted searches in March 2011. There were 61 species considered to be 'regionally vulnerable' for Western Sydney with ten listed as of 'particular significance' (James *et al.* 1999). No nationally listed ecological communities were recorded. State listed endangered ecological communities (mapped as constrained area on Figure 5) were recorded on the low-lying land. These communities were Cooks River/Castlereagh Ironbark Forest on the northern boundary of the New Brighton Golf Course with the

remaining bushland on the land less than 10 m AHD comprising Cooks River/Castlereagh Ironbark Forest, River-Flat Eucalypt Forest on Coastal Floodplains, Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions, and/or intergrades.

Area without flora constraints (Figure 5) were:

- On the New Brighton Golf Course, all of the existing fairways and the higher land in the north-west above 10 m AHD. On the higher land (the area proposed to be developed for residential housing), the between fairway vegetation consisted of planted native and non-local native trees with a mown understorey and the mown golf fairway; and
- On the former Greenwood Golf Course, the areas of modified soil, especially associated with the raised former fairways.

Areas with flora constraints (Figure 5) were the existing and former between fairway vegetation on the natural occurring land below 10 m AHD. The vegetation of these areas meet the listed criteria for endangered ecological communities (degraded). These constrained areas vary in width from about 10 m to 160 m wide.

There is also constrained vegetation along the Georges River foreshore. This area, together with an area comprising existing fairway, will be dedicated to Council for a distance of 40 m back from the river (Figure 5).

4.0 Recommendations from the flora assessment

Based on the flora findings, and in order to increase the ecological sustainability as part of the upgrading of the golf course and rezoning of the higher land, it is recommended that:

- Any future re-design of the golf course utilise the existing and former fairways on the two golf courses, as far as practicable;
- Any future re-designed golf course should be on the existing and additional constructed raised free-draining land;
- All water and nutrient runoff from the fairways should be directed to bioswales. The water and associated nutrients should be directed for re-use on the fairways and greens, rather than flowing into the between fairway vegetation;
- Cut drains and associated soil mounds in the between fairway vegetation on New Brighton Golf Course be restored to the natural landform and local native vegetation re-established;
- In the riparian zone adjoining the Georges River, the landform be reconstructed to mimic a free-draining natural landform and local-native vegetation be re-established as part of the vegetation management plan;
- Within the riparian zone, a bicycle track/boardwalk should be considered in consultation with Council;
- Any loss of constrained land on the low lying lands as a result of re-modelling or reinstatement of the golf course, should be offset at a ratio of 1:8, that is 1 ha for constrained land cleared or modified resulting in rehabilitation of at least 8 ha of the existing degraded constrained land, as part of the biodiversity offset strategy to be discussed with Council;
- If any offsetting is required, the focus should be on enhancing, rehabilitating and planting of the low lying land between fairway vegetation and riparian area. If this is not required, then these areas should be conserved and carefully bush regenerated as part of the conservation management plan. The aims of the management plan should be to increase the natural resilience of the coastal floodplain vegetation; and
- only local native species grown from seed collected from remnant vegetation onsite or nearby, should be used in the rehabilitation of between fairway vegetation as part of the conservation management plan.

5.0 Constrained vegetation and the preferred golf course layout

The constrained vegetation is restricted to the low lying land below 10 m AHD. The proposal includes the upgrading of the existing and former golf courses on the low lying land, and dedication of a foreshore reserve along the Georges River. The desired layout of the upgraded fairways utilise the existing and former raised fairways. The exact location of the former fairways, based on contour changes, needs to be further confirmed by the surveyors. However, provided the reinstated and remodelled fairways, tees and holes are located within existing and former fairway areas, then the constrained vegetation will not be affected. The proposed golf course design generally follows this principle, but the proposed design may need to be slightly modified in areas to align properly with the existing and former areas.

The preferred golf course layout currently shows a dam in the southeast of the New Brighton Golf Course, which encroaches into the riparian buffer. It is possible that the new golf course layout will require less water storage, as the upper land will no longer be used as a golf course. Decreasing the dam size or relocating it outside the riparian buffer will prevent the constrained land being potentially impacted.

6.0 Offsetting

The proposed golf course design may require minor modification to avoid the constrained vegetation. If any minor clearing is required then offsetting needs to be implemented consistent with the Commonwealth and NSW offsetting policies. The NSW Principles for the use of biodiversity offsets are summarised by Justice Jayne Jagot (Sanctuary Investments Pty Ltd & Ors v Baulkham Hills Shire Council [2006]) as:

> *the offset for any particular development should reflect six principles – namely:*
> 1. *preference should be given to a "like for like" offset.*
> 2. *the offset should be greater than the area cleared.*
> 3. *the offset should preferably be in proximity to the area impacted.*
> 4. *the offset actions should be located in strategic, targeted areas.*
> 5. *offsets should be in addition to existing initiatives and should not duplicate or replicate existing schemes or programs.*
> 6. *the offset must be secure and long-term.*

Liverpool Council's offset policy (Eco Logical Australia, 2003) provides a Habitat Multiplier Table for calculating the amount of offset considered by Council:

Conservation classification of land being impacted on by the activity	Offset action to be applied to the receiving land		
	Protect	Enhance	Create
Core Region	2	8	NA
Core Local	1.5	6	NA
Support for Core	1	4	8
Urban Remnant	NA	NA	NA
Other	NA	2	4

If any offsetting is required, then there should be sufficient in the approximately 24.9 ha of existing vegetation and about 1.35 ha of existing fairway in the 40 m wide riparian corridor available to regenerate, enhance or establish new vegetation in these areas. Given the lack of vegetation clearing of constrained land after minor modification of the golf course layout to align with existing and former fairway, there should be no or minimal need for offsetting.

However, should minor clearing occur, there are more than sufficient potential offset areas available to enhance existing vegetation and/or planting in the newly dedicated reserve along the Georges River.

7.0 Conclusions

There are no flora constraints (Figure 5) on the existing and former fairways and none on the higher land in the north-west above 10 m AHD. On the higher land (the area proposed to be developed for residential housing), the between fairway vegetation consisted of planted native and non-local native trees with a mown understorey and the mown golf fairway.

There are no requirements for offsetting loss of vegetation associated with the proposed development of the residential parts of the site as this vegetation does not comprise constrained vegetation.

Provided the golf course upgrade is to be restricted to the existing and former fairways, the loss of constrained vegetation should be minor. If any offsetting is required for the course upgrade, then there is sufficient potential offset area available to regenerate, enhance or re-establish in the approximately 25 ha of existing degraded vegetation, and on the approximately 1.5 ha of existing fairways in the 40 m wide newly dedicated reserve along the Georges River.

References

Clements, A., Burley, R., Rodd, T., Simmonds, P., Clarke, D. (2011)
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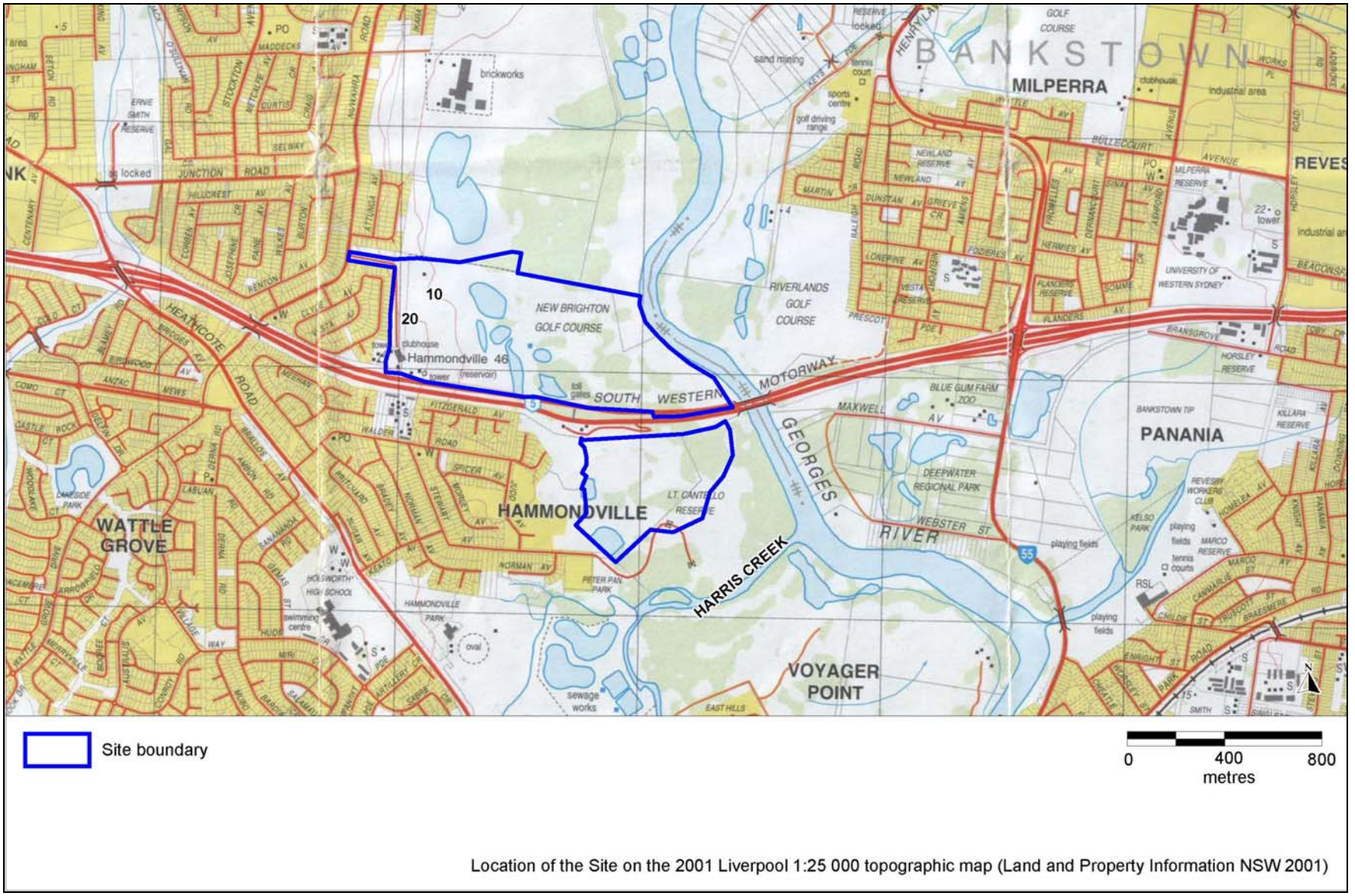
Site boundary
0
400
800
metres
Location of the Site on the 2001 Liverpool 1:25 000 topographic map (Land and Property Information NSW 2001)
BANKSTOWN
MILPERRA
PANANIA
HAMMONDVILLE
WATTLE GROVE
VOYAGER POINT
NEW BRIGHTON GOLF COURSE
RIVERLANDS GOLF COURSE
SOUTH WESTERN MOTORWAY
HARRIS CREEK
GEORGES RIVER
HEATHCOTE ROAD
JUNCTION ROAD
Hammondville 46
10
20

Figure 1.

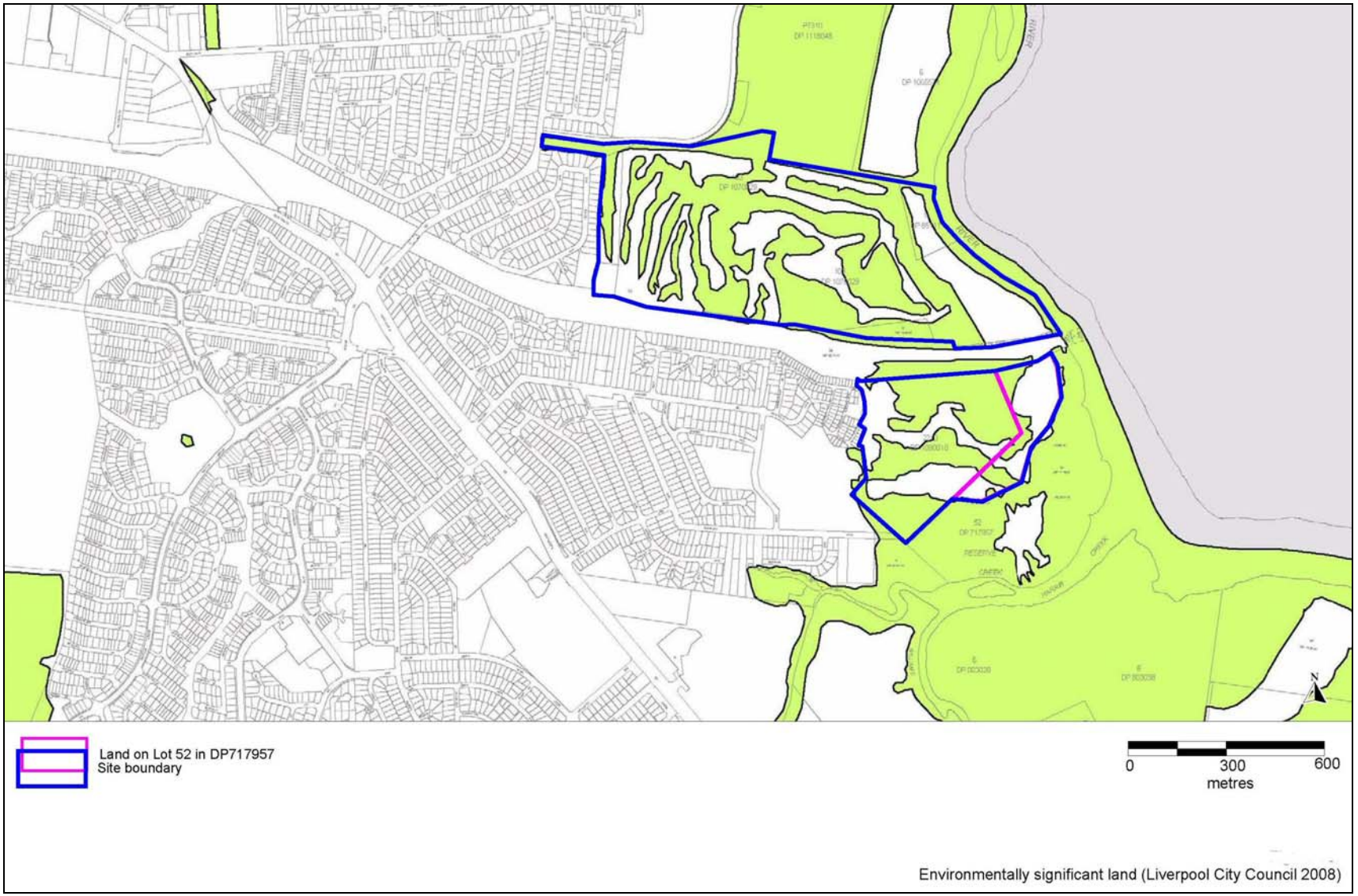
Land on Lot 52 in DP717957
Site boundary
0
300
600
metres
N
Environmentally significant land (Liverpool City Council 2008)

Figure 2.


13
14
18
15
12
10
1
9
11
16
4
5
17
8
2
3
7
6
Legend
Site boundary
Former fairway
Land on Lot 52 in DP717957
0
100
200
metres
Former fairways marked on Greenwood Golf Course overlaid on orthotopo map (circa 1960 to 1970)

Figure 3.

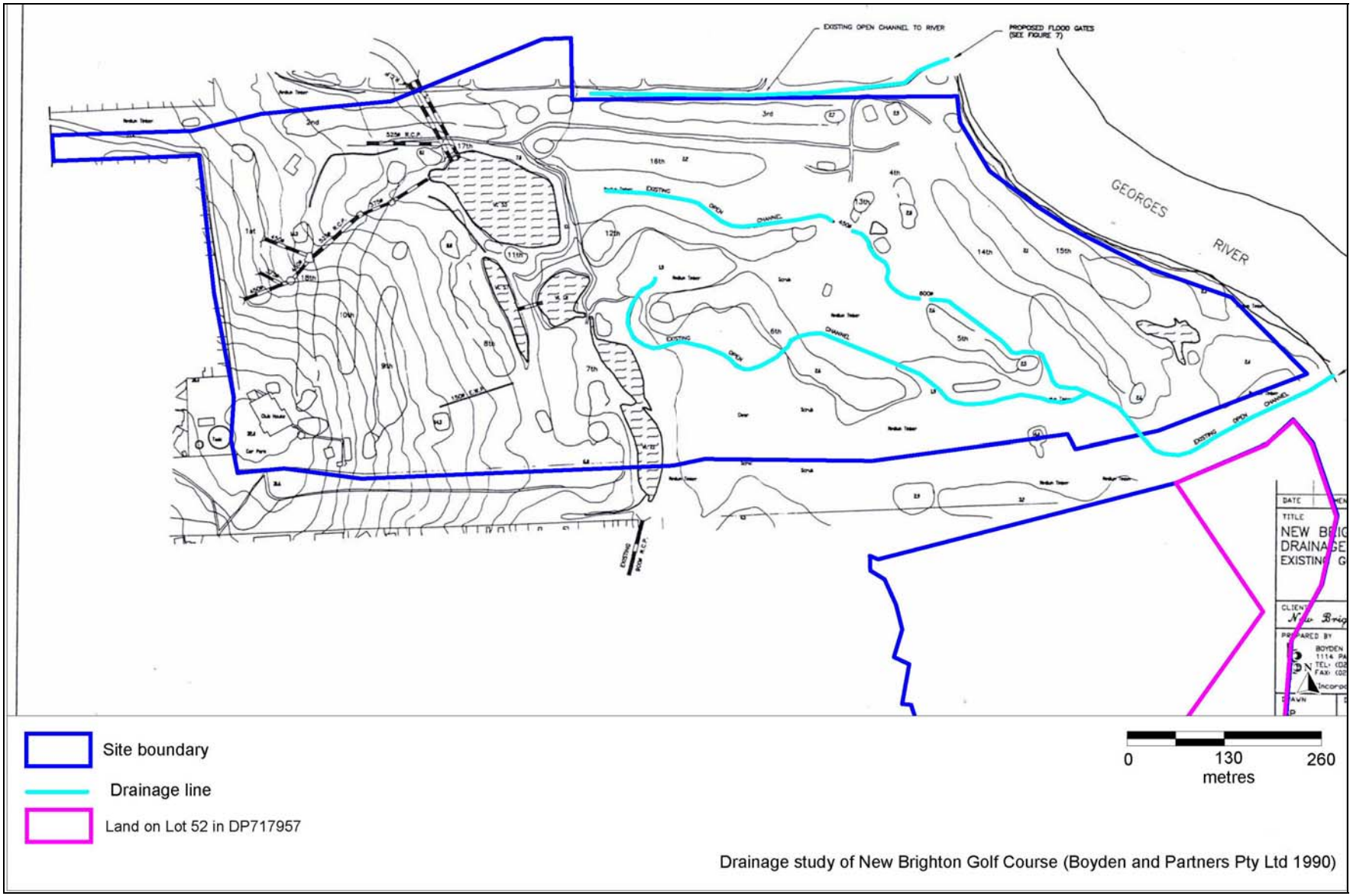
EXISTING OPEN CHANNEL TO RIVER
PROPOSED FLOOD GATES (SEE FIGURE 7)
GEORGES
RIVER
Site boundary
Drainage line
Land on Lot 52 in DP717957
0
130
260
metres
Drainage study of New Brighton Golf Course (Boyden and Partners Pty Ltd 1990)

Figure 4.

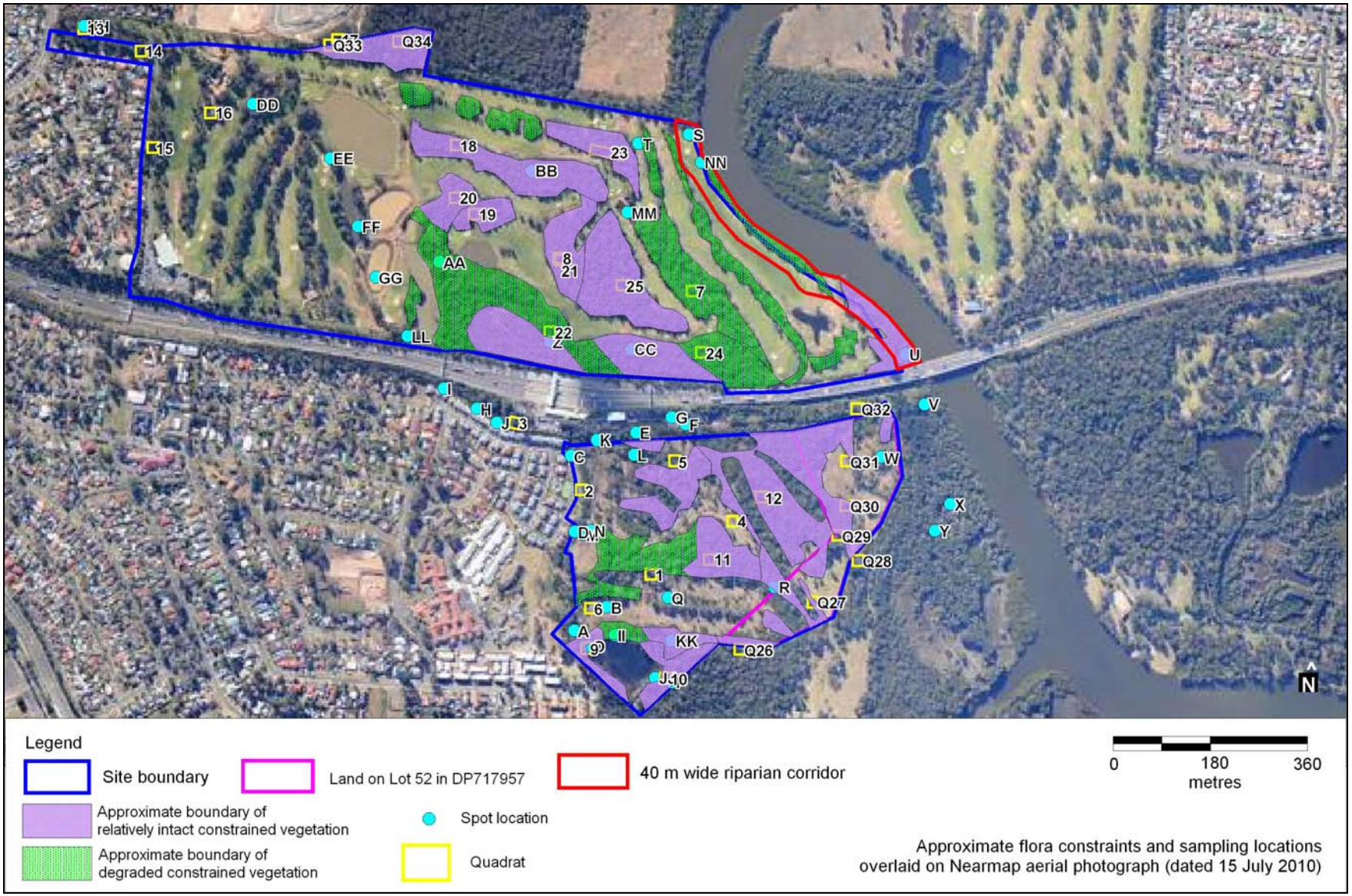
Legend
Site boundary
Land on Lot 52 in DP717957
40 m wide riparian corridor
Approximate boundary of relatively intact constrained vegetation
Spot location
Approximate boundary of degraded constrained vegetation
Quadrat
0
180
360
metres
N
Approximate flora constraints and sampling locations overlaid on Nearmap aerial photograph (dated 15 July 2010)

Figure 5.