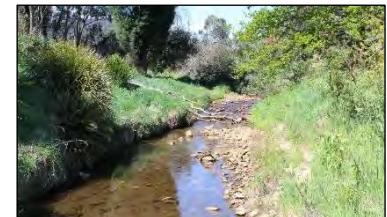


# Farmers Creek Precinct Masterplan



**for Lithgow City Council**  
**Final Draft V4**  
24 January, 2017

# Farmers Creek Precinct Masterplan

## for Lithgow City Council

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CONTROLLED DOCUMENT  
“Farmers Creek Precinct Masterplan”

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# 1. INTRODUCTION AND BACKGROUND

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## 1.1 Background

Farmers Creek is the principal waterway flowing through the City of Lithgow.

The creek rises in the rugged stone escarpment and pagoda terrain of the western scarp of the Blue Mountains, where dams across its upper reaches have supplied much of Lithgow's drinking water since the mid 1890s. Emerging from the eastern hills it passes roughly east to west through the northern urban areas and playing fields of Lithgow, in a broad valley flat. Here it is joined by three main tributaries – Ida Falls Creek, Vale of Clwydd Creek and State Mine Creek.



On the town's western outskirts it turns sharply southwards to pass under the Main Western Rail Line, through two striking rail viaducts, and then under the Great Western Highway. From here Farmers Creek flows south



though rolling agricultural lands before entering more timbered valley country on the margins of Marrangaroo National Park before emptying into the upper arm of Lake Lyell.

Within the Lithgow urban area Farmers Creek has had a chequered history – it was largely cleared of its original native vegetation, has been a valuable local water supply, was previously used as a convenient drain for the town's residential and industrial waste, and posed a serious flood threat. Today Farmers Creek and its main tributaries are managed as a mix of – several utilitarian channelised sections and flood mitigation works, as incidental open space where it passes alongside a number of playing fields and parks, as scattered recreational sites with sections of creekside paths, and a major constructed wetland and nearby significant industrial heritage tourism attraction.



Sections of the creek are benefitting from targeted weed removal and revegetation efforts. However some sections, particularly in the eastern parts of the urban area and on the western outskirts, remain largely unmanaged and heavily weed infested in places.

Lithgow City Council recognises that Farmers Creek has enormous potential as a recreation and environmental asset for the city and its residents and acknowledges that this potential is only partially realised at present. Residents and community groups have suggested several proposals to enhance the creek's recreational, environmental and scenic values. Council has an on-going, but limited, programme of weed control and revegetation targeting problem sites along the creek. Council has also developed a number of leisure and recreation assets along the corridor in recent years – such as the Geordie Street pathway and footbridge.



Lithgow City Council well appreciates the greater role and value of Farmers Creek as a potentially unifying green corridor through the Lithgow urban area – as a place for local leisure and recreation, to link together and access other attractions within the town area, to restore native vegetation and enhance the city's biodiversity while also “softening” the urban landscape, to offer educational opportunities and nature encounters, and to enhance water quality.

To realise these benefits in a co-ordinated and staged manner Council has recognised the need for an overarching vision and masterplan to guide the delivery of recreational opportunities and environmental improvements to the Farmers Creek Precinct.

This masterplan is intended to fulfil that role.

## 1.2 Project Scope and Objectives

As set out in the brief the project's aim is to “produce a document that provides to LCC and the community a strategic framework for the enhancement and development of Farmer's Creek Precinct”.

The masterplan is intended to describe “clear and achievable management strategies” for public land within the Farmers Creek precinct and to provide clarity and directions for the “future development use and management” of these community lands.

The project's key components were drawn from the “key objectives to be addressed” and “project scope” requirements as set out in the Lithgow City Council Project Brief and include the following.

- Prepare a Farmers Creek Precinct Masterplan – including detailed maps, descriptive sheets, recommendations and priorities – describing the environmental and recreational measures proposed for each “project section” of the creek. The masterplan is to be a foundation for, and description of, the recommended strategic framework for future environmental and recreational works along Farmers Creek. Identification of an overarching “inspirational and visionary” future for Farmers Creek that can be endorsed by the community is a key element of the masterplan.
- Identify a connected network of public open space areas along the Farmers Creek Precinct, and show these linkages spatially.
- Identify measures for the improvement of public access and increased recreational use or opportunities (such as walking/cycle paths) and provide better linkages along the main section of Farmers Creek, State Mine Creek, Vale of Clwyd Creek, Lake Pillans Wetlands and Blast Furnace Park.
- Identify locations with the potential to be visitor nodes and provide educational opportunities for the built and natural environment.



- Identify measures to provide for the protection and management of the historic and cultural “icons” and historic fabric of Farmers Creek.
- Identify key areas for revegetation to improve biodiversity values – including in-stream habitat values – and measures to protect, enhance and restore remnant vegetation and biodiversity values in the catchment (including identifying stream reaches not under Council management but likely to impact upon the management of urban waterways).
- Identify measures to enhance the existing Lake Pillans Wetlands, and assess opportunities for additional aquatic habitat.
- Identify opportunities for water sensitive urban design and improvements in water quality in Farmers Creek – including stormwater drain treatment, litter management, and water quality enhancements.
- Identify soft engineering options for flood mitigation, such as wetlands, where consistent with the *Lithgow Flood Study Review* (2015).
- Develop a framework for the future management of open space and recreational facilities, and the reduction in costs associated with the on-going maintenance of public reserves.

An associated requirement of the project is to undertake a rapid waterways condition and vegetation site assessment for each “project section” of the creek which “endeavours to outline some key aspects of waterways condition”.

These rapid condition assessments should include ecological, hydrologic and geomorphic attributes; be suitable for a range of stream conditions; be suited to database and spatial (MapInfo) recording; be suited to incorporation into State of the Environment reporting or equivalent; and be readily repeatable by novice or less experienced assessors to allow for updating and works/improvements monitoring. A project-specific rapid waterway condition assessment format as to be developed, if warranted.

## 1.3 Project Area

The Farmers Creek project area extends from the historic Farmers Creek No. 2 Dam downstream through the Lithgow urban area and associated tributaries, then on to Lake Lyell – a total of approximately 18 kilometres – as shown on Figure 1. However, as the project brief acknowledged, “the majority of project objectives are focused on the 10 km section of Farmers Creek and tributaries within the urban area ... with the remaining 8 km of creek within a largely agricultural landscape with limited public access”.

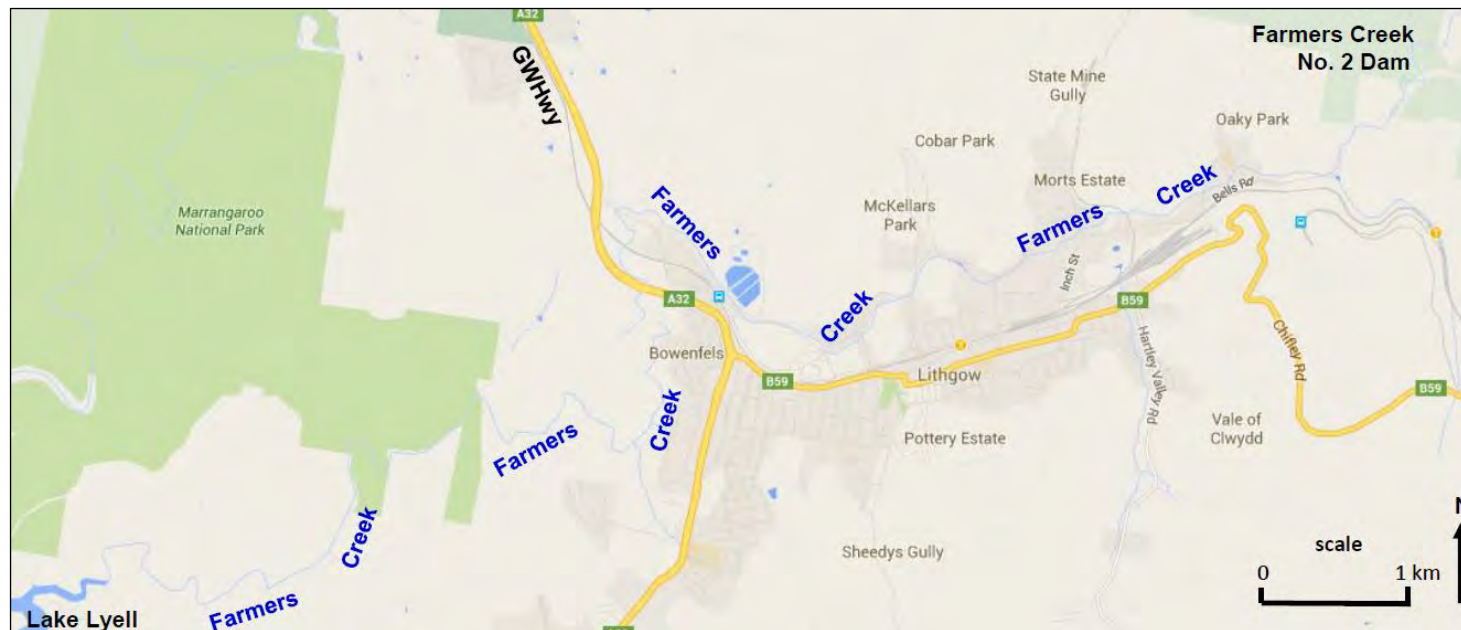
Within the “urban” section of Farmers Creek and its major tributaries – the focus of this masterplan – the project area was divided into several planning units as shown on Figures 2 and 3:

- Planning Units FC1 to FC10 along Farmers Creek, from upstream at the historic Farmers Creek No. 2 Dam to the Great Western Highway downstream;
- Planning Units SMC1 and SMC2 on State Mine Creek (upstream to downstream); and,
- Planning Units VoCC1 to VoCC3 on Vale of Clwyd Creek (upstream to downstream), with VoCC3 encompassing the Lake Pillans Wetlands and Blast Furnace Park.

These planning units were identified on the basis of “homogenous stream segments”. That is – sections of Farmers Creek which exhibited broadly similar biophysical attributes, appearance and visual character, recreational or usage features/qualities, and land use settings/surrounds (and pressures). The planning units are a compromise between being large enough to be meaningful units for planning and management while being small enough to capture the changing attributes and character that are evident along the course of Farmers Creek’s urban reach. For mapping and clarity purposes, some planning units are covered by two map sheets – as shown on Figure 3.

The upstream Planning Units SMC1 and VoCC1 do not contain any public (Council or State Government owned) land. (Planning Unit SMC1 contains the site of the former Lithgow Power station which had been owned by Council, but was slated for sale during the course of this project.) These two planning units were identified to support the rapid waterways





*Figure 1 Farmers Creek project area*  
(base map source: Google Maps)

assessment component of the project, more so than the project's public open space and recreation path objectives.

Downstream from the Great Western Highway the public land estate is limited to a small un-named, and largely unmanaged, area of Council-owned land just downstream of the highway and the inaccessible south-eastern corner of Marrangaroo National Park.

### 1.3.1 Broad Masterplan Zones

For masterplanning purposes the Farmers Creek corridor through the Lithgow urban area divides into three major zones, each with comparable

unifying characteristics and likely usage patterns. These were identified after the project's initial creek corridor familiarisation and first round of on-site assessments. These three zones, as shown on Figure 4, have been labelled:

- central urban recreation and open space zone;
- eastern upstream environmental zone; and
- western heritage zone.

In conjunction with the overall masterplanning approach, these zones have also helped inform the staging of the masterplan actions and works – as described in the following sections.

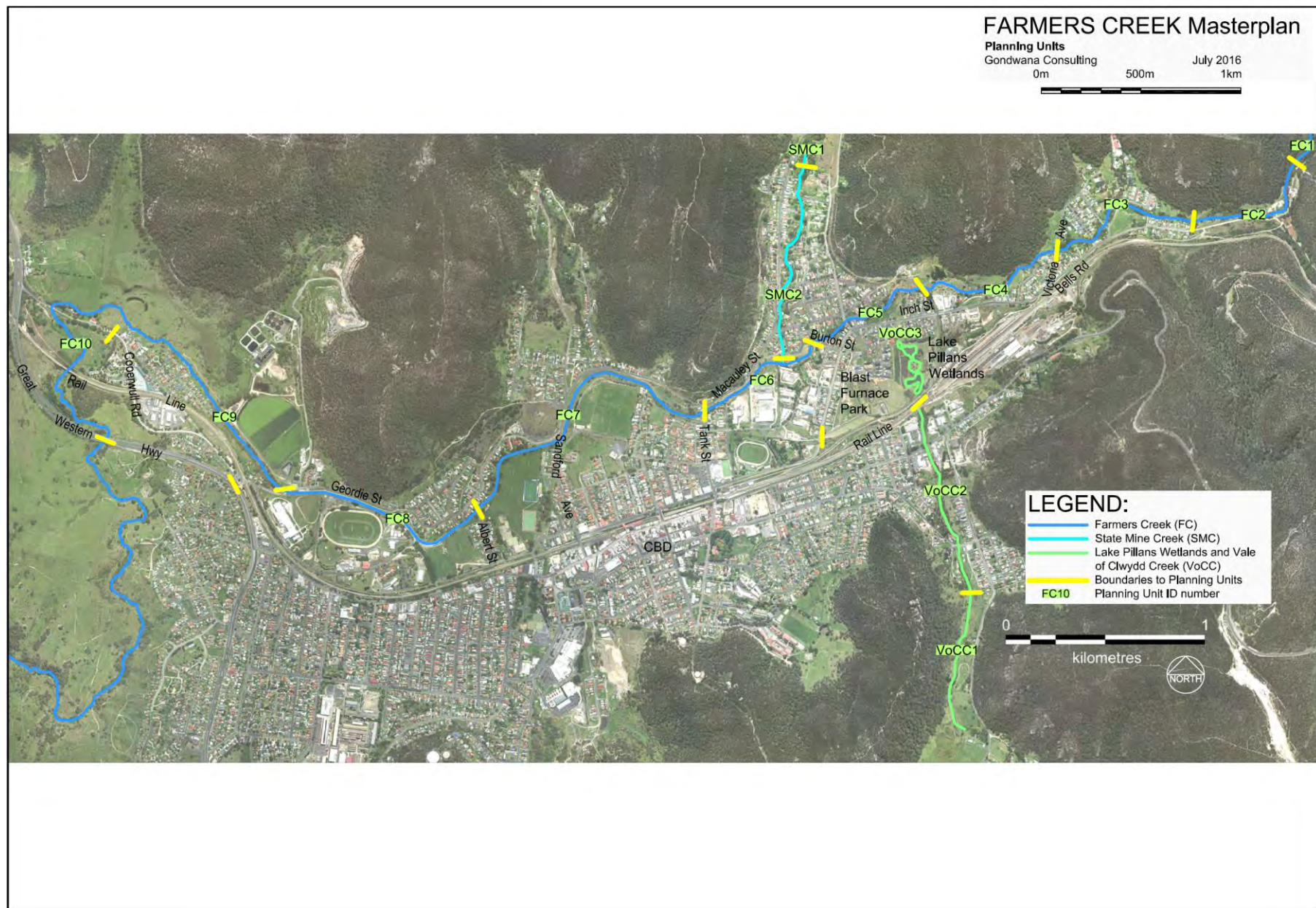


Figure 2 Planning units (Farmers Creek – Lithgow urban area)



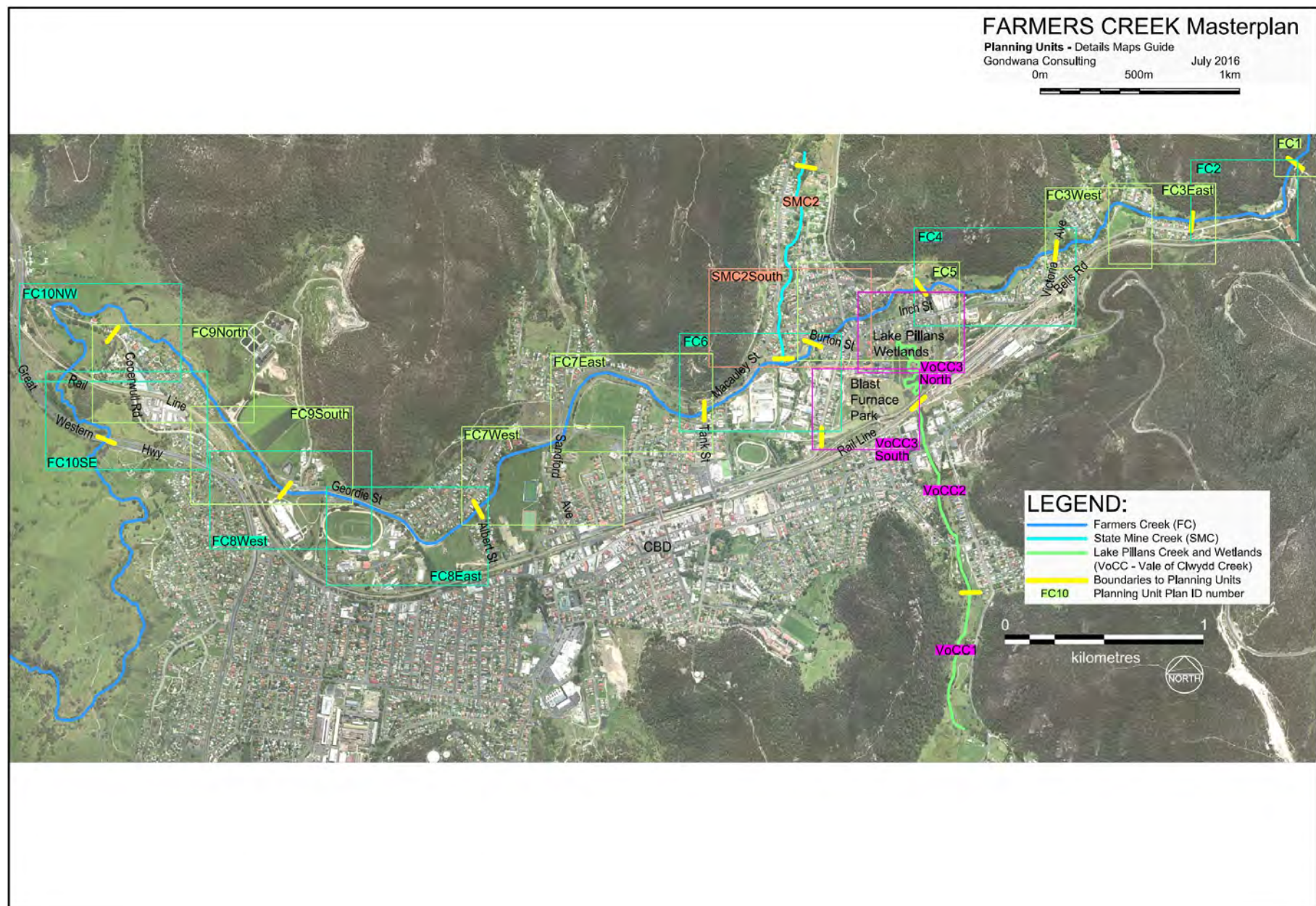


Figure 3 Planning unit map sheets (Farmers Creek – Lithgow urban area)



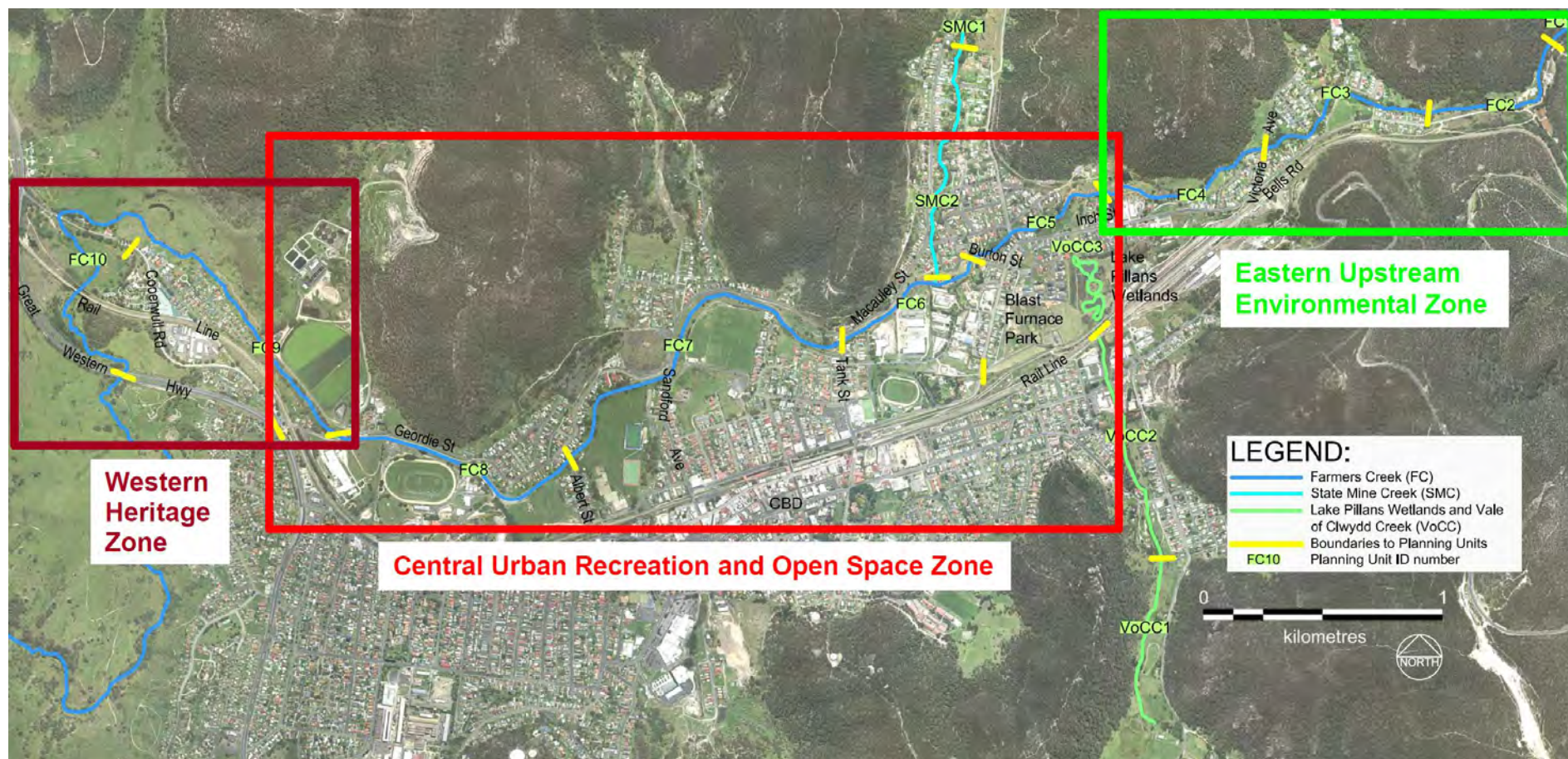


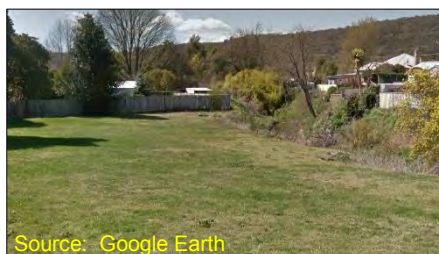
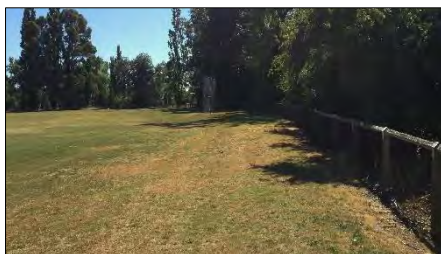
Figure 4 Broad masterplan zones, and planning units (Farmers Creek – Lithgow urban area)



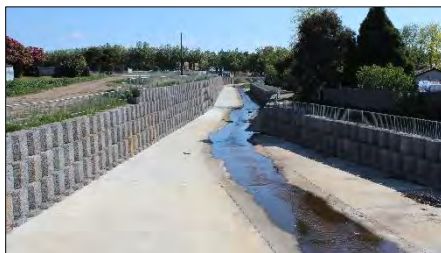
## Central Urban Recreation and Open Space Zone

The largest of these zones is the central zone – the “central urban recreation and open space zone” – extending from the State Mine rail line and Drurie Street in the east to the Lithgow Tourism Information Centre and nearby Geordie Street causeway in the west, and including the Lake Pillans Wetlands (on the Vale of Clwydd Creek) and Blast Furnace Park. This zone encompasses Planning Units FC5, FC6, FC7-East, FC7-West, FC8-East, FC8-West, VoCC3-North and VoCC3-South (refer to Figures 2 to 4).

In this zone the creek corridor is largely flanked by, or passes through, managed open space reserves or, less commonly, by road reserves. Downstream of Tank Street these reserves are predominantly larger playing fields, while upstream parks and smaller creekside reserves are the more common. This juxtapositioning affords easy access to the creek corridor, as well as greater flexibility in siting a shared path and associated revegetation or amenity planting measures.



However within this zone substantial sections of Farmers Creek have been “formalised”, as both large and smaller concrete channels (including a large channelised section under Albert Street recently completed by Council). While these measures assist in flood management, such highly engineered sections of creekline have much lower visual appeal, significantly reduced recreation values and minimal environmental values.



This zone is the location of all Council’s existing creekside paths (to shared path standard and otherwise), with these assets also offering an established usage pattern that can be built on by any extension and upgrading of the path network. This zone also has the largest local residential and user “catchment” of any part of the urban creek corridor – being proximate to the Hermitage, Cobar Park, Morts Estate and State Mine Gully areas as well as the Lithgow CBD – and includes a larger array of likely “traffic generators” than either of the other two zones.



The Lake Pillans Wetlands and Blast Furnace Park at the south-eastern end of this zone have been identified by Council as major activity nodes and attractions to be incorporated into any shared path network developed along Farmers Creek.



The State Mine rail line, at the eastern end of the “central urban recreation and open space zone” and separating it from the adjacent “eastern upstream environmental zone”, is a major impediment to the creation of a continuous (useable) public open space corridor and shared path along Farmers Creek.



State Mine Creek and the Vale of Clwydd Creek both flow into Farmers Creek in the east of the zone.

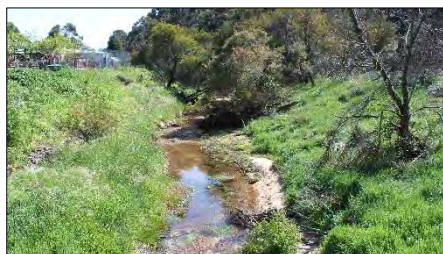
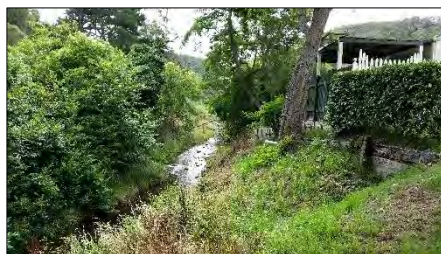


## Eastern Upstream Environmental Zone

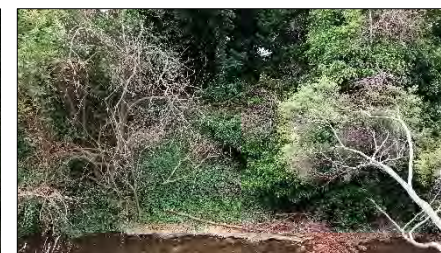
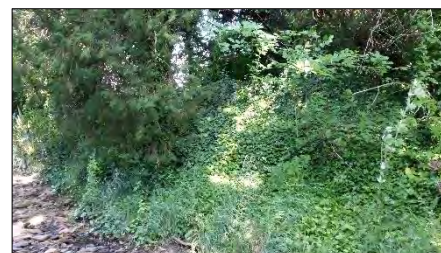
The “eastern upstream environmental zone” extends from the State Mine rail line and Drurie Street in the west to the eastern end of the project area at the lower heritage dam upstream from the Water Treatment Plant in the east.

It encompasses Planning Units FC4, FC3, FC2 and FC1 (refer to Figures 2 to 4).

In this zone Farmers Creek is typically located within a narrow corridor of public land, most often with housing lining one or both sides of the creek. In places the physical streambed is located on the adjacent private lands. Only three smaller parks abut the creek corridor within the urban area and this, combined with the creekline’s general confinement by housing and private property, means that access to creek corridor in this zone is far more limited.



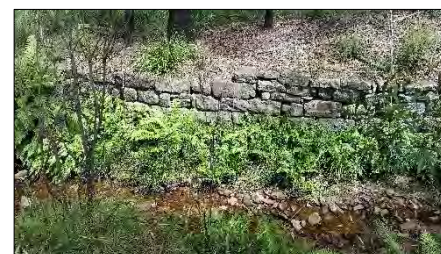
This section of Farmers Creek is much less intensively managed with no existing formal paths and, within the urban area, is typically heavily impacted by weeds. Encroachments from adjoining private lands are



common – ranging from lawns and gardens or stockpile areas, to fencing encroachments and landfill, and in some places even larger structures.

The local user “catchment” is small, principally residents of the Oakey Park area and housing along Bells Road.

Beyond the urban area Farmers Creek flows partly within a cadastral creek corridor and partly through private land before entering Newnes State Forest and then the water supply reserve. Access is via an unsealed, largely unmaintained, vehicle track that roughly parallels the creek (crossing both public and private lands) through this area of attractive bushland and stone escarpment terrain.





## Western Heritage Zone

North-west from the Geordie Street causeway, and nearby Lithgow Tourism Information Centre, is the “western heritage zone” which extends north-west and then south to the Great Western Highway, and includes the creek’s passage under the Main Western Rail Line.

It encompasses Planning Units FC9-South, FC9-North, FC10-Northwest and FC10-Southeast (refer to Figures 2 to 4).

This zone is a mixture of open unmanaged reserves, utilitarian spaces (the sewage ponds and Council storage/depot), residential streets, and road reserves. Access points to the creek corridor are generally limited, with the creek flowing through private lands in the west and south (preventing possible public access), and only informal existing paths along the creekside in the south-east. The local user “catchment” is small, principally residents from part of the Bowenfels area (in the Fullagar Avenue area).



However a feature of this zone is the heritage listed railway infrastructure that is visible, and potentially accessible (depending on negotiations with Rail Corp), from any shared path route in this zone.

## 1.4 Preparing the Masterplan

The following key tasks were undertaken in preparing this masterplan (with the project’s primary focus being on the 10 kilometre urban reach of Farmers Creek, as described above):

- an inception meeting with the Project Reference Group and initial on-site (familiarisation) visit to the project area, with a Council and Reference Group representatives;
- conducting a desktop assessment of area’s values and attributes and reviewing other relevant available data (demographics, recreation participation, etc.) – including Council GIS data layers;
- reviewing the project’s policy and planning context – including key Council (and other) strategies, plans and reports;
- reviewing Council-supplied land tenure information along the creek corridor to identify key links and gaps in public land, and resolving tenure unknowns/uncertainties with Council;
- identifying planning units along the creek corridor to support the masterplan’s formulation (and implementation);
- reviewing Farmers Creek’s recreation and open space planning context, within the Lithgow urban area as well as the wider (regional) visitor use and tourism context (including possible competing and complementary attractions);
- conducting a thorough on-site assessment of each planning unit – to identify activation assets, constraints and opportunities – and document in map and text format;
- developing a rapid waterway condition assessment template (focused on vegetation and waterway conditions), revising following Council and external specialist review, and undertaking rapid waterway condition assessments at fourteen selected sites on Farmers Creek and its main tributaries (the results of this allied task were detailed separately to this masterplan, but are briefly summarised in Section 2.5.3);



- undertaking a rapid, reconnaissance level, assessment of weed occurrences and densities along those sections of the creek not subject to formalisation or channelisation works;
- reviewing the creek corridor assessments and constraints/opportunities analysis with the Project Reference Group;
- analysis/synthesis of masterplanning considerations and preparing draft masterplans, by planning unit and providing for the project's staged development;
- reviewing the draft masterplans with the Project Reference Group; and



- preparing this draft Masterplan Report, including masterplans by planning unit and staging supported by order of cost estimates, for Council approval for public exhibition.

At Council's direction the masterplan's preparation did not entail any targeted or general engagement with users, neighbours, interest groups or other stakeholders (beyond the government agencies represented on the Project Reference Group). However Council intends that this draft Masterplan will be exhibited for community and stakeholder feedback.

Due to public land and access limitations in the 8 kilometre section of Farmers Creek downstream from the Great Western Highway, project tasks in this area were limited to "reconnaissance" level observations of the creek corridor from nearby public roads and a single rapid waterway assessment site only.



## 2. RESOURCES AND VALUES

This section provides an overview of the Farmers Creek project area with summary information regarding the area's natural and cultural heritage values, hydrology and water quality attributes, and open space and recreation assets of relevance for the area's masterplanning.

### 2.1 Native Vegetation

No comprehensive vegetation survey has been conducted of the entire Farmers Creek corridor. The following overview description is taken from a wider vegetation mapping project (Department of Environment and Conservation, 2006) as well as on-site evaluations undertaken for this masterplan and the associated rapid waterway condition assessments.

#### 2.1.1 Vegetation of the Western Blue Mountains Mapping

Vegetation mapping of the area from Lithgow northwards was undertaken by the Department of Environment and Conservation NSW, for the Hawkesbury-Nepean Catchment Management Authority, and published in 2006 as *The Vegetation of the Western Blue Mountains - Including the Capertee, Coxs, Jenolan and Gurnang Areas*. However, this study largely excluded the Lithgow urban area which was classed as “cleared and severely disturbed”, and so did not address most of the Farmers Creek corridor – as shown on Figure 5. However the following less disturbed/developed sections of the creek were mapped:

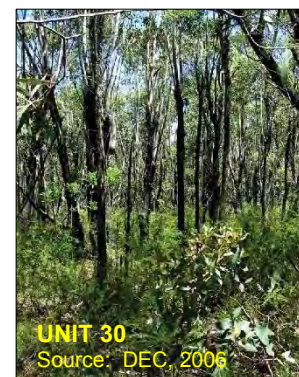
- upstream of the end of Bells Road and the Water Treatment Plant – as shown on Figure 5 and
- downstream of Coorwull Road and the Great Western Highway to Lake Lyell (although the lower portion of Farmers Creek, before

entering the Lake Lyell storage, is not mapped) – as shown on Figure 6.

Upstream of the Water Treatment Plant the Farmers Creek corridor now appears as reasonably undisturbed bushland – typically Eucalypt dominated shrubby woodland or open forest. However there is considerable evidence of past disturbance (such as sinter and coal waste), particularly along the creek corridor, indicating that much of the lower valley vegetation may comprise regenerated communities.



The immediate creek corridor is mapped almost entirely as “Newnes Sheltered Peppermint – Brown Barrel Shrubby Forest” (Unit 8, State vegetation class: Montane Dry Sclerophyll Forests). This community is a tall forest dominated by *Eucalyptus piperita*, Narrow-leaved peppermint (*Eucalyptus radiata*) and Brown Barrel (*Eucalyptus fastigata*) with a



moderately dense mid-stratum of shrubs and small trees including *Leptospermum* and *Leucopogon* species. The flanking lower hillslopes are mapped as “Exposed Blue Mountains Sydney Peppermint – Silvertop Ash Shrubby Woodland” (Unit 30, State vegetation class: Sydney Montane Dry Sclerophyll Forest). The creek corridor immediately downstream of the historic (lower) dam is mapped as “Sandstone Plateau Tea Tree – Dwarf Sheoak – Banksia Rocky Heath” (Unit 44, State vegetation class: Sydney Montane Heath).

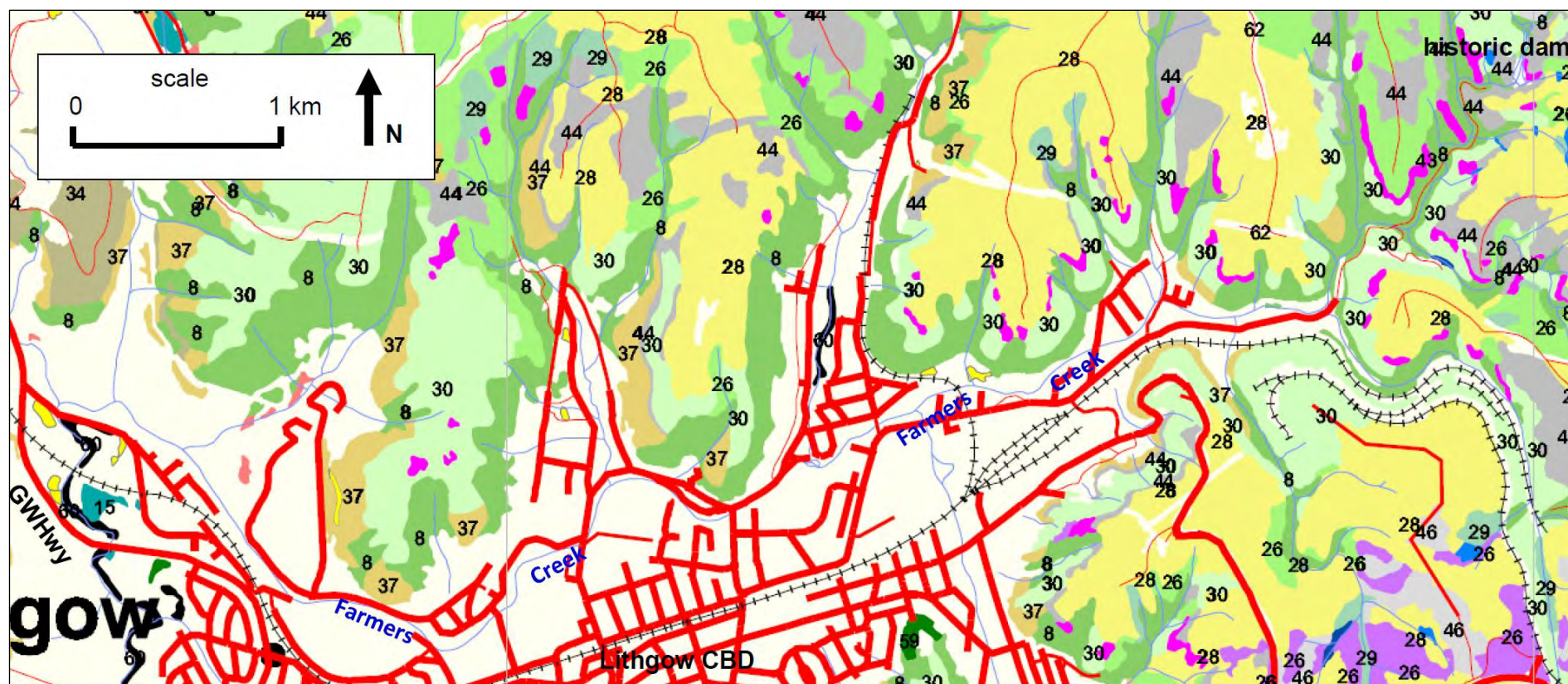


Figure 5 Mapped vegetation communities, Farmers Creek upstream of the Great Western Highway (including the Lithgow urban area)  
(refer to text for vegetation unit [as numbered above] labels and summary descriptions)



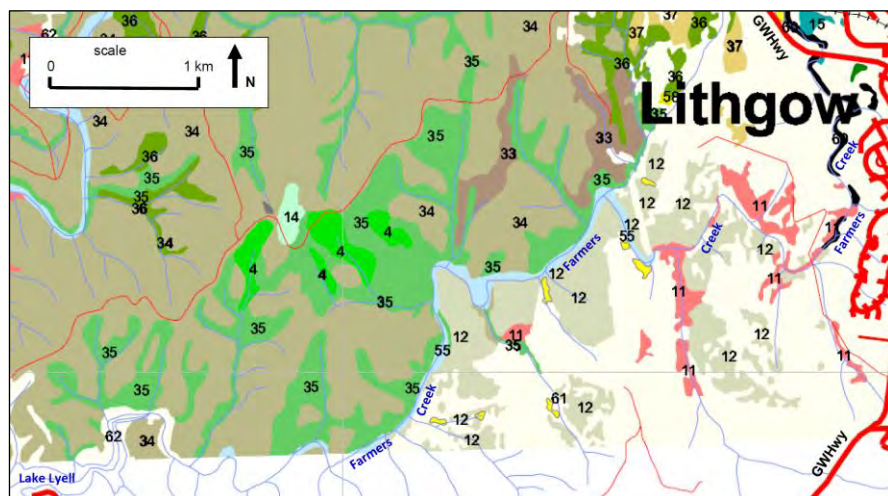


Figure 6 Mapped vegetation communities, Farmers Creek downstream of the Great Western Highway to Lake Lyell (refer to text for vegetation unit [as numbered above] labels and summary descriptions)

South from Coerwull Road and the Great Western highway Farmers Creek flows through cleared agricultural land, in a slightly more defined and steeper valley, until entering more heavily vegetated country north of James O'Donnell Drive. The creek corridor here is initially mapped as “Non-native



Vegetation – Other Exotics (Willows etc.)” (Unit 60), with a small area of “Tableland Hollows Black Gum – Black Sally Grassy Open Forest” (Unit 15, State vegetation class: Subalpine Woodlands) located just north-east of the creek’s passage under the Great Western Highway. As Farmers Creek flows south, then west past James O'Donnell Drive towards Marrangaroo National Park, the corridor and flanking vegetation progressively changes to patchy areas of “Tableland Gully Snow Gum – Ribbon Gum Grassy Forest” (Unit 11, State vegetation class: Tableland Clay Grassy Woodland) and

“Lithgow – Abercrombie Grassy Woodland” (Unit 12, State vegetation class: Southern Tableland Grassy Woodland).

From just east of Marrangaroo National Park, through to Lake Lyell, the immediate creek corridor is dominated by “Tableland Riparian Scrub Complex” (Unit 55, State vegetation class: Eastern Riverine Forests). This community typically has a dense cover of riparian shrubs, notably *Leptospermum* and *Hymenanthera* species, often backed by Ribbon Gum (*Eucalyptus viminalis*), Snow Gum (*Eucalyptus pauciflora*) and Black Sally (*Eucalyptus stellulata*) and wattles. The creek corridor is flanked by “Tableland Gully Mountain Gum – Broadleaved Peppermint Grassy Forest” (Unit 35, State vegetation class: Southern Tableland Dry Sclerophyll Forests), “Tableland Gully Snow Gum – Ribbon Gum Grassy Forest” (Unit 11, State vegetation class: Tableland Clay Grassy Woodland), and smaller areas of “Tableland Slopes Brittle Gum – Broadleaved Peppermint Grassy Forest” (Unit 34, State vegetation class: Southern Tablelands Dry sclerophyll Forests).

## 2.2 Weeds and Introduced Vegetation - Farmers Creek Urban Waterway

Historic photographs show that the Farmers Creek corridor through the Lithgow urban area was substantially, if not entirely, cleared and disturbed at varying stages in the town’s development as an industrial and regional centre. Even as late as the 1980s large sections of the creek remained minimally vegetated and the dominant creekside vegetation was introduced species (notably Poplars).

As a consequence the current vegetation of the “urban waterway” sections of Farmers Creek is predominantly a mixture of regrowth, managed and unmanaged vegetation.

The creek corridor or creek bed formation varies markedly as Farmers Creek passes through the urban areas of Lithgow. This, together with the land use history and adjoining land uses, influences the type of vegetation present – notably the occurrence and density of weeds and other





1928 Farmers Creek flood, showing complete absence of vegetation from the creek corridor

(source: Lithgow Facebook)



Looking north along Tank Street, cleared Farmers Creek corridor in the foreground

(source: <http://members.ozemail.com.au/~joywilkinson/wilkiewebPages>)



Farmers Creek looking east from Albert Street, 1980s, Farmers Creek running top right to bottom centre

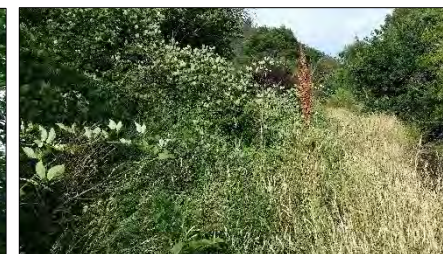
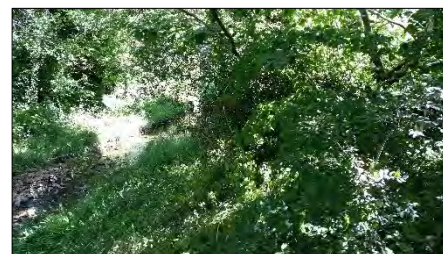
(source: Cremon, 1989)

introduced species present. The creek form, width of the public creek corridor, and the presence of adjacent public land, also influence how easily various sections of the creek can be accessed by Council to undertake vegetation management, weed control and native revegetation works.

An assessment of weed occurrences and densities was undertaken along the non-channelised or engineered sections of the creek. This rapid, reconnaissance level, assessment rated relative weed densities along those sections of the urban creek corridor not subject to channelisation. Weed densities were rated high, medium or low (as illustrated with Table 1), and the assessment also recognised areas of past or current Council weed control and revegetation works.

The result of this rapid assessment are given in Table 1 (in area, m<sup>2</sup>, terms for public lands only), and discussed further below. Over the assessed reaches of Farmers Creek there are estimated to be a total of 3.42 hectares (34,180 m<sup>2</sup>) of low density weed infestations, 3.94 hectares (39,370 m<sup>2</sup>) of medium density weed infestations and 2.66 hectares (26,630 m<sup>2</sup>) of high density weed infestations. Note that these totals relate to public lands only. The most heavily weed impacted sections of the study area (based on the public lands only in non-channelised sections of the creek), as shown on Figures 7 to 11, were assessed to be:

- Planning Units FC3, FC5 and FC 9 on Farmers Creek;
- all public lands on State Mine Creek (Planning Units SMC2) north of Laidley Street; and
- part of Vale of Clywdd Creek at the north end of Planning Unit VoCC2.



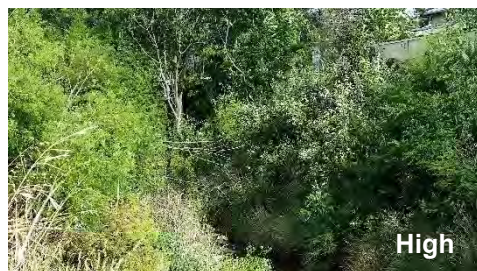


**Table 1 Weed Occurrence/Density in the Urban Reaches of Farmers, Vale of Clywdd and State Mine Creeks**

Planning Unit (urban reaches of Famers Creek, and on public lands, only <sup>1 9)</sup>	Weed Density and Area (in square metres)		
	Low	Medium	High
FC2 – End of Bells Rd (north of Water Treatment Plant) (east) to Ida Falls Creek (west)	3,600	2,190	-
FC3 – Ida Falls Creek (east) to Victoria Ave (west) <sup>2</sup>	-	6,240	8,080
FC4 – Victoria Ave (east) to State Mine Rail Line (at Drurie St) (west) <sup>3</sup>	980	4,430	1,110
FC5 – State Mine Rail Line and Drurie St (east) to Burton St (west) <sup>4</sup>	5,480	5,740	2,690
VoCC2 – opposite, west of, Berry St (south) to opposite, east of, Boundary St (north) <sup>5</sup>	9,060 <sup>5</sup>	1,370	1,490
FC6 – Burton St (east) to Tank St (west)	13,390	5,850	-
SMC2 – confluence with Farmers Creek (south) to NW of end of Pillans Rd (north) <sup>6</sup>	-	2,230 <sup>6</sup>	12,100
FC7 East – Tank St (east) to Sandford Ave (west) <sup>7</sup>	-	5,380	-
FC9 South & North – Geordie St Causeway (south) to Coerwull Rd (north) <sup>8</sup>	1,670	5,940	1,160
<b>Totals</b>	<b>34,180</b>	<b>39,370</b>	<b>26,630</b>

**Notes:**

- <sup>1</sup> Due to its position upstream of the urban reaches of Famers Creek the weed status of FC1 (Lower [Historic] Dam in north-east to End of Bells Rd [north of WTP] in south/south-west) was also assessed. This mainly bushland area was estimated to contain a total of 600 square metres of low density weed infestations, as small scattered areas mainly along the access track and at usage sites.
- <sup>2</sup> Does not include any areas of Oakey Park or Mill Street reserves beyond the riparian corridor.
- <sup>3</sup> Excludes 2 creek sections where the vegetated channel is located on private land outside the cadastral creek corridor (or off other public lands).
- <sup>4</sup> Includes 4,000m<sup>2</sup> area of Crown land abutting north side of creek to the north-west of State Mine Rail Line bridge.
- <sup>5</sup> Includes two previous weed control and revegetation areas (north and south of Mort Street), now assessed as low weed concentrations.
- <sup>6</sup> Includes current weed control and revegetation area (off north end of Pillans Road), assessed as medium weed concentration (at present).
- <sup>7</sup> Eastern end of Planning Unit only, upstream of channelised (concrete canal) section of creek.
- <sup>8</sup> Creek channel winds in and out of private lands north-west from Geordie Street causeway to Council Depot, only the eastern creekbank (or less) is within public land.
- <sup>9</sup> A weed assessment was not undertaken along FC10, due to its position downstream of the urban area.



Past native vegetation removal and the proximity of residential areas has led to the spread of weeds through the urban waterways in Lithgow. Weed propagules spread by stormwater drainage and dumping of garden waste contribute to on-going weed infestation. At least three problem tree species occur in the creek corridor and require attention to halt further spread, which



has been naturally assisted by the creek itself – Poplar Trees, Honey Locust Trees (*Gleditzia* species) and Willows. A range of typical urban weeds are present and include Privet, Tree of Heaven, Blackberry, Honeysuckle, and Blue Periwinkle (particularly prevalent) as well as Broom – amongst a range of other species.

In sections, recent regeneration planting has occurred within the creek corridor, consisting of tube stock planted into existing vegetated areas (usually grasses) within plastic sleeved tree guards. A particularly hot and dry past summer has seen a high percentage of plant failure amongst these plantings.

#### **Farmers Creek – Upstream to Downstream (Urban Reaches Only)**

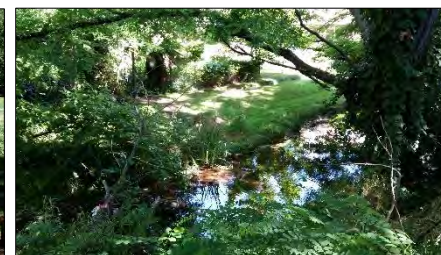
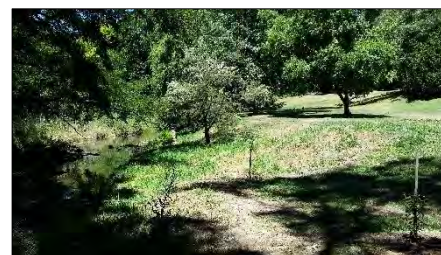
From opposite the water treatment plant to Ida Falls Creek (Planning Unit FC2) the creek channel is relatively natural with gently sloping banks or flats adjacent. While small sections show remains of sandstone channelisation, little development occurs along this portion of the creek and the regenerated vegetation is native, in most part, although with some areas of weed infestation present. The eastern and western sections of Planning Unit FC2 were assessed as low



weed density areas, with the intervening section of creek corridor assessed as a medium weed density area (beside a dense stand on Poplar Trees and a mixed weed understory along the adjacent section of Bells Road) – as shown on Figure 7.

weed density areas, with the intervening section of creek corridor assessed as a medium weed density area (beside a dense stand on Poplar Trees and a mixed weed understory along the adjacent section of Bells Road) – as shown on Figure 7.

As Farmers Creek flows downstream from Ida Creek Falls it passes through a quite narrow cadastral creek corridor and is closely bordered by fenced rear boundaries of residential properties. Encroachment into the creek corridor by land filling and the extension of lawns/gardens has greatly altered the natural formation of the creek banks, providing little opportunity for native vegetation regeneration to occur. Planning Unit FC3 is a heavily weed infested area with colonising weed species and garden escapees, shrubs and groundcovers dominating in all strata. A major stand of the introduced Honey Locust Trees (*Gleditzia* species) fringes the creek along the north side of the Oakey Park reserve, and was assessed as a high weed density zone. Other high weed density reaches occur upstream of the Oakey Park reserve, from Mill Street downstream to below the end of Hay Street, and upstream of Victoria Avenue – as shown on Figure 7. The remainder of the creek corridor in Planning Unit FC3 is assessed as a medium weed density zone.



The narrower sections of the creek corridor upstream of the State Mine rail line bridge to Victoria Avenue, Planning Unit FC4, are largely dominated by weeds in all strata with only a few emergent native trees. In places land filling to create level lawn areas has also encroached onto the creek corridor, replacing re-emerging native shrubs and groundcovers with lawn and garden plantings, and steepening the creek banks in places. Although



a small section of creek adjacent to the Brook Street open space retains some natural characteristics the regenerated native vegetation has been invaded by urban weeds. Another large stand of Honey Locust Trees (*Gleditzia* species) flanks the creek's northern side downstream of the Brook Street





Park. Both these sites are partly on private land. Significant parts of the creek channel in this planning unit are located on private lands outside of the cadastral creek corridor (or other public lands) with these areas harbouring considerable weed infestations, particularly in the Brook Street area. This land tenure

arrangement has the potential to complicate, or limit, weed control measures within this planning unit. The majority of the public creek corridor in Planning Unit FC4 was assessed as having medium density weed infestations, with a highly weed infested reach immediately downstream of the Brook Street Park – as shown on Figure 8. The nearby shorter section assessed as low weed density is dominated by open lawns and garden beds extending from adjacent private properties.

The cadastral creek corridor widens briefly west of the State Mine rail line bridge over Farmers Creek (Planning Unit FC5) but little improvement occurs in the type or number of weed species present. Past vegetation management measures and native tree and understorey regeneration plantings along the northern perimeter of Saywell Street Park flank an area



assessed as medium weed density (mainly along the opposite, northern, creekbank). A short but narrow section of the creek is heavily weed infested immediately downstream of Saywell Street Park – as shown on Figure 8. Downstream of Atkinson Street the creek is again a narrow corridor between private properties with weed species dominant and areas of encroaching lawn. Weeds are present in high numbers. Many species are considered garden escapees and probably occur through dumping of garden waste material. The creek corridor also widens briefly at Guy Street (Planning Unit FC6), however



vegetation cover becomes thinner with few, or no, trees and mainly weed species as groundcover – assessed as a medium density weed zone.

As Farmers Creek flows further to the west – into Planning Unit FC6 – it becomes confined by adjacent road development (Macauley Street) and industrial complexes. The creek bed is not hardened but banks are steep due to land filling for adjacent activities. Vegetation is restricted to grasses and ground cover weeds. Past vegetation management and weed control measures along much of this section, and scattered replanting areas, have



reduced weeds to low densities for much of Planning Unit FC6 – as shown on Figure 9. Medium density weed areas were identified where State Mine Creek flows into Farmers Creek, at a group of suckering Poplar Trees off the south-west end of Guy Street, and upstream of the Tank Street bridge.

Adjacent to the dog park at Montague Street (Planning Unit FC7) introduced plantings have been undertaken, there is also a patch of native species and an avenue of introduced Birch trees. Additional mature native tree



plantings occur adjacent to Heffernan Place open space on the south side of the creek corridor. Part of the channel/bed of Farmers Creek between Tank Street and the start of the larger concrete canal appears to have been previously engineered or modified (into a wide

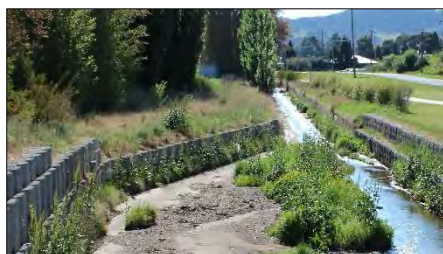
trapezoid cross-section) but has not been hardened. The wide creek bed in this reach was assessed as a moderate weed zone – as shown on Figure 9.

It is west of the dog park (Planning Unit FC7) where the first section of channelisation of Farmers Creek occurs. The large concrete lined canal has relatively low side retaining walls backed (in most places) by wide creek slopes grassed in weed species. Little larger vegetation occurs in this area apart from an extensive grove of Poplars west of the Marjorie Jackson Sporting Complex (Planning Unit FC7), where the concrete channel



narrows, and scattered introduced Pine Trees. This smaller canal continues on the opposite side of Sandford Avenue around the northern and western margins of Glanmire Oval, with a number of mature and aesthetically valuable exotic and native trees fringing the canal and oval.

The concrete canal widens, as a new structure, to almost the full width of the creek corridor from west of Glanmire Oval to west of the Georgie Street footbridge (Planning Unit FC8),



where it again narrows to the previous older style concrete canal. Little to no vegetation occurs along this wide concrete canal and only limited weed species and grasses flank the narrower canal with some previous plantings (in varied condition) also fringing the canal.

The narrow canal ends east of the Georgie Street causeway and the creek returns to a semi-natural form as it continues to flow downstream to the north-west. Despite the return to a relatively natural creek formation the vegetation in this area – Planning Units FC9 (South) and FC9 (North) – consists very largely of weed species. Most of the creek corridor here was assessed as a moderate weed zone – as shown on Figure 10 – with areas of higher weed density in the vicinity of the sewage outfall



and between Chivers and Evans Close in the north-west.

### Vale of Clywdd Creek and Lake Pillans Wetlands

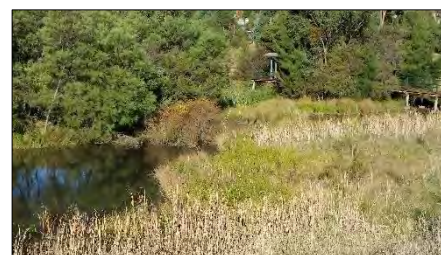
Vale of Clywdd Creek originates to the south, in the Vale of Clywdd, and flows under the Main Western Rail Line into the Lake Pillans Wetlands

(adjacent to Blast Furnace Park) from where it is piped across Inch St to an outfall into Farmers Creek at Saywell Street Park. Much of the creek bed has been modified by adjacent land development (and land filling) and, as indicated, parts of the channel have been piped or formalised. Little remnant native vegetation is present, and much of the creek corridor is



infested with weeds. However weed control measures and mass plantings have previously been undertaken on the middle reaches of the Vale of Clywdd Creek, at Vale Park and the nearby creekside public lands north of Mort Street (Planning Unit Vocc2). These recent treatment areas have been assessed as low weed density

areas, while adjacent non-treated or recolonised areas have been assessed as either medium or high weed density areas – as shown on Figure 11. Despite past treatment efforts numerous Willows remain in this section of the Vale of Clwydd Creek.



The constructed wetlands and revegetation areas at the Lake Pillans Wetlands (Planning unit CVoCC3) offer substantial areas of native species plantings. These maturing plantings contribute significantly and positively to the biodiversity of the area and the amenity of this open space. Weeds

are actively managed over most of this area.

### State Mine Creek

State Mine Creek, which flows from the north and joins Farmers Creek at the Guy Street Creekside open space, has been highly modified over the years due to the proximity of adjacent development and land filling into the creek corridor. It supports little native vegetation and is heavily weed infested (as well as having several sites with encroaching garden/ornamental plantings). Two sections of State Mine Creek (in



Figure 7  
Assessed weed occurrences/densities in  
Planning Units FC1, FC2 and FC3

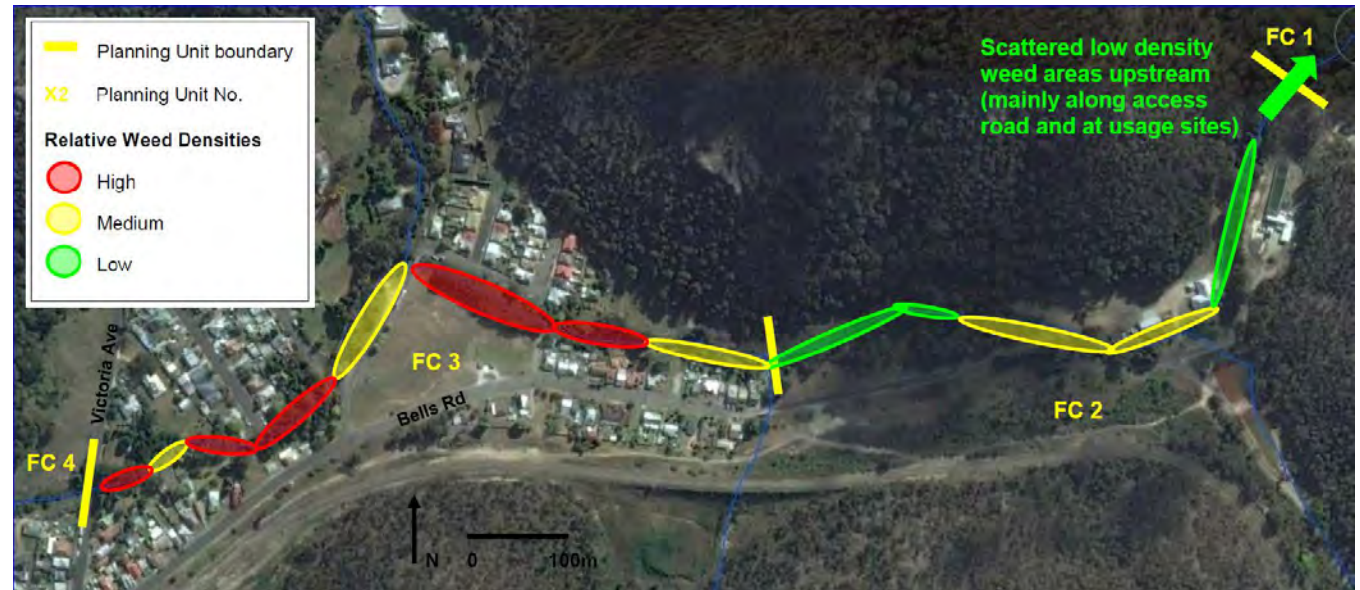


Figure 8  
Assessed weed occurrences/densities in  
Planning Units FC4 and FC5



Figure 9  
Assessed weed occurrences/densities in  
Planning Units FC6 and FC7 (East) (part)



Figure 10  
Assessed weed occurrences/densities in  
Planning Units FC9 (South) and FC9 (North)

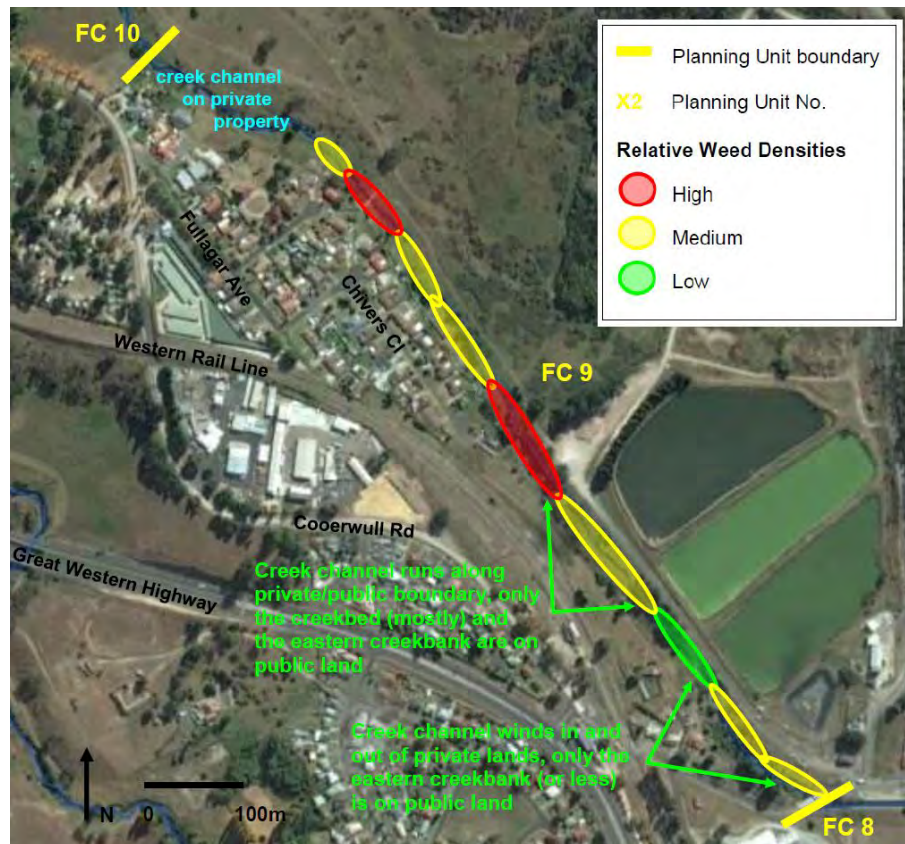






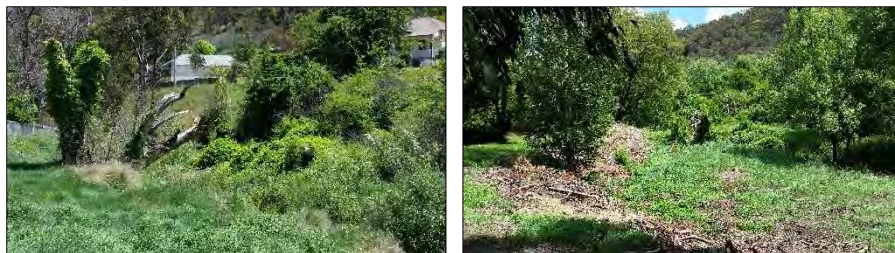
Figure 12  
Assessed weed occurrences/densities  
in Planning Unit SMC2

Figure 11  
Assessed weed occurrences/densities in Planning  
Unit VoCC2





Planning Unit SMC2) are located on private lands outside the cadastral creek corridor, with these areas heavily infested with weeds. This land tenure arrangement is likely to complicate, or limit, weed control measures within this planning unit (without the co-operation of private landholders in this planning unit, and similarly for other weed infestations further upstream on State Mine Creek).



North of Laidley Street all public lands within the creek corridor (in Planning Unit SMC2) were assessed as a high density weed zone – excluding the area off the north end of Pillans Road where Council had recently commenced weed control works (which was rated, at the time of assessment, as a moderate weed zone) – as shown on Figure 12. Downstream from Laidley Street, State Mine Creek runs in a narrow partially engineered (but not hardened) channel in an area assessed as being of moderate weed density.

## 2.3 Fauna

Little information is available regarding the fauna of the Farmers Creek corridor. Those sections of the creek through the Lithgow urban area can be expected to support a “cosmopolitan” fauna assemblage typical of urban bushland sites and managed/modified landscapes dominated by open space.

Birdlife is the most abundant and readily observed wildlife along the creek, with a variety of waterbirds and larger open forest species apparent even in the most urbanised sections of the creek. The sewage ponds adjacent to

the corridor’s western segments support a marked concentration of birdlife (and are known to regularly attract birdwatchers). A variety of small to medium reptiles (mainly lizards) shelter amongst the creek’s groundcover, and nearby residents have reported occasional snake sightings in summers. Frogs were heard calling along parts of the creek corridor during the on-site assessments. Native mammals can be expected to be less common, with microbats likely to be the most abundant (but infrequently seen) native species – although a Swamp Wallaby (*Wallabia bicolor*) was seen in the corridor near Brewery Lane during the on-site assessments. Anecdotal reports suggest trout can still be occasionally seen in the creek and a variety of smaller fish were noted during the on-site assessments.

## 2.4 Threatened Species and Communities

The Atlas of NSW Wildlife (which draws together flora and fauna records from the NSW National Parks and Wildlife, Office of Environment and Heritage, Royal Botanic Gardens, Department of Primary Industries, Forests NSW and the Australian Museum) records seven threatened species from the vicinity of Farmers Creek. These comprise one flora species and six fauna species. All are listed under the NSW *Threatened Species Conservation Act 1995*. Three are also considered of national significance, being listed under the *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999*.

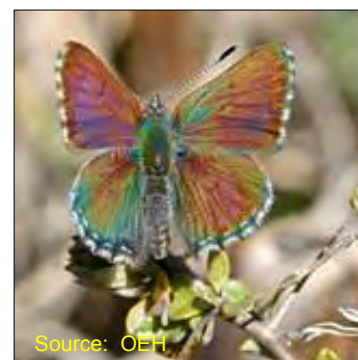


Table 2 lists the significant flora and fauna species recorded from the Farmers Creek area. Of these the Bathurst Copper Butterfly (*Paralucia spinifera*) requires the closest consideration in future planning for the Farmers Creek corridor – to minimise potential adverse impacts on this species as well as to support on-going local conservation measures. No endangered communities or populations are recorded from the Farmers Creek vicinity (as listed in the Atlas of NSW Wildlife).

**Table 2 Recorded threatened species from the Farmers Creek vicinity**

Species	TSC Act Status	EPBC Act Status	Record Locations (and number)
<b>Plants</b>			
Silver-leafed Gum ( <i>Eucalyptus pulverulenta</i> )	Vulnerable	Vulnerable	head of Lake Lyell, where Farmer Creek enters storage (1)
<b>Mammals</b>			
Spotted-tailed Quoll ( <i>Dasyurus maculatus</i> )	Vulnerable	<b>Endangered</b>	Oakey Park area, and near sewage ponds (just north of Geordie St) (2)
Koala ( <i>Phascolarctos cinereus</i> )	Vulnerable	Vulnerable	near Farmers Creek's passage under the GWHighway (1)
<b>Birds</b>			
Blue-billed Duck ( <i>Oxyura australis</i> )	Vulnerable	Not listed	Albert St area (1)
Glossy black-cockatoo ( <i>Calyptrorhynchus lathami</i> )	Vulnerable	Not listed	creek corridor downstream of Marrangaroo National Park (1)
Flame Robin ( <i>Petroica phoenicea</i> )	Vulnerable	Not listed	lower (heritage) dam on Farmers Creek upstream, east of, the urban area (1)
<b>Invertebrates</b>			
Bathurst Copper Butterfly ( <i>Paralucia spinifera</i> )	<b>Endangered</b>	Vulnerable	north of Farmers Creek between Tank Street and sewage ponds (multiple records)

## 2.5 Hydrology

### 2.5.1 Flooding

The steep heavily timbered upper catchment of Farmers Creek presents the risk of flash flooding in downstream parts of the Lithgow urban area, with flood damage risks compounded by the creek's potential to also carry a high debris load (especially if heavy rain follows a major bushfire event). In response to historic flood event, sections of the creek were progressively channelised – by concrete canal “stream improvement works” – along

approximately 2.5 kilometres of the creek downstream of Tank Street to the Geordie Street causeway. Initially undertaken in the 1930s parts of this earlier canal have since been enlarged – in the Albert Street and Sandford Avenue areas – in response to subsequent flood studies, and further canal enlargement works are planned. In addition to these works the Farmers Creek corridor, and the wider floodplain, has also been modified over time by land filling for the construction of adjacent parks and sporting fields, railway embankments and residential developments.

Council recognises that flooding along Farmers Creek impacts the current and future land uses in this corridor – but is yet to prepare a Floodplain Risk Management Plan. However a number of flood risk properties in proximity



to Farmers Creek have been purchased by Council with these blocks being returned to public open space (in varying condition and frequency of management), particularly in the Montague Street area.

The 2015 *Lithgow Flood Study Review* modelled the flood depths along Farmers Creek under various scenarios and Average Return Interval (ARIs). This information for flood liable areas and flood depths along the creek margins, at the 10 year ARI, has been included in the masterplan's constraints and opportunities analysis. Paths and other recreational facilities located within the creek corridor will need to be sited and designed acknowledging that they are likely to be subject to periods of inundation and cognisant of the potential for flood damage. Similarly, the implications of proposed masterplan actions and works, including massed plantings, for the hydraulic performance of the creek and associated flood risks may need to be assessed in some locations (particularly in the creek's narrower upstream urban sections).

## 2.5.2 Stormwater Quality Management

Council acknowledges that although the Lithgow urban area has a substantial stormwater management network, comprised of a series of concrete pits and pipes as well as open channels, the system lacks any stormwater quality management measures. All Lithgow's urban stormwater discharges, by surface flow or through these constructed pipes and channels, into Farmers Creek. The absence of any litter control and stormwater quality management or improvement devices – as either “hard” built works (such as litter nets, gross pollutant traps or sediment basins) or “soft” works (such as rain gardens or planted filter strips), or more contemporary best-practice measures (such as vegetated detention basins or stormwater harvesting measures) – was noted during the on-site assessments of the creek corridor.



At present there are no permanent water quality monitoring stations in place on the urban reaches of Farmers Creek.

## 2.5.3 Rapid Waterway Condition Assessments

### Rapid Waterway Condition Assessment Template

Associated with the preparation of this masterplan, a rapid waterway condition assessment was undertaken at selected points along Farmers, Vale of Clywdd and State Mine Creeks.

A draft assessment template was developed and amended following trial application, Council comments and external specialist review. The template employed a parametric assessment format, focused on the following major determinants of waterway condition and their component attributes:

- bank and bed stability/geomorphology – bank slope, bank height, bank erosion and stability, stabilising bank vegetation, bed erosion and stability, and stabilising in-stream vegetation;
- riparian vegetation and habitat – width of riparian vegetation, longitudinal continuity of riparian vegetation, riparian vegetation cover (by stratum), percentage of introduced species (by stratum), integrity of native riparian vegetation, and habitat features;
- aquatic (in-stream) habitat – in-stream and stream-edge aquatic vegetation, percentage of introduced aquatic vegetation species, extent of stream cover/shading, in-stream habitat features, and smothering by mobile sediments and sediment deposition in the channel; and
- disturbances and pressures – stormwater outlets/pipes and water discharge points, surrounding land use and potential levels of waterway impacts, bank disturbances or encroachments and developments, occurrence of in-stream and stream-edge litter and gross pollutants, garden/green waste dumping, and visible water pollution/pollutants.

The form included descriptive (but not “scored”) information regarding channel/waterway form and features, including – broad waterway type (natural, modified/semi-natural, or engineered/constructed), channel style and modifications, widths, bed type/features description, bank slope and shape, bank height, and bank material.

Attributes were scored, and totalled – by key determinant and for each site overall – to allow for an overall assessment of waterway condition. Scores,

and weightings between key determinants (and components), were informed by other widely accepted waterway condition assessment methodologies (such as NSW Waterwatch, Waterwatch Queensland - Queensland Community Waterways Monitoring, and the “Rapid Appraisal of Riparian Condition” guideline developed by Land and Water Australia).

The template was also formatted to be compatible with the NSW “Waterwatch Field Manual” and reporting format. In keeping with the NSW Waterwatch approach the rapid condition assessment form was deliberately kept non-technical, to enable assessments to be repeated as/when required by non-specialists (such as community groups, students, residents and other laypeople).

Locational information (including GPS data), survey conditions (including flow levels and strength), a transect cross-section and photographic records were also recorded for each assessment site.

A copy of the Rapid Waterway Condition Assessment Template, as finally applied, is provided at Appendix 1.

### Rapid Waterway Condition Assessment Results

The rapid condition assessment form, once finalised, was applied at fourteen selected sites along Farmers Creek (11 sites) and on Vale of Clywdd Creek (1 site) and State Mine Creek (2 sites). All sites were on public land. Sites were chosen to be broadly typical or representative of the planning unit within which they are located – as far as possible.



One assessment site was chosen in each planning units identified along Farmers Creek upstream of the Great Western Highway (excluding Planning Unit FC7 which had two sites, and Planning Unit FC10 with no site

[due to the absence of public land and/or access]), as well as a single site downstream of the Highway. A single site was selected on the Vale of Clywdd Creek in the upstream Planning Unit VoCC2 (rather than the highly modified and managed setting of Lake Pillans Wetlands in Planning Unit VoCC3). Two sites were selected on State Mine Creek – a downstream site near its confluence with Farmers Creek and an upstream site – both in Planning Unit SMC2.

Waterway condition ratings used were:

- excellent (score range 0 – 15);
- good (16 – 35);
- fair (36 – 60);
- poor (61 – 85); or
- highly degraded (> 85).

This scale was based on a “maximum” possible score of 130 across the three major determinants of bank and bed stability/geomorphology, riparian vegetation and habitat, and aquatic (in-stream) habitat (but excluding the disturbances and pressures scores).

Table 3 summarises the rapid waterway condition assessments for all sites, and Figure 13 shows these results graphically. Figure 14 locates all fourteen assessment sites, with their overall condition ratings, within and around the urban area.

All sites on Farmers Creek within, or downstream of, the Lithgow urban area were assessed as being in “Fair” (4 sites) or “Poor” (5 sites) condition. As shown on Figure 13 a site’s riparian vegetation – typically assessed as being in a modified, depauperate or degraded state (with all sites scoring 30 or more, from a possible 55) – was, in all cases, the major contributing factor to these fair or poor overall condition ratings. This was followed by aquatic (in-stream) habitat issues as the second most important contributing factor, and bank and bed stability/geomorphology as the least significant of all three determinants. Unsurprisingly, all sites in the urban area rated highly for disturbances and pressures.

Only those sites located on Farmers Creek upstream of the Lithgow urban area were assessed as being in “Good” condition (site 2, in Planning Unit 2, north of Bells Road on the urban fringe) or in “Excellent” condition (site 1, in



**Table 3 Rapid waterway condition assessments – summary table**

Site	Location	Bank and Bed Stability / Geomorphology (50)	Riparian Vegetation and Habitat (55)	Aquatic (In-Stream) Habitat (25)	Total Condition Assessment Score	Waterway Condition	Disturbances and Pressures (max. 20)	Comments (applicable Planning Unit)
<b>Farmers Creek</b>								
1	Newnes State Forest	3	8	3	14	Excellent	0	Bushland setting, "natural" site, at lower entrance/end to rocky country (FC 1)
2	N of Bells Rd (E end)	9	8	4	21	Good	0	Upstream of urban area (FC 2)
3	S end of Hay St	13	45	23	81	Poor	9	Constrained/narrow urban creek corridor, downstream of Oakley Park and Ida Falls Creeks (FC 3)
4	NW of Brook St Park	14	30	16	60	Fair	6	Proximate to bush slope, with rocky creek bed, managed open space (left side) (FC 4)
5	NW of Saywell St Park	13	44	17	74	Poor	12	Downstream of Lake Pillans and Vale of Clwydd Creek, managed open space (left side) (FC 5)
6	S of Guy St	4	43	23	70	Poor	7	Downstream of State Mine Creek, partially engineered channel, managed open space (right side) (FC 6)
7	S of Montague St dog park, N of Heffernan Park	6	43	18	67	Poor	4	Upstream of large concrete canal section, partially engineered channel, managed open space (both sides) (FC 7)
8	NW corner of Glanmire Oval	0	41	17	58	Fair	6	Downstream of sportfields and CBD, smaller stable concrete canal, managed open space (both sides) (FC 7)
9	S of Geordie St, NW corner of Showground	0	43	15	58	Fair	4	Downstream of showground / sportfields and CBD, smaller stable concrete canal, managed open space (right side) (FC 8)
10	N of Evans Cl	7	51	21	79	Poor	7	Downstream of STP outfall and at lower end of main urban area (FC9)
11	Downstream of GWHwy, NW of Tweed Rd	5	30	9	44	Fair	6	Downstream of Great Western Highway

Site	Location	Bank and Bed Stability / Geomorphology (50)	Riparian Vegetation and Habitat (55)	Aquatic (In-Stream) Habitat (25)	Total Condition Assessment Score	Waterway Condition	Disturbances and Pressures (max. 20)	Comments (applicable Planning Unit)
<b>State Mine Creek</b>								
12	N/NW of Pillans Rd	6	45	12	63	Poor	10	Upstream end of public land on State Mine Creek, upstream bush regeneration area (SMC 2)
13	50m upstream from Farmers Ck junction	3	43	12	58	Fair	9	Lower reach of State Mine Creek, partially engineered channel, managed open space (both sides) (SMC 2)
<b>Vale of Clwydd Creek</b>								
14	S end of Vale Park	18	50	18	86	Highly Degraded	9	Most upstream (southernmost) public land on Vale of Clwydd Creek, less managed section of creek, upstream of bush regeneration area, managed open space (right side) (VoCC 2)

Key to Waterway Condition:

Score Range	Waterway Condition
0 - 15	Excellent
16 - 35	Good
36 - 60	Fair
61 - 85	Poor
> 85	Highly Degraded

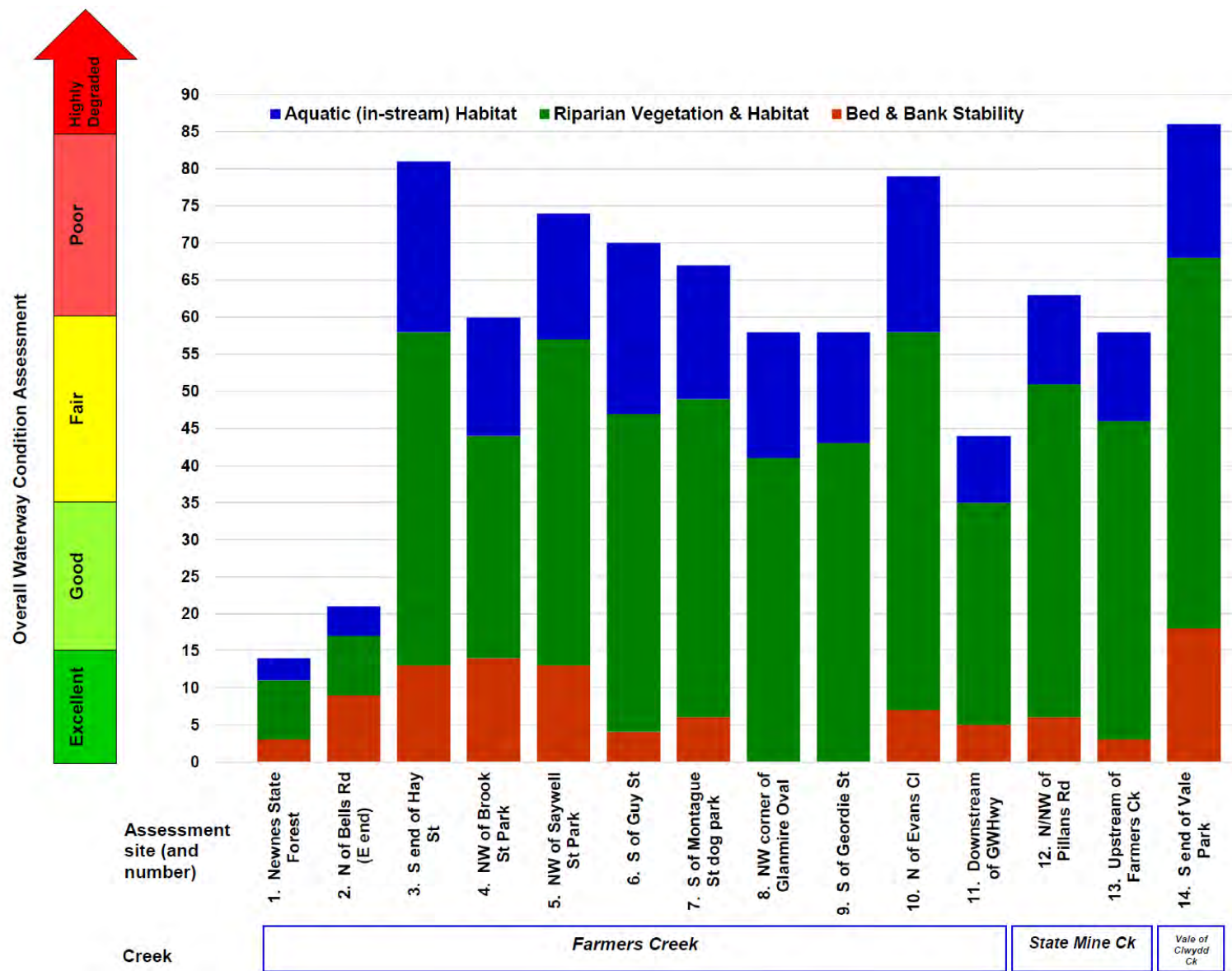


Figure 13 Rapid waterway condition assessments – overall ratings and components, by site





Figure 14 Rapid waterway condition assessments – overall rating by site

Planning Unit 1, in the bushland area [Newnes State Forest] above the township).

The single assessment site on the middle/upper reaches of the Vale of Clywdd Creek, in Planning Unit VoCC2, was rated as “Highly Degraded” and was the lowest quality location of all sites assessed.

Of the two sites assessed on State Mine Creek (in Planning Unit SMC2) the downstream site (site 13) near the junction with Farmers Creek was assessed as “Fair” while the upstream site (site 12) was considered “Poor”.

## 2.6 Aboriginal Cultural Heritage Sites/Values

The Lithgow area is traditionally associated with the Wiradjuri, Darug and Gundungurra Aboriginal people. Today Lithgow is within the Bathurst Local Aboriginal Land Council area and the Mingaan Wiradjuri Aboriginal Corporation is a local (Lithgow based) Aboriginal organisation.

Interrogation of the Office of the Environment and Heritage's on-line Aboriginal Heritage Information Management System (AHIMS) register, in May 2016, indicated that there are no Aboriginal cultural heritage sites recorded in the vicinity of Farmers Creek through the Lithgow urban area. The search area extended from the historic dam site upstream (east) of the urban area to approximately 1 kilometre west of Farmers Creek's crossing of the Great Western Highway, and approximately 1.5 kilometres north and south of the creek corridor.

South from the Great Western Highway to Lake Lyle the AHIMS register records two Aboriginal cultural heritage sites in proximity of Farmers Creek. Both are located downstream of where the creek passes through/beside Marrangaroo National Park.

It must be acknowledged that the AHIMS register is far from complete or comprehensive, and is focused very much towards tangible Aboriginal sites (where there is remaining physical evidence) with a strong bias towards

pre-contact sites and has a dearth of intangible cultural or spiritual sites represented in its listings. The absence of a listing on the register does not necessarily mean that no Aboriginal heritage sites are known, remain or could occur in an area.

## 2.7 Historic Cultural Heritage Sites/Values

Lithgow has a rich collection of historic heritage sites. Twenty-two listed heritage sites (including four sites of State significance), one heritage conservation area, and five archaeological sites (including one site of State significance) occur on, or in the majority of cases, near the Farmers Creek corridor – according to the NSW State Heritage Register and Schedule 5 Environmental Heritage of the Lithgow Local Environmental Plan 2014.

Of the five sites of State level significance:

- Farmers Creek passes under the Bowenfels Rail Viaducts (in Planning Unit FC10-North-west) – comprising the 1870 viaduct over Farmers Creek which is one of the oldest stone arch railway viaducts in New South Wales, and the 1921 viaduct dominated by brick arch construction;
- the Bowenfels Railway Station and Bowenfels Station Masters Residence are proximate to, and clearly visible from, the creek (in Planning Unit FC9-South);
- the Lithgow Coal Stage Signal Box (and associated locally significant Eskbank Railway Station Group) are proximate to, and visible from, Lake Pillans Wetlands and Blast Furnace Park (in Planning Unit VoCC3-South); and





- the Blast Furnace site and coke ovens (Blast Furnace Park) is an Archaeological Site of State Significance (in Planning Unit VoCC3-South).

Farmers Creek passes through the following locally significant sites (listed from upstream):

- Lithgow No. 2 Dam (the lower dam, representing the eastern end of the project area) – an historic heritage site (in Planning Unit FC1); and
- Andrew Brown Private Cemetery (Cooerwull Road) – an archaeological site (in Planning Unit FC10-North-west).



The Inch Street Heritage Conservation Area is located immediately west of Blast Furnace Park, on a potential link in a loop route taking in the Lake Pillans Wetlands and Blast Furnace Park. Eskbank House and Museum, an established heritage attraction, is also located a short distance away from Blast Furnace Park (off the south-west end of the Inch Street Heritage Conservation Area) en-route to and from the town centre.

The following locally significant sites directly abut the creek corridor (listed from upstream):

- Oakey Park Colliery Site (Bells Road, Oakey Park) – an archaeological site;
- Colliery Managers Cottage (Bells Road, Oakey Park);
- Greys Terrace (Brisbane Street and Bragg Street, Oakey Park);
- Langs Dairy (Brewery Lane, Oakey Park);
- Brighton Cottage (Bells Road);
- Mossend (Laidley Street, Morts Estate);
- Inch Street Group (two listings within the Inch Street Heritage Conservation Area);

- Directors House, Lithgow Valley Colliery (Coalbrook Street, Hermitage Flat);
- The Hermitage (Coalbrook Street, Hermitage Flat);
- Rosebank (Coalbrook Street, Hermitage Flat);
- Tony Luchetti Showground grandstand and buildings; and
- Methven House (Evans Place, Bowenfels).

Heritage sites can provide attractions or features of interest, and potential interpretive or educational components, to a walking track or shared path. However there is also the requirement not to impair the heritage values, and fabric, of these sites – with additional approval requirements applying in relation to State listed heritage sites.

## 2.8 Recreation and Amenity Values

The recreation and amenity values of the Farmers Creek corridor are far from fully developed, sympathetically managed or fully realised at present.

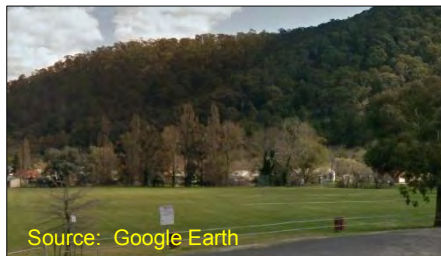
Within the urban area recreation facilities are only provided along limited sections of the creek corridor, and these facilities consist solely of access and movement infrastructure – paths and bridges. Typically these are components of the town's wider path network, or sometimes associated with other open space areas, and have not specifically focused on activating the Farmers Creek corridor or better enabling people to enjoy the Creek as a discrete asset. However their location adjacent to parks and playing fields often allows for access to the facilities provided for these areas – such as toilets, drinking water or shade.

All the existing “creekside” or creek corridor paths are located downstream of Tank Street, as follows:

- an 805 metre section of narrow bitumen path (in fair condition, excluding the 20 metres at the eastern end which is in poor condition) running from the eastern side of the Montague Street dog park to Sandford Avenue just north of the Coalbrook Street, this path runs between Sandford Avenue and the larger then smaller stormwater

canal that forms this section of Farmers Creek, it is signposted for shared use (walkers and cyclists) but is considerably below standard shared path width, and no park furniture or other facilities are provided;

- a 245 metre section of shared path (concrete, in excellent condition) along the southern edge of the large stormwater canal, east from the new Georgie Street footbridge (built to shared path standard) past the Tony Luchetti Showground and Watsford Oval (Council has funding to extend this path past Conran Oval to Albert Street), no park furniture or other facilities are provided with the path; and
- a 570 metre section of concrete path (in good condition) from south of Georgie Street, mostly along the creek margin (here as a smaller canal though open grass) from Georgie Lane downstream nearly to the Georgie Street causeway – this path is signposted for shared use (walkers and cyclists) but not to standard shared path width, and no park furniture or other facilities are provided.



Source: Google Earth

Where it passes along the margins of, or close to, playing fields – notably Marjorie Jackson Oval, Glanmire Oval, Conran Oval, Watsford Oval and the Tony Luchetti Showground and Sportsground – the creek has been largely ignored in the recreational development,

planting schemes and management of these open spaces. The potential recreational and amenity benefits of the creek corridor have been ignored and not integrated with the adjacent parklands. Elsewhere smaller parks



located adjacent to the creek, such as the Brook Street Park or Saywell Street Park or Guy Street open space, have minimal if any facility development and negligible (formalised) user interactions with the creek (although Saywell Street Park does benefit from perimeter plantings along the creek margin).

The *Lithgow Open Space and*

*Recreation Needs Study* (2011 draft) similarly noted that the much of the town's open space "does not meet the DSS [Desired Service Standards] in regard to visibility, accessibility, land characteristics and level of embellishment".

The Lake Pillans Wetlands is a notable exception to this pattern of open space areas "ignoring" the adjacent creek corridor, although the facility standard and management of this site appears inconsistent in parts.



Footbridges over Farmers Creek are a more common feature in the upper urban reaches, where the creek corridor is narrower and surrounded by residential land uses. However there are no other creekside paths or facilities in these upstream areas.

Consequently access to, and use of, the creek corridor is very restricted. In these areas numerous adjoining residents "manage" the creek corridor via lawn and garden encroachments (which act to deter public access) and even a weir and wading pool in the stream channel at one location, or use the public land corridor for less sympathetic uses (such as storage, garden





waste dumping, landfill and rubble dumping, vehicle access and parking, and even for structures).



Views from, and within, the creek corridor can be an important part of a location's appeal. Conversely visually intrusive or unappealing adjacent land uses or developments can detract from enjoyment of the creek corridor. Views are addressed more fully in the constraints and opportunities analysis in Section 4.



The creek corridor is also frequently used for utilities and services, with sewer lines and occasional sewage pumping stations being a common feature, which can both detract from a user's experience as well as limiting the locations of facilities and

plantings (such as taller trees under powerlines). The outfall from the Sewage Treatment Plant discharges into Farmers Creek opposite the southern end of Chivers Close (in Planning Unit FC9-North).

## 3. MASTERPLANNING CONTEXT

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### 3.1 Policy and Planning Context

The following plans and reports were reviewed to identify relevant information, directions, implications and constraints or opportunities to consider in the masterplan's preparation:

- *Open Space and Recreational Needs Study*, 2011;
- *Greater Lithgow City Council Bicycle Plan*, 1998;
- *Lithgow Land Use Strategy 2010-2030*;
- *Community Strategic Plan 2025*;
- *Council Combined Delivery Program 2012-2016 and Operation Plan 2015/16*;
- *Strategic Asset Management Plan*;
- *Lithgow Blast Furnace Conservation Management Plan*, 1997;
- *Lithgow Flood Study Review*, 2015; and
- *Central Tablelands Local Land Services Transitional Catchment Action Plan*, 2013.

Significantly, there was a general consensus among most documents of the need for, and value of, an enhanced public open space corridor and pathway along the Farmers Creek corridor. Further discussion of the information, directions and implications of the most relevant plans and reports is provided in Appendix 2.

### 3.2 Land Use Zoning

Under the *Lithgow Local Environmental Plan* (LEP) 2014 the majority of the Farmers Creek corridor (the creek corridor and adjacent land parcels likely to be addressed by the masterplan) is zoned RE1 Public Recreation or E3

Environmental Management. Most of the playing fields and parks adjacent to the creek are also zoned RE1 Public Recreation. There are smaller areas of R1 General Residential, R2 Low Density Residential and SP2 Infrastructure (Sewerage System) – especially where Farmers Creek is not defined by a cadastral creek corridor and subject to the zoning of adjacent lands or road reserves. There are also areas of unzoned land (Rail Corp lands) and a small area of IN2 Light Industrial zoning over the Rail Corp block east of the State Mine rail line.

Objectives of the RE1 Public Recreation zoning are – “to enable land to be used for public open space or recreational purposes; to provide a range of recreational settings and activities and compatible land uses; to protect and enhance the natural environment for recreational purposes; to maintain or improve the water quality of receiving water catchments.”

The Objectives of the E3 Environmental Management zone's objectives are – “to protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values; to provide for a limited range of development that does not have an adverse effect on those values; to facilitate the management of environmentally sensitive lands and riparian areas; to protect and conserve the vegetation and escarpment landscape surrounding Lithgow; to maintain or improve the water quality of receiving water catchments”.

Under these land use zones a “recreation area” is defined as “a place used for outdoor recreation that is normally open to the public, and includes .... a public park, reserve or garden or the like”. The LEP does not address shared paths, walking tracks or bicycle paths as separate land uses – in terms of application of the Land Use Tables – and “recreation area” would be the most appropriate definition for the range of activities and uses most likely to occur along the Farmers Creek corridor.



In all the above zones, with the exception of SP2 Infrastructure (Sewerage System), a recreation area is “permitted with consent”. Aligning a shared path, and other public open space or recreation developments or uses, within an area now classed as SP2 Infrastructure (Sewerage System) may require a rezoning (or changes to the consent activities for this zone).

### 3.3 Context and Connections to Lithgow’s Open Space and Pathway Network

Farmers Creek’s context within the surrounding open space system was reviewed through the rapid appraisal of other parks, reserves and open space areas within a 1-1.5 kilometre radius of the creek corridor.

The principal findings of this assessment were as follows.

- Beyond the playing fields and smaller parks or open space areas adjacent to the creek, Farmers Creek is not connected to Lithgow’s wider open space system. Lithgow’s open space system as whole was observed to be very poorly interconnected. Other than the string of more-or-less linked playing fields along Farmers Creek between Tank Street and Geordie Street (Marjorie Jackson Oval, Glanmire Oval, Conran Oval, Watsford Oval and the Tony Luchetti Showground and Sportsground) the greater majority of parks and reserves are “stand alone” entities disconnected from other surrounding parks and reserves.
- The level of development and amenity of many passive use parks and reserves is low – with a limited range of facilities (if any), little shade and few amenity plantings with most simply being large expanses of mown grass (an observation



also made by the *Open Space and Recreational Needs Study*, 2011).

- Other Lithgow parks are not focused on a creek channel or riparian corridor. Farmers Creek therefore has the potential to offer a unique setting and attraction within the Lithgow area.

Lithgow does not have an established system of shared paths, instead a more traditional network of generally narrow footpaths interconnect within and between the residential and other areas of the town. Some walks, such as the “Iron Walk” along Inch Street, have been enhanced with other elements of interest, however the greater majority are purely utilitarian.

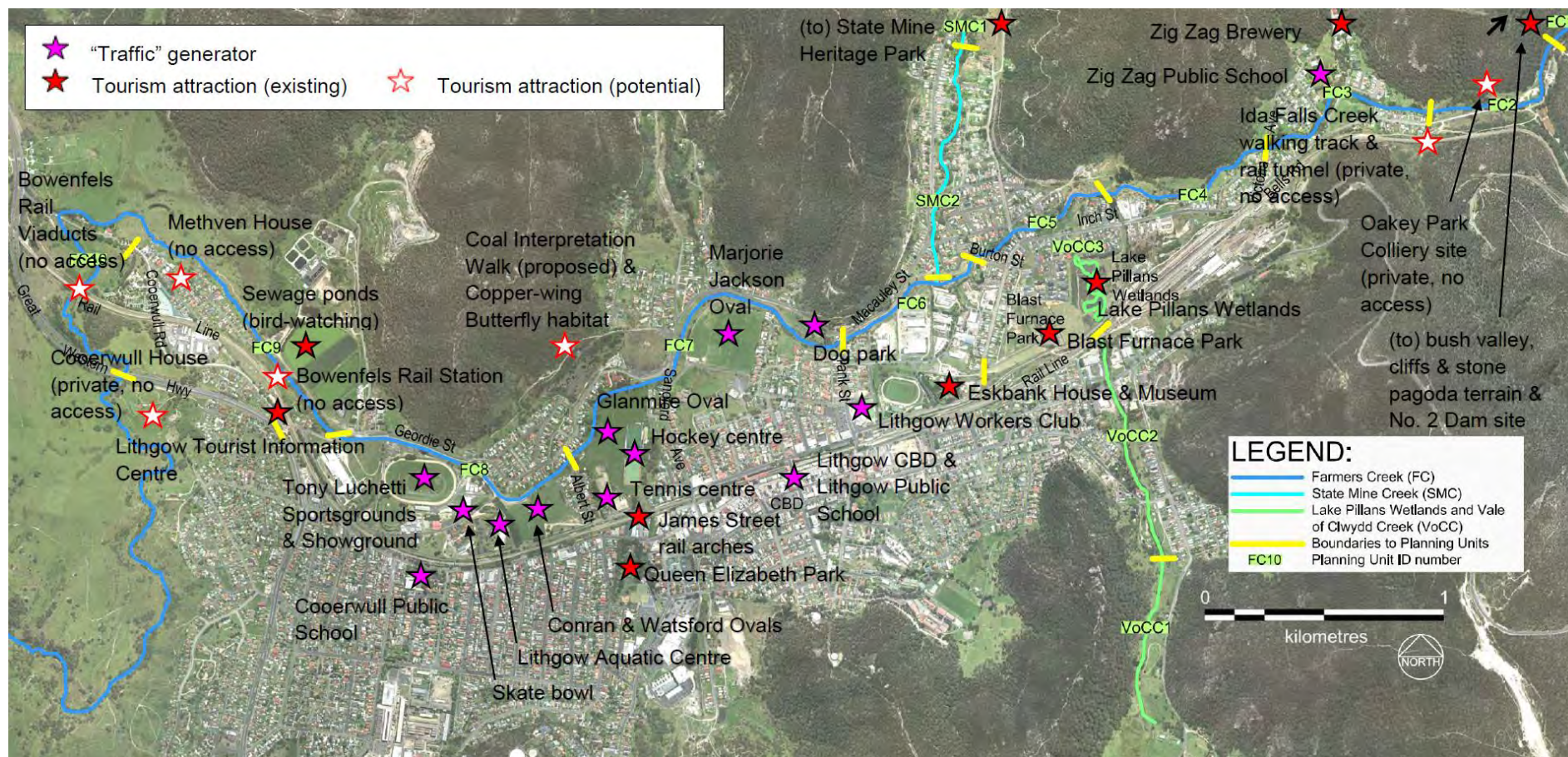
The Farmers Creek corridor intersects with these footpaths at numerous locations. However in their present form they do not offer shared path links to other activity nodes or attractions nor the foundation for a wider shared path network. A short section of shared path runs south from the Tourist Information Centre, beside the Great Western Highway for approximately 330 metres, but then connects with a standard (narrow) footpath and the town’s wider path network. A shared path along Farmers Creek, linking and upgrading the existing disconnected paths (as described in Section 2.7) and then extending further along the creek would be a unique recreation asset within the Lithgow area.

### 3.4 Traffic Generators

An array of likely “traffic generators” that have been observed to, or could be expected to, attract or generate walker and/or cyclist traffic are located within the vicinity of the Farmers Creek corridor. Such pedestrian and cyclists “traffic generators” typically include – residential areas, schools and educational facilities, sporting or recreational venues (outdoor and indoor), open space and parks, business and employment centres, retail centres, tourism attractions, clubs and community facilities, retail centres, arts and entertainment precincts, and public transport interchanges.

Figure 15 shows potential “traffic generators” – in addition to residential areas – near Farmers Creek that warrant consideration in the masterplan’s





*Figure 15 Likely “traffic generators” within the vicinity of the Farmers Creek corridor*



preparation (including potential traffic generators that are not at present accessible to the public).

### 3.5 Demographics and Recreation or Leisure Patterns

Demographic characteristics and participation levels or behaviours are key factors to address in planning for leisure and recreation.

Lithgow has an ageing population with considerable growth forecast in the number (and proportion) of people over 55 years old. As noted by Council's 2011 *Open Space and Recreational Needs Study* "an older population is more likely to seek unstructured recreation and physical activity pursuits



such as walking" and this will place demands on Council to continue to expand and upgrade the town's footpaths and track/trail network. This is likely to be exacerbated by the trend for increasing use of mobility scooters by older people, which also has standards and design implications for the path network.

In areas of lower income and higher socio-economic disadvantage the low cost and easy accessibility of activities such as walking and cycling can make these pursuits more important in equity, participation and public health terms. Providing easy and convenient opportunities for walking has also been demonstrated to bring significant community health benefits, in terms of combating obesity and encouraging regular but low-key and inexpensive exercise.

All these factors point to the likely demand, and support, for a considerable investment in walking tracks and other low-key outdoor leisure and recreation facilities in the Lithgow area – such as would be offered by enhancing the Farmers Creek open space corridor.

Spatial variations in population numbers and characteristics – such as relative proportions of younger versus older residents, or patterns in vehicle ownership and use – can also have a bearing in leisure and recreation facility planning, provision and prioritisation. Although Lithgow's population densities are close to the average for regional centres in New South Wales, this population is not evenly distributed or homogenous. The pattern of residential land use in Lithgow means that the downstream and central sections of Farmers Creek are more accessible to a larger nearby (and slightly more distant) population – and potential local "user catchment". As the Farmers Creek valley, and flanking residential areas, narrow towards the creek's upstream reaches this local population and potential "user" base is both numerically and comparatively smaller.

### 3.6 Regional Recreation and Tourism Context

Relatively gentle creekside walking or cycling paths are very uncommon in the Lithgow region (comprising the western face of the Blue Mountains or other locations within a convenient distance of Lithgow generally).

Although nearby, the tracks and trails network in the Hassans Walls Reserve, including the "Pony Express" downhill mountain bike track, offer a very different experience to that available and proposed along Farmers Creek.

West from Lithgow, Bathurst has an extensive urban pathway network.



However this only includes limited lengths of shared riverside path which, in their present form, would not be as extensive as proposed for the Farmers Creek open space and pathway network – even if it is only partially developed. The Bathurst riverside paths run beside the much larger Macquarie River, which also

means they offer a different – less intimate – experience to that envisaged for Farmers Creek. They are also more typically through developed, highly modified, landscape settings.

To the east Blue Mountains City Council is progressively developing the “Great Blue Mountains Trail” as a regional shared trail across the mountains, with plans to “eventually link up with Lithgow ... trail networks”. Parts of the initial Upper Mountains component of this project are in place – a roadside shared path, mostly beside the Great Western Highway, from Katoomba to Blackheath and a quieter section from Mount Victoria to Mount York. As an undulating ridgeline track, in places unsealed and alongside a very busy highway, this shared trail provides a vastly different experience to that to be offered by the Farmers Creek initiative. Other walking tracks and mountain biking opportunities in the Blue Mountains, particularly those available in the Blue Mountains National Park (including the Six Foot Waking Track passing south-east of Lithgow) are also distinctly different to Farmers Creek.

Further east Yellomundee Regional Park has special provisions for cross-country and downhill mounting biking, but again in a setting vastly different to Farmers Creek.

The Lithgow region boasts a varied suite of tourism attractions and experiences – from nature-based attractions and scenic highlights, through cultural and heritage drawcards, to dining and lifestyle experiences. None of region’s existing higher profile attractions offer activities and experiences comparable to those envisaged for the Farmers Creek open space corridor. The more conveniently accessed and urban styled settings and experiences envisaged for Farmers Creek are unlikely to figure among the region’s major tourism attractions. However they will expand and diversify the experiences on offer, and add to the critical mass of tourism attractions, in the Lithgow region.



## 4. SITE ASSESSMENTS AND CONSTRAINTS/OPPORTUNITY ANALYSIS

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### 4.1 Constraints and Opportunities Assessments

A thorough assessment of the Farmers Creek corridor and its surrounds – especially adjoining or nearby open space and pathways networks, or natural vegetation areas – provided an essential foundation for the masterplan’s preparation.

The recreation and environmental assets and constraints/opportunities presented for a public open space or vegetated corridor and the development of a shared path and recreation facilities, were comprehensively assessed over a series of on-site investigations for each of the following twelve planning units (refer to Figure 2 for location of planning units):

- Farmers Creek (Planning Units FC1 to FC10);
- Vale of Clywdd Creek (Planning Unit VoCC3 only – Planning Unit VoCC2 was not assessed in detail due to being non-contiguous with the other public lands in the project area); and
- State Mine Creek (Planning Unit SMC2).

A constraints and opportunities plan was prepared, accompanied by a summary constraints and opportunities table, for each planning unit – as provided in Appendix 3. These provide a more detailed description, and graphic presentation, of the constraints and opportunities of each planning unit.

A range of attributes were assessed during the on-site investigations for each planning unit, including:

- the width of the public land corridor along the creek, and the on-ground location of the physical creek channel relative to the “cadastral creek corridor” (a key determinant of Council’s ability to access and undertake on-ground works along particular sections of the creek);
- other public lands, such as Council open space or Crown lands, as well as road reserves;
- other tenures – notably Rail Corp lands;
- existing access infrastructure – shared paths, bitumen pathways, footpaths (including footpaths and road verges in surrounding streets – as possible alternative or interim routes), laneways and on-road cycleways – these were assessed as either shared path standard or “not to standard”;
- open space, parklands and existing recreation facilities, including toilets and drinking water;
- potential leisure, recreation or education facility sites;
- possible access points to the creek corridor – both point access and areas of “open” or “unconfined” access;
- potential conflict points, especially between walkers or cyclists and vehicles (or trains), and potential road crossings;
- “trample track” and informal paths – indicating current use patterns;
- possible creek crossing points;



- “pinch points – such as narrow bridges, limited public land, intruding fences, power poles, and other obstructions or impediments to a shared path;
- physical barriers to a shared path, and locations not suitable for shared path construction due to significant physical constraints (scarps and steep banks, narrow benches, undercut or eroding sections, etc.);
- locations likely to require additional construction or design measures, and expense, to accommodate a shared path – such as sloped banks/benches, dips, stormwater outlets, etc.;
- an evaluation of landscape amenity or the scenic qualities of a creek segment or alignment – rated high, medium or low as influenced by factors such as vegetation condition, views, enclosure, proximity of fencelines and buildings, adjacent land uses, shade/exposure, etc.;
- views along and from the creek, including intrusive elements in a viewshed, and vantage points;
- assets and features of interest or possible attractions – ranging from short attractive sections of creek bed to major built heritage features;
- areas of natural or semi-natural vegetation;



- weed infestations and densities – including the occurrence of high risk, problem or noxious weeds;
- past, and on-going, weed control and replanting/revegetation measures by Council (or others);
- sections of eroded or unstable creek bank;
- contaminated lands or subsidence issues (where obvious or apparent on the surface only);
- encroachments into the public creek corridor and locations requiring tenure and property boundary clarifications; and
- potential safety, privacy and security concerns – for path users and adjoining resident or land users.



The flood liability assessments (less than, or more than, 300mm depth in a 10 year ARI flood event) included in the constraints and opportunities plans were taken from Council's 2015 *Lithgow Flood Study Review*. These were not identified or assessed on-site.

The constraints/opportunities analysis also included results from the rapid waterway condition assessments where relevant.

Summary descriptions of each planning unit and key outcomes of these constraints/opportunities assessments, for each of the above twelve planning units, are presented the following Sections:

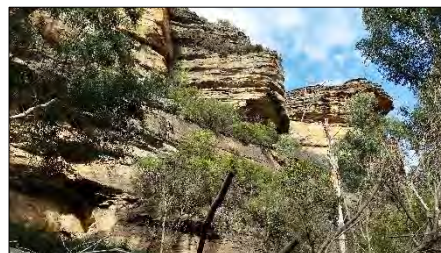
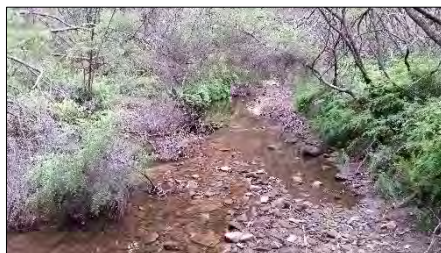
- Section 4.2 Farmers Creek;
- Section 4.3 Vale of Clwydd Creek, including Lake Pillans Wetlands and Blast Furnace Park; and
- Section 4.4 State Mine Creek.



## 4.2 Farmers Creek Constraints and Opportunities - Summary

### 4.2.1 Planning Unit FC1 – Historic (Lower) Farmers Creek Dam to End of Bells Road

Planning Unit FC1 extends from the lower dam (the historic now dis-used No. 2 Dam) downstream to the northern end of Bells Road (just north of the Oakey Park Water Treatment Plant).



For much of this unit the physical channel of Farmers Creek runs through private lands and is located outside the “cadastral creek corridor” (which terminates at the north-east corner of Newnes State Forest). Council land abuts the creek in sections at the southern end, and the dam lies in Council land in the north. These factors present challenges for aligning a creekside pathway and siting other facilities.

However this unit also has considerable user appeal. The land is undeveloped and the creek winds through a narrow valley flanked by scenic rocky escarpments and stone pagodas/pillars/outcrops in a setting of natural or regenerating bushland. The creek is mainly a narrow series of attractive rocky or gravelly pools and riffles. This unit contrasts markedly with all other lands along Farmers Creek and its tributaries (within the project area) offering an undeveloped, natural and largely enclosed setting – while still being readily accessible from the urban area. The area also has several smaller features of heritage interest, in addition to the dis-used No. 2 Dam (and an informal access track to the upper dam).

Weeds occur as small, low density patches scattered along the access track and around usage sites. The rapid waterway condition assessment (site 1) identified this section of Farmers Creek as being in “Excellent” condition.

### 4.2.2 Planning Unit FC2 – End of Bells Road to Ida Falls Creek

Planning Unit FC2 extends from Bells Road just north of the Oakey Park Water Treatment Plant downstream to the Ida Falls Creek bridge.



For approximately half of this unit the physical channel of Farmers Creek runs through private lands and is located outside the “cadastral creek corridor” (which is generally narrow, between 3 to 7 metres wide). The Bells Road reserve flanks the cadastral creek corridor at the eastern end of this unit, however here the actual creek flows on the western (and, in part, on the northern) side of the cadastral creek corridor within private lands.

A small portion of Crown land abuts the south side of the creek corridor (where it is contained within the cadastral corridor) in the middle of this unit. As the creek flows downstream from this point it diverges from the cadastral corridor to flow to the north again within private lands. No public land abuts the creek in this section. These factors, as well as the proximity of Bells Road to the creek channel in the middle section of this unit, present challenges for aligning a creekside pathway or the siting other facilities or for conducting environmental works.

Much of this unit is undeveloped with the exception of the Oakey Water Treatment Plant (located on two sites on the south and eastern side of Bells

Road) and a rural residential property on the north side of Bells Road, all in the unit's eastern half.

Remaining lands to the north are open paddocks or cleared land backed, in close proximity, by vegetated rocky ridges. Remaining lands to the south are partially cleared with introduced grasses dominating and remnant vegetation in places. Sections of the creek channel in this unit are incised with a narrow pebbly bed, and attractive reaches in the better vegetated areas, but the extent of private property limits public access. The scattered remains of the Oakey Park Colliery are a feature of this unit, but are inaccessible within private land.

This unit was assessed as a low and medium weed density area (assessing the public lands along the creek corridor only). The rapid waterway condition assessment (site 2) identified this section of Farmers Creek as being in "Good" condition.

#### 4.2.2 Planning Unit FC3 – Ida Falls Creek to Victoria Avenue

Planning Unit FC3 extends from Ida Falls Creek downstream to Victoria Avenue.



For much of this unit the physical channel of Farmers Creek is contained within the "cadastral creek corridor" although in some sections this corridor is extremely narrow (only 5 to 7 metres wide). At places in the eastern end of this unit the creek channel runs through private lands, just to the north of the cadastral corridor. There is also only very limited public land flanking the cadastral creek corridor, principally Oakey Park Reserve. Several existing

items of infrastructure, mainly footbridges and road bridges with footpaths, cross the creek in this unit – but none are to shared path standard. All these factors present challenges for aligning any creekside pathway and siting other user facilities, and afford only a limited riverine corridor (on public land) for environmental works.

For most of this unit the land north and south of the cadastral creek corridor is developed, predominantly as housing with Zig Zag School located within the residential area on the northern side (east of Mill Street). Encroachments into the public lands along creek corridor, from adjacent residential blocks, are common along this upper section of Farmers Creek. Garden waste dumping is also common.

Vegetated rocky ridges, in close proximity, back the residential area to the north. Bells Road and the rail line back the residential areas to the south, with views to more distant vegetated rocky ridges.

This unit is heavily weed infested, including a large stand of the introduced Honey Locust Trees (*Gleditzia* species) creekside along the northern margin of the Oakey Park Reserve. This entire unit was assessed as either a high or medium density weed area. The rapid waterway condition assessment identified Farmers Creek, at the south end of Hay Street (site 3) as only being in "Poor" condition.

#### 4.2.4 Planning Unit FC4 – Victoria Avenue to State Mine Rail Line (Drurie Street)

Planning Unit FC4 extends from Victoria Avenue downstream to the State Mine rail line (embankment and bridge, on the eastern side of Drurie Street).





For much of this unit the physical channel of Farmers Creek runs through private lands and is located outside the “cadastral creek corridor” (which is generally narrow, mostly 8 to 13 metres wide). There is also only very little public land flanking the cadastral creek corridor, principally Brook Street Park, and few access points to the public creek corridor (especially in the western half of this unit). All these factors present challenges for aligning any creekside pathway and siting other user facilities, and afford only a limited riverine corridor (on public land) for environmental works.

For most of this unit the land to the south of the cadastral creek corridor is developed, predominantly as housing but with industrial blocks at the western end, and encroachments into the corridor from adjacent properties are a regular feature. Garden waste dumping is common. Lands to the north are open paddocks or cleared land backed, in close proximity, by vegetated rocky ridges.

The State Mine rail line is a very significant barrier to access along the creek corridor and the continuity of any creekside path. A large block of land owned by Rail Corp (and used for storage by adjacent industrial premises) is located on the southern creekbank immediately west of the State Mine rail line. Use of this parcel would require Rail Corp approval.

This unit has a varied weed profile, with most of the public lands along the creek corridor being medium weed density areas as well as smaller areas assessed as high and low weed density. The rapid waterway condition assessment identified Farmers Creek, along the north-west margin of the Brook Street Park (site 4), as being in “Fair” condition.

#### **4.2.5 Planning Unit FC5 – State Mine Rail Line (Drurie Street) to Burton Street**

Planning Unit FC5 extends from the State Mine rail line (embankment and bridge) at Drurie Street downstream to Burton Street.

Farmers Creek is predominantly located within the “cadastral creek corridor” within this Planning Unit, with the exception of a small meander just to the west of Saywell Street (which runs through private property to the north). Vale of Clywdd Creek (from the Lake Pillans Wetlands to the south) joins



Farmers Creek opposite the Saywell Street Park (with piped outlets in the creek’s southern bank).

Public land flanks the cadastral creek corridor at Farmers Creek Reserve between Drurie and Saywell Streets (southside), at Saywell Street Park (south side) and at two small parks on each side of Atkinson Street (on the northside of the creek corridor). The State Mine rail line at the eastern end forms a very significant barrier to access along the creek corridor between Planning Units FC4 and FC5, and to the continuity of any creekside path.

It is west of the State Mine rail line that the creek curves southwards to head away from the vegetated rocky ridges along its northern side and flows into/through the Lithgow urban area.

Saywell Street Park offers a large area open space adjacent to the creek corridor, with an attractive planted belt of trees along the park’s northern boundary (southern creekbank). However this large park is poorly supplied with facilities and appears little used. Across Inch Street to the south a smaller park, with a low-key playground, links to the open space of the Lake Pillans Wetlands and Blast Furnace Park beyond (Planning Unit VoCC3).

Apart from the two small Atkinson Street open space areas, the land to the north of the creek is largely developed as housing with the exception of an open grassed paddock located at the unit’s eastern end opposite Saywell Street (this apparently unmanaged creek flat is an area of Crown land). On the creek’s southern side housing flanks the western half of this unit, as well as a small area between Saywell and Drurie Streets in the east.

West/downstream from Saywell Street Park the creek corridor is generally narrow and heavily weed infested with the creek channel often very close to the residential property boundaries along the southern side, leaving very little

room for locating recreation facilities or undertaking environmental works. Where the northern creekbank widens slightly towards the western end of this unit several encroachments (lawns and fences) extend into the public creek corridor and garden waste dumping is common.

The upstream/western section of this unit was assessed as, mostly, a medium density weed zone (mainly the northern side of the creek past Saywell Street Park, with the opposite southern bank having been subject to previous vegetation management and native tree plantings). Downstream of the park the narrower section of creek corridor is heavily weed infested and assessed as either a high or medium density infestation zone.

The rapid waterway condition assessment identified Farmers Creek, at the north-western end of Saywell Street Park (site 5) as only being in “Poor” condition.

#### 4.2.6 Planning Unit FC6 – Burton Street to Tank Street

Planning Unit FC6 extends from Burton Street downstream to the road bridge at Tank Street.



Largely, Farmers Creek is located within the “cadastral creek corridor” within this Planning Unit with the exception of two sections, near Guy St Park and adjacent to Macauley Street near Tank Street which are both public land (zoned environmental management). Other public lands – including Crown land (also zoned environmental management), other Council lands and road reserve – flank a large proportion of the cadastral creek corridor giving a reasonable width in which to accommodate recreational facilities or undertaken environmental/amenity works.

There are many possible access options to the creek corridor from the northern side of Farmers Creek. However access to the southern side is limited, due to almost continuous industrial development from Burton Street to Union Street. The land to the north of the creek, beyond the adjacent strips of Crown land and road reserve, is largely developed as housing. The creek meanders in close proximity to the vegetated ridges to the north towards the downstream end of the planning unit. To the south the creek is flanked by large factories on industrial sites from Burton Street almost to Tank Street (with housing between Union and Tank Streets).

The majority of this unit was assessed as a low weed density zone with much of the creek corridor subject to past vegetation management and weed control measures and scattered replanting efforts. Some smaller areas of medium weed density occur, such as at the junction with State Mine Creek.

The rapid waterway condition assessment identified Farmers Creek, at Guy Street (and downstream of the junction with State Mine Creek), as only being in “Poor” condition.

#### 4.2.7 Planning Unit FC7 – Tank Street, to Sandford Avenue, and on to Albert Street

Planning Unit FC7 extends from Tank Street downstream, past Marjorie Jackson Oval and Sandford Avenue then via Glanmire Oval, to Albert Street.



Largely, Farmers Creek is not located within the “cadastral creek corridor” within this Planning Unit. Not far downstream from the Tanks Street bridge, the creek alignment leaves the cadastral boundaries of the creek corridor and winds to the north. The cadastral creek corridor winds around the dog park



and continues west into the Marjorie Jackson Sporting Complex where it terminates. The cadastral corridor recommences downstream of the Sandford Ave road bridge, deviating into Glanmire Oval but substantially returning to the same alignment as the creek around the remainder of Glanmire Oval downstream to Albert Street.

From Tank Street, Farmers Creek winds west past the Montague Street dog park – initially as a semi-natural creek and then as a previously engineered or modified (but not hardened) channel – to just west of Heffernan Place Park. This section of creek corridor was assessed as a moderate weed zone. The rapid waterway condition assessment (site 7, in the previously engineered/modified wide channel) identified this section of Farmers Creek as only being in “Poor” condition.

Downstream/westward from Heffernan Place Park, Farmers Creek has been formalised as a wide concrete canal with relatively low sided walls (topped by open metal fencing) with adjacent grassed sloping banks in most places. This canal essentially parallels Sandford Avenue downstream. After approximately 250m this wide canal narrows to continue west, then south, around Marjorie Jackson Oval before passing under the Sandford Avenue road bridge. Scattered introduced Pine Trees, and a large grove of Poplar Trees adjacent to Sandford Avenue, occur here.

The narrow/smaller concrete canal continues west then south around the northern and western boundary of Glanmire Oval, with a variety of larger exotic and native trees between the oval and canal. The northern bank is mostly lawn with scattered trees, and regular encroachments (such as garden furniture).

This narrow smaller canal continues until approximately 100 metres short of Albert Street. At this point recent works have enlarged the canal to a considerably more substantial structure with a very wide concrete base and high concrete block side walls (topped by safety railings). The amenity of the creek transforms from relatively pleasant to highly engineered, presenting as all hard surfaces with little to no plantings.

The south side of Farmers Creek in this unit is flanked for approximately two thirds of the boundary by sports fields (Marjorie Jackson Complex and Glanmire Oval). An area of open space flanks the creek for a small length

near Heffernan Place and another smaller area containing a pump station at the Tanks Street end. The remainder of adjacent development is housing.

On the north side open space flanks the creek at the dog park (upstream end), between the creek and Sandford Avenue, at the upstream end of Coalbrook Street and a small pocket behind housing in Coalbrook Street. The remainder of land is developed as housing, though backed in close proximity by vegetated ridges giving high value long-range views from much of the creek corridor.

The rapid waterway condition assessment (site 8, on the narrow canal at the north-west corner of Glanmire Oval) identified this section of Farmers Creek as being in “Fair” condition.

#### 4.2.8 Planning Unit FC8 – Albert Street, to/past Showground and along Geordie Street, to Tourist Information Centre

Planning Unit FC8 extends from Albert Street downstream past the Tony Luchetti Sportsground and Showground, over the new Geordie Street footbridge and along the south side of Geordie Street, to the Tourist Information Centre in Geordie Street west of the rail line.



In the east Farmers Creek is contained within a recently constructed canal (with a wide concrete base and high concrete block side walls topped by safety railings), from Albert Street to the new Geordie Street footbridge. This crossing has been designed for shared use. This highly engineered section of creek has low amenity, exacerbated by the few plantings and only scattered “urban” weeds. West from the Geordie Street footbridge the creek

is contained within an older style smaller/narrow canal, flanked by unmanaged grasses and weeds on the southern (Showground) side and mown grasses with some plantings (in varied condition) also lining the canal margin on the northern side (plus a concrete pathway).

Between Albert Street and the western boundary of the Showground, Farmers Creek runs within the “cadastral creek corridor” or the road reserve of Geordie Street to the north. The cadastral creek corridor terminates at the western boundary of the Showground (and does not resume until west of the Great Western Highway).

From the Geordie Street causeway, Farmers Creek leaves the road reserve and flows to the north-northwest. However Planning Unit FC8 continues along Geordie Street to the Lithgow Tourist Information Centre (west of the rail line) in order to accommodate shared path links to this facility and to the existing urban path network.

Large areas of open space, sporting fields and the Showground, flank the south bank of the creek, although the Showground site is fenced restricting open access to the creek corridor from the south. A small strip of Crown land borders the Albert Street end, with a section of private land between this and the sports fields. Investigation is required to ascertain the width of public land available at this point. An industrial complex borders the unit’s downstream end.

Between Albert Street and the Geordie Street footbridge the northern bank is flanked by developed residential land, while Geordie Street parallels the creek from the footbridge to the causeway. The Sewage Treatment Plant ponds have a small frontage on Geordie Street just east of the causeway and housing occurs between the causeway and the rail line to the west. Immediately west of the rail line is parking for the Tourist Information Centre and the centre building (either side of Geordie Street).

A level crossing is located at the intersection of the rail line and Geordie Street, but does not pose a significant barrier to access as does the State Mine rail line to the east.

A vegetated ridge is in close proximity to the north, adjacent to Geordie Street and behind the housing at the upstream end.

The rapid waterway condition assessment (site 9, on the small canal at the north-west corner of the Showground) identified this section of Farmers Creek as being in “Fair” condition. Being a developed and closely managed section of creekline, a weed density assessment was not undertaken for this unit.

#### **4.2.9 Planning Unit FC9 – Geordie Street causeway, via sewage ponds and Council depot to Chivers Close, and on to Coorwull Road**

Planning Unit FC9 extends from the Geordie Street causeway downstream to the intersection of Coorwull Rd with Fullagar Avenue – running along the unsealed service road accessing the Council storage/depot area, then an undeveloped reserve to the Chivers Close footbridge, and then to Fullagar Avenue.



Between the Geordie Street causeway and the Council storage depot Farmers Creek flows in a north-westerly direction along the boundary between Council land (Sewage Treatment Plant) and private lands. The creek does not form the boundary line between these tenures, but meanders in and out of the Council and private lands. The ponds of the Sewage Treatment Plant lie to the east of the creek and blocks zoned as light industrial to the west (including noise generating dog kennels, and several items of historic rail infrastructure).

From the Council storage depot Farmers Creek re-enters Council land (a largely unmanaged block) and continues to the north-west, to just north of Evans Close. The creek corridor is accessible from three residential roads off Fullagar Avenue – Chivers Close, Evans Close and (indirectly) Willow



Place. The footbridge at the north-east end of Chivers Close is not to a shared path standard. Housing closely abuts the creek's western margin in this section, with a creek bench (mostly mown grass and to varying widths) behind these private properties. Open paddocks lie to the east and north of the creek and Council land, and the Council Waste Depot is located to the north-east of the sewage ponds (but visible from the creek and Council land). A vegetated ridge lies beyond the paddocks in the north within reasonable proximity.

From just north of Evans Close, Farmers Creek flows through private property for the remainder of this planning unit (and all of Planning Unit 10), to below the Great Western Highway.

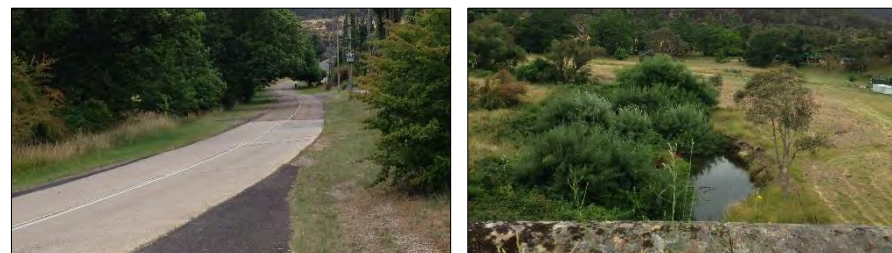
Within this unit Farmers Creek lies in a relatively natural channel although the banks, and wide bed, are highly weed infested in places. Most of this creek corridor was assessed as a moderate weed density zone, with areas of higher weed density in the vicinity of the sewage outfall (west of the Council storage depot) as well as between Chivers and Evans Close.

The rapid waterway condition assessment (site 10, north-east of Evans Close) identified this section of Farmers Creek as only being in "Poor" condition.

#### **4.2.10 Planning Unit FC10 – Fullagar Avenue (east) and Coerwull Road rail bridge (south), to Great Western Highway (north-west)**

Planning Unit FC10 extends from the intersection of Coerwull Road with Fullagar Avenue to the Great Western Highway to the west and addresses the option for a loop or return along Coerwull Road back to the Tourist Information Centre in Planning Unit FC8.

Farmers Creek meanders to the north-west from the end of the Council Reserve noted in Planning Unit FC9 and re-joins Planning Unit FC10 as it meanders to the south under Coerwull Road at the James Kirkwood Bridge. The road reserve of Coerwull Road is almost twice the average width of this road at this point. Farmers Creek then flows south east to pass through private lands (paddocks) passing under the rail line then continuing in a south



easterly direction to pass under the Great Western Highway. Farmers Creek continues flowing to the south through privately owned lands.

Here it flows along a relatively natural channel through farming land with vegetated ridges lying beyond the paddocks to the north within reasonable proximity of the creek.

West of Fullagar Avenue, Coerwull Road is flanked by lands zoned for environmental management and developed as farming land (paddocks). South of Fullagar Avenue, Coerwull Road is flanked by a caravan park to the west and light industrial (storage unit and motel) to the east (north of the rail line). There is no open space or Council owned land except for the road reserves in this Planning Unit. A Rail Corp owned easement runs between the Great Western Highway and Coerwull Road. It includes the Main Western Rail line passing over an arched brick viaduct, and a service road passing over a stone arched viaduct, crossing Farmers Creek. Both these "Bowenfels Rail Viaducts" are heritage listed.

## **4.3 Vale of Clwydd Creek Constraints and Opportunities - Summary**

### **4.3.1 Planning Unit VoCC2 – Opposite Berry Street (south) to Chifley Road (north)**

Planning Unit VoCC2 is an area of public land running along and beside Vale of Clwydd Creek north-south each side of Mort Street, and including Vale



Park in the south. It is “land-locked” and not connected with the other public lands in the project area, and only tenuously linked to the town’s existing pathway network. It was not subject to a detailed constraints and opportunities assessment.

The creek corridor was assessed as a low weed density zone over much of this planning unit – due mainly to previous weed control measures and mass plantings at Vale Park and north of Mort Street. Adjacent non-treated areas, or recolonised sites, were assessed as medium weed density. An area of high weed density was identified along an untreated section of the creekline in the north.

The rapid waterway condition assessment (site 14 at the southern end of Vale Park) identified this section of the Vale of Clywdd Creek as being in a “Highly Degraded” condition.

#### **4.3.2 Planning Unit VoCC3 – Inch St (north) to Main Western Railway (south) and Inch Street (south-west) (includes Lake Pillans Wetlands and Blast Furnace Park)**

Planning Unit VoCC3 extends from the Main Western Rail Line south of Lake Pillans Wetlands to Inch Street (Saywell Street Park South) to the north.

Vale of Clywdd Creek, a tributary of Farmers Creek, flows from a culvert under the rail line, into the Lake Pillans Wetlands. The creek’s outflow from the wetlands is piped under Saywell Street Park (south), Inch Street and Saywell Street Park (north), to where it joins Farmers Creek (refer to Planning Unit FC5 for details).



Essentially this planning unit consists of public open space – Lake Pillans Wetlands and Blast Furnace Park to the east (plus a portion of Crown land between the Blast Furnace Park access road, from Inch St, and the rail corridor to the south). The Main Western Rail Line borders this area of open space in the south and a private branch rail line (State Mine rail line) leaves the main line in the south-east corner and forms the eastern border to Lake Pillans Wetlands, travelling north, eventually passing over Farmers Creek (refer to Planning Unit FC5 for details). To the north-east and north housing development borders the open space. A vacant block of land borders Blast Furnace Park to the west, on which horses are agisted, and presents as an unmanaged and unattractive block.

The Lake Pillans Wetlands provides a “natural” setting with high amenity internal views. The wetlands and surrounding planted areas offer substantial areas of native species, where weeds are actively managed, and contribute to the area’s biodiversity values. To the east Blast Furnace Park, though open with little planting, contains dramatic remnants of the historic furnace buildings. The rail embankment to the south also dominates this area although views to the vegetated ridges to the north are possible.

Both Lake Pillans Wetlands and, to a lesser degree, Blast Furnace Park are already provided with vehicle access, limited facilities and an existing path network (including a pathway link between both sites via a moderate gradient grassy slope). The area offers few constraints to further recreational and educational or interpretive development.

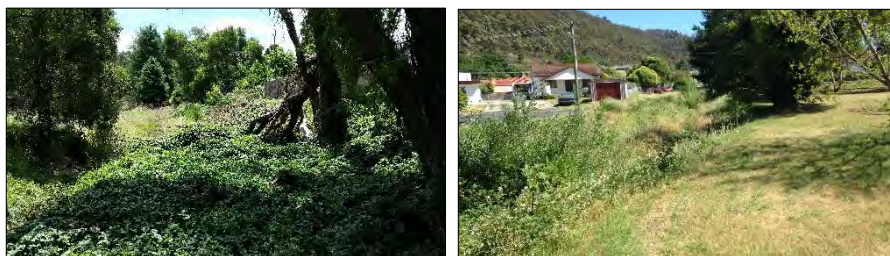
Being a developed and closely managed site, neither a weed density assessment nor a rapid waterway condition assessment were undertaken for this unit.



## 4.4 State Mine Creek Constraints and Opportunities - Summary

### 4.4.1 Planning Unit SMC2 – confluence with Farmers Creek (south) to north-west of end of Pillans Road (north)

Planning Unit SMC2 extends from the northern limit of public lands on State Mine Creek, north-west of the northern end of Pillans Road (approximately opposite Mount Street in the west) south/downstream to its junction with Farmers Creek at the Guy Street open space just south-west of Banksia Street (refer to Planning Unit FC6 for details).



State Mine Creek is not delineated by a cadastral creek corridor (as is the situation for Farmers Creek) but flows through a mix of Council parks (Sutcliffe Street open space) and other Council managed lands, Crown land

and road reserve all of varying width. Midway along this unit it flows across private lands for approximately 150 metres.

All the public land through which State Mine Creek flows is relatively narrow with a number of issues in regard to aligning a shared path, providing recreational facilities or undertaking environmental works. The public land is flanked on each side by developed housing and roads, and set in a narrow valley flanked each side in close proximity by vegetated ridges beyond the housing.

Much of the creek corridor (both public and private lands) supports little native vegetation and is heavily weed infested. All public lands north of Laidley Street were assessed as a high density weed zone – except for an area off the north end of Pillans Road where Council had recently commenced weed control works, assessed, as a moderate weed density area. South from Laidley Street to Farmers Creek weeds are confined to the narrow creekbanks and bed (due to mown grass areas adjoining both sides of the creek), with this area assessed as a moderate density weed zone.

The rapid waterway condition assessment sites were located in Planning Unit SMC2 – site 12 near the northern limit of the public lands, and site 13 just upstream of the junction with Farmers Creek. Site 12 identified the upper section of State Mine Creek as being in a “Poor” condition only, while site 13 identified the lower section of State Mine Creek as being in a “Fair” condition.

## 5. MASTERPLANNING PRINCIPLES

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The following principles were identified to guide to masterplan's preparation. Not all could be applied with equal weight along the full length of Farmers Creek – given inherent variations in the nature and attributes of the public lands that comprise the creek corridor. However these principles articulate the overall framework that guided masterplan decision-making.

- Confine the masterplan's extent to public lands, including re-establishing the public land estate where adjacent land uses have encroached upon it.
- Ensure that proposed measures deliver both an increase in public access to and enjoyment of Farmers Creek and its tributaries and improvements in the creek corridors' environmental values, water quality performance, and scenic quality.
- Control, and where practical remove, weeds and other introduced plants along Farmers Creek and its tributaries to improve the system's environmental and biodiversity values and enhance its recreational and visual appeal.
- Restore natural riparian vegetation communities along appropriate sections of Farmers Creek and its tributaries.
- Improve the continuity and connectivity of native vegetation along Farmers Creek.
- Identify measures to improve the quality of water entering, and in, Farmers Creek.
- Identify opportunities for applying water sensitive urban design principles, and sustainable and sensitive stormwater management.
- Avoid exacerbating the flood risks along Farmers Creek.
- Provide for greater community access to and connectivity along Farmers Creek, and encourage increased enjoyment, appreciation and understanding of this urban waterway asset.
- Include measures or opportunities to promote community support for, and engagement or active involvement in, the creek's improvement.
- Recognise the different settings, landscape character and usage patterns evident along the creek corridor – and maintain or reinforce these where appropriate to ensure that a variety of settings and experiences continue to be offered to users.
- Activate the creek corridor by identifying a shared path alignment that follows Farmers Creek as closely as practically possible.
- Identify a shared path alignment that is able to accommodate, or has the potential to be upgraded to, a sealed path with a minimum design width of at least 2.4 metres.
- Build on the existing path network (shared paths, footpaths and other links) within and adjacent to the creek corridor.
- Identify assets within and adjacent to the creek corridor (such as plantings, toilets, recreation facilities) to ensure the preferred path alignment maximises access to these assets. Make optimal use of the creek's existing scenic assets and attractive settings along the path's alignment to enhance user experiences.
- Select a path alignment that links locations of interest or activity centres, and services likely pedestrian and cyclist traffic generators.



- Identify a shared path alignment that can be quickly established in the first instance to provide continuity of access along the creek corridor within a reasonable budget, but is also suitable for a staged development programme of upgrading and extension.
- Provide for user safety, and identify hazard points where additional infrastructure is required to provide safe access.
- Activate and enhance areas of open space alongside the creek corridor.
- Link the creek corridor open space and shared path to Lithgow's wider path and open space network wherever possible.
- Consider the current condition of the creek and ensure that creek health is not compromised by the proposed shared path alignment or other planned measures.
- Consider the proximity of adjacent development and potential privacy conflicts between path and open space users along the public land corridor and existing adjoining property owners.
- Pair path development and open space improvements along specific sections of the creek with accompanying measures to enhance the environmental value and water quality outcomes in that area.
- Identify locations for advance environmental works and amenity enhancement measures ahead of the path's construction to improve biodiversity, creek health and amenity.

## 6. FARMERS CREEK MASTERPLAN

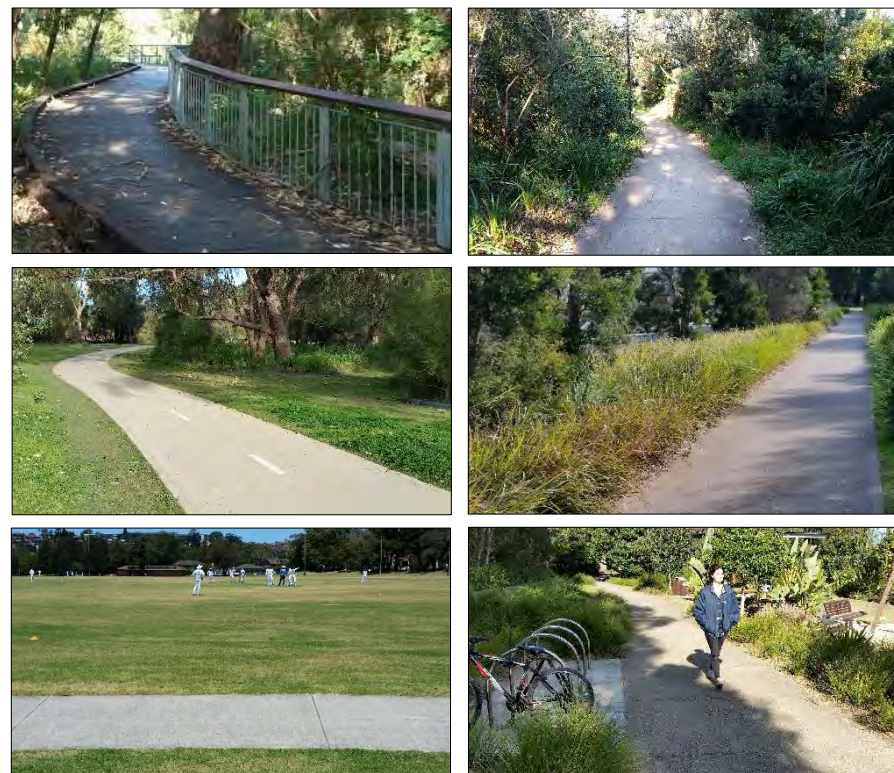
### 6.1 A Vision for Farmers Creek

This masterplan envisions Farmers Creek as a green corridor of publicly accessible land through Lithgow's northern suburbs.

It will feature a high standard path, suitable for multiple uses, meandering along the creekside through a mixture of developed parks and playing fields as well as attractive semi-natural landscape settings and restored natural riparian vegetation communities. Connections to the urban pathway network and low-key facilities dot the path, which will also link activity centres and heritage or other attractions in and around the town area. The path and its surrounding green spaces will be conveniently accessible for leisure, recreation and fitness activities for locals and visitors alike.

Weed control, revegetation using native species and improvements to stormwater management undertaken as part of the corridor's improvements will deliver biodiversity and water quality benefits and also offer opportunities for outdoor education and interpretation.

The "new" Farmers Creek will become a valued, enjoyed and well managed asset of which the Lithgow community will be justifiably proud.



### 6.2 Masterplanning Approach

In broad terms the overall masterplanning approach adopted is one of:

- incremental development – initially building on existing assets and then progressively extending a managed high-quality public open space system and shared path network, resulting over time in a "green

corridor" (variously as restored natural bushland or managed plantings/landscapes using native species), public open spaces and shared path "backbone" gradually accessing more of Farmers Creek from Stage 1 to Stage 2 and culminating in Stage 3 with continuous or connected native vegetation and (potentially) access to almost the entire urban creek corridor;



- supporting these recreational, amenity and biodiversity improvements by “advance” environmental restoration and enhancement measures in those sections of the creek corridor planned for future open space and path improvements – to both improve the environmental quality of these areas and provide attractive settings for future open space and recreational improvements;
- enhancing the natural and semi-natural attributes, and water quality management measures along the entire creek corridor;
- targeting early open space, shared path, amenity, vegetation and biodiversity enhancements in the more “visible” central sections of the creek corridor – to demonstrate the project’s benefits to the Lithgow community and engender support for the project’s continued roll-out; and
- generally progressing from downstream to upstream in terms of expanding and upgrading the open space system and shared path network, while initially focusing weed control and revegetation efforts in the creek’s upstream segments and major tributaries.

Within this overall masterplanning approach there are a number of more specific masterplan “drivers” that have influenced the identification, staging and priority of the masterplan’s components – as described for each stage in Sections 6.4 (Stage 1), 6.5 (Stage 2) and 6.6 (Stage 3) below.

The legend for the following detailed individual masterplans – in Sections 6.4 (Stage 1), 6.5 (Stage 2) and 6.6 (Stage 3) – is provided in Figure 16.

### 6.2.1 Proposed Staging

Enhancement of the Farmers Creek corridor has been planned as a staged process – with most initiatives or actions requiring sequential and co-ordinated implementation, while some could potentially be undertaken as stand-alone projects.

For the purposes of this masterplan the following three stages, and associated implementation periods, have been identified:

- Stage 1 – 1 to 4 years;
- Stage 2 – 5 to 10 years; and
- Stage 3 – 11 years and beyond.

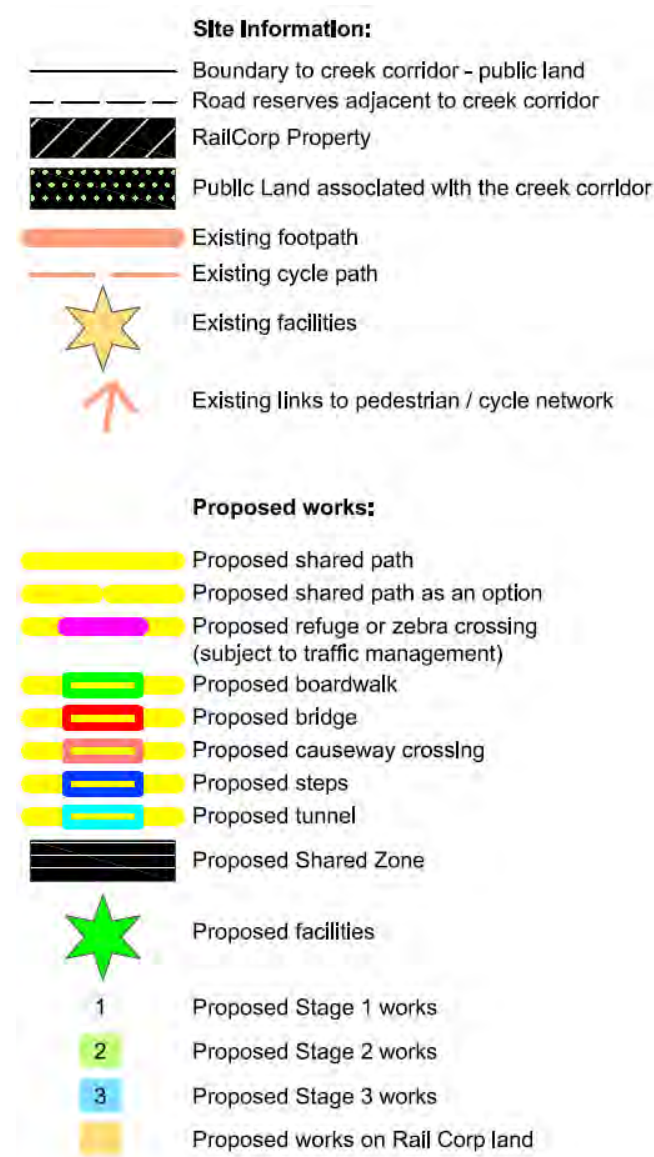


Figure 16 Masterplans legend

These should be considered very indicative, and interpreted as a planning framework only. The actual timing of masterplan actions will very much depend on Council's budget cycles and competing priorities, levels of community support for the project, possible complimentary or related works, supplementary funding possibilities, and many other factors.

## 6.3 Key Masterplan Components

### 6.3.1 Shared Path Standards

The *Austrroads Guide to Road Design - Part 6A: Pedestrian and Cyclist Paths* 2009 acknowledges that the width of shared paths can "have a significant bearing on the level of convenience and conflict between users and potentially on path safety" and is also an "important factor given construction costs and operational considerations".

The Austrroads Guide gives the following guidance regarding shared path widths – "local access paths" have a desirable minimum width of 2.5 metres with a range of 2.5 to 3.0 metres, and for "recreational paths" a desirable minimum width is 3.5 metres with a range of 3.0 to 4.0 metres. However the Guide also notes that lower minimum widths may be adopted under certain circumstances (such as lower cyclist volumes or lower "operational" speeds). The preferred minimum width recommended for shared paths by state roads agencies is frequently 2.5 metres – for example the *Queensland Road Planning and Design Manual* 2015 recommends this width for "recreational and regional commuter paths". Many park management agencies and local councils have also adopted 2.2 to 2.5 metres as the minimum preferred width for shared paths for maintenance and operational reasons, acknowledging that maintenance vehicles can also effectively operate on 2.4 to 2.5 metre wide paths.

Within the Lithgow area most of the existing paths signposted for shared use (walkers and cyclists) are typically 1.8 to 2.2 metres wide. The *Lithgow Open Space and Recreation Needs Study* 2011 identified 2 metres as the minimum width for "walk/cycle" trails as part of the town's "pedestrian

pathway access network". The *Lithgow Bike Plan* 1998 recommended "shared pedestrian/cycle paths of a preferred minimum width of 2.5 metres with a reservation to allow for landscaping where appropriate".

Balancing user convenience and safety, appearance, maintenance practicalities and construction cost the masterplan has applied a minimum shared path width of 2.4 metres for alignment selection and order of cost estimation purposes.

However it is recommended that further assessments of existing and projected/potential user numbers, and the probable mix of usage types, are

undertaken before finalising a preferred minimum width for all, or sections of, the proposed Farmers Creek shared path. The expected volume of mobility scooter (or wheelchair) usage of the path is likely to be a significant factor when considering minimum path widths. A greater "design width" for the path would alter the order of cost



estimates but would have few, if any, implications for the indicative alignments included in the individual masterplans.



The proposed shared path is envisaged as a reinforced concrete path along the greater majority of its length – as consistent with the type and standard of Council's recent path works along the creek corridor. Concrete paths offer greater durability and a long effective life (and a relatively simple construction method compared with other surface seals).



Construction as a compacted path (using crushed sandstone or decomposed granite, contained by timber or recycled plastic edge



strips) is also proposed along sections of the creek. This is as an interim stage in the path's development, pending growth in usage levels (as in Planning Units FC9-South, FC9-North and FC10-Northwest), or where this less formalised/developed path style is more in keeping with the surrounding landscape setting (as in Planning Unit FC2).

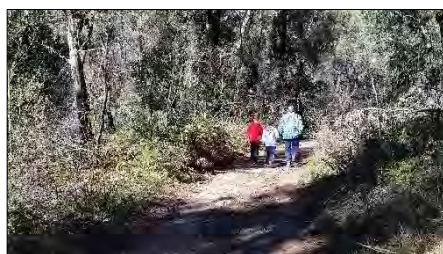


Bitumen (asphaltic concrete) has not been costed as a path construction material, but may offer a 20 to 30% cost saving compared with concrete construction (and offer greater flexibility which may be an advantage in potential subsidence zones). However these paths would have a shorter life span and higher maintenance costs, and are

especially susceptible to edge degradation and surface failure (due to seal break-up, potholing, root intrusion, etc.).

### 6.3.2 Overall Approach to Landscape and Vegetation Management, Bush Regeneration and Amenity Plantings

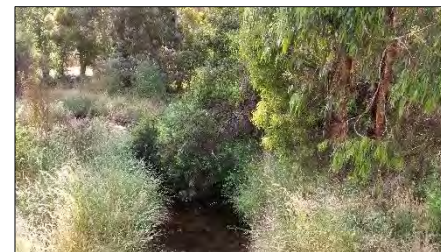
The masterplan's overall approach to landscape or vegetation management – principally amenity plantings, the character of open spaces, and native riparian or bushland restoration and management – along Farmers Creek and its tributaries is as follows.



Upstream of the urban boundary, in Planning Unit FC1, it is envisaged that the creek corridor will be retained in its existing, predominantly natural, character – as a bushland creek in a largely natural setting.

Within the “eastern upstream environmental zone” it is proposed to aim, ultimately, for the restoration of more or less continuous native riparian vegetation along the narrow band of

public land that makes up the creek corridor. This would result in a ribbon of native vegetation, dominated by riparian species extending from the urban edge in the east downstream to Burton Street – within Planning Units FC2, FC3, FC4 and FC5. A more or less continuous band of native vegetation along this section of Farmers Creek will offer a fauna, and flora, link into (and in places through) the town's eastern urban area. However the moist nature of this riparian environment will act to minimise potential fire risks within, and the potential for fire spread



along, this narrow corridor (which is largely confined by adjacent residences). This approach is also envisaged for those public lands along State Mine Creek (Planning Unit SMC2), and the upper reaches of Vale of Clywdd Creek (Planning Unit VoCC2).

Planning Unit FC6 and the eastern end of Planning Unit FC7-East – from Burton Street downstream to the start of the large stormwater canal – is proposed as a transition zone in terms of vegetation management. The upstream bushland restoration treatments merging with, and gradually giving way to, the more managed landscapes and amenity plantings of the downstream central sections of Farmers Creek – as described further below. Establishing a reasonably continuous or connected corridor of native vegetation through this area is seen as important to connect the (future) vegetated creekline with the bushland hillslope to the north of the Montague Street dog park enabling and enhancing potential fauna links.

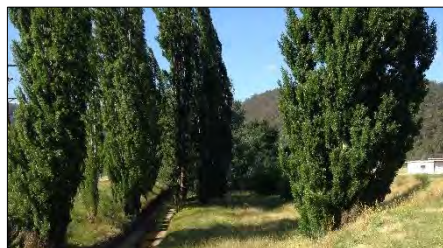
Vegetation management within the Lake Pillans Wetlands and Blast Furnace Park (Planning Unit VoCC3) will be as guided by Council's current grounds/vegetation management regimes, and existing plans, for these sites.

In the central sections of Farmers Creek the surrounding urban landscape “opens up” and the creek becomes far more visible as it flows beside roads or extensive areas of playing fields. This section of creek aligns with the “central urban recreation and open space zone”, and runs from Burton Street downstream to the Geordie Street Causeway (Planning Units FC6, FC7 and FC8 – Farmers Creek's more developed open space and



channelised sections). Here the creek corridor is envisaged as variously lined or dotted with bands or “islands” of native plantings – as already in place at Saywell Street Park and, more informally, around the margin of Glanmire Oval. These planted areas would mostly be dominated by trees and lower understorey species – to avoid markedly changing the appearance or character of the town’s major open spaces and for safety/security concerns (observing Crime Prevention through Environmental Design [CPTED] principles). More complex or varied plantings could occur where practicable.

Using “islands” or “bands” of planted areas will permit management of the creek corridor (where space allows) by machine mounted mowers, which is Council’s preferred approach and allows for efficiencies in operations/maintenance. The discontinuous nature of these additional landscape or amenity plantings will also minimise the risk of the creek corridor acting as a channel for wildfire to enter or spread through the urban area under high fire risk scenarios. However, these “islands” of plantings will serve as “stepping stones” for the movement of wildlife as well as offering habitat for smaller urban-adapted species. This habitat connectivity would be enhanced if the Council owned (contaminated land) block on the corner of Sandford Avenue and Coalbrook Street is revegetated, in whole or part, to connect the creek corridor to the bushland hillslope to the north-



west. Despite its appearance of being a less natural landscape, and the focus on creekside and amenity plantings (rather than full bushland/habitat restoration), weed control will still be a priority in these reaches. This includes the progressive control/removal of Poplars and Pines and the general

shift towards a landscape, albeit a managed one, dominated by native species.

Undertaking weed control, revegetation and amenity planting works in these more visible central sections of Farmers Creek early in the masterplan’s implementation would have the additional benefit of helping establish the project’s profile and promote community awareness. This will be very valuable in engendering community support for the project and encouraging involvement in its progressive roll-out.

Downstream of the Geordie Street Causeway (Planning Units FC9) Farmers Creek is again envisaged as being returned to a corridor of more or less continuous native riparian vegetation. Given the existing less vegetated nature of these sections, and their downstream location, this may be a longer term undertaking. Strategic gaps in the tree and shrub storey layers here may be warranted to retain views to the escarpments and timbered slopes to the north and north-east, and to assist in fire management (although again the mesic nature of the riparian corridor will minimise the degree of fire risk).

### 6.3.3 Weed Control and Bush Regeneration / Revegetation

Weed control and native vegetation regeneration/revegetation within the Farmers Creek corridor and its major tributaries, particularly State Mine Creek, are essential environmental works – and will also significantly support enhancing the creek corridor’s recreational and aesthetic values.

The masterplan proposes significantly expanding and escalating Council’s current programme of weed control and native species regeneration/revegetation along Farmers Creek and its tributaries. As described in Section 6.3.2 above, these efforts will be focused on restoring native riparian communities in the following areas:

- upstream from Burton Street to the town’s eastern edge – Planning Units FC5, FC4, FC3 and FC2;
- from Burton Street downstream to the start of the large stormwater canal (as a transition zone and mix of restored bushland and



landscape/amenity plantings) – Planning Unit FC6 and the eastern end of Planning Unit FC7-East;

- public lands along State Mine Creek – in Planning Unit SMC2;
- the upper reaches of Vale of Clywdd Creek – in Planning Unit VoCC2; and
- downstream from the Geordie Street Causeway to the limit of public lands (north of Evans Close) – in Planning Unit FC9.



Source: chloiregallary.wordpress.com



Source: Western Sydney Parklands

Progressively implementing weed control and riparian vegetation community restoration will significantly improve the native vegetation and biodiversity values of the creek corridor. Removing upstream sources of weeds (in Planning Units FC2, FC3, FC4, FC5, SMC2 and VoCC2) will benefit lower sections of Farmers Creek. Importantly, reinstating natural (or near natural) riparian vegetation will also enhance the creek corridor's visual appeal and provide an attractive setting for the subsequent development and use of the envisaged shared creekside path. However these restoration works are warranted from a biodiversity and environmental values perspective alone, as well as for water quality improvement, in addition to (or regardless of) the additional recreational and aesthetic advantages they will also deliver.

Within these targeted reaches of Farmers Creek and its tributaries (as above) weed control and riparian vegetation community restoration works have been prioritised and co-ordinated with other masterplan components (and Council's current and planned works along the creek corridor) as follows.

Stage 1 weed control and riparian vegetation community restoration works have been prioritised in the following areas.

- Planning Unit FC6 and the eastern end of Planning Unit FC7-East, along Burton Street downstream to the start of the large stormwater canal (with restored bushland merging with, and transitioning to, landscape/amenity plantings). Despite being in the middle sections of Farmers Creek (as opposed to commencing in the upper reaches and working downstream) these works will support Council's planned



weed control and landscape improvement works in this area. Importantly, they will also assist in promoting community awareness and support for enhancing Farmers Creek through such works (and demonstrable positive results) in this highly visible section of the creek. These works will provide an attractive setting for the shared path and other recreational facilities proposed for this reach in Stage 1 (and beyond).

- Planning Unit SMC2, along the public lands on State Mine Creek, to consolidate and build-on Council's past and current weed control efforts on this creek. These works will help remove a major source of weed propagules for downstream sections of Farmers Creek (however collaboration with private landholders in this planning unit, and upstream on State Mine Creek, will be required to effectively minimise this tributary's role as a weed source for Farmers Creek).

Stage 2 works are proposed in Planning Units FC2, FC3, FC4, FC5 and VoCC2 in conjunction with, or preferably in advance of, the development of a shared path, recreation facilities and amenity or other plantings.



Weed control and riparian vegetation community restoration works are the only masterplan actions proposed in Planning Unit VoCC2. These measures will consolidate and build-on Council's past weeding (particularly Willow control) and planting efforts in this

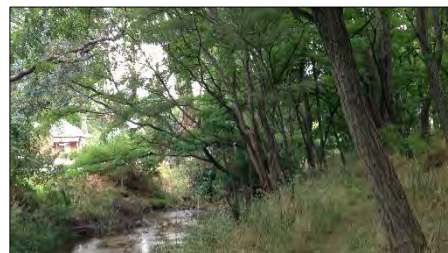
area. Despite being a moderately to heavily weed infested reach, environmental works in this planning unit have been allocated to Stage 2 in recognition of the Lake Pillans Wetlands' function in limiting weed propagule spread downstream into Farmers Creek.

Considering their downstream location, as well as the limited suite of recreational facilities proposed and smaller residential catchment, weed control and riparian vegetation community restoration works in Planning Unit FC9 (downstream from the Geordie Street Causeway to the limit of public lands) have been allocated to Stage 3 of the masterplan.

No riparian vegetation community restoration works have been identified for Planning Units FC7 (downstream of the start of the large stormwater canal) or FC8. Only landscape enhancement and amenity plantings are proposed in these areas. Similarly no riparian vegetation community restoration works are proposed for Planning Unit VoCC3, where Council's current management of the Lake Pillans Wetlands and Blast Furnace Park would continue.

However weed control measures are still required in these planning units, and along Farmers Creek and its tributaries generally – including, but not limited to:

- the staged removal of Poplars and Pines (particularly in Planning Units FC7, FC8 and FC9) commencing from the upper catchments and working downstream;
- the staged removal of Honey Locust trees (*Gleditzia* species) (particularly in Planning Units FC3, FC4 and SMC2) again commencing from the upper catchments and working downstream;
- the on-going staged removal of Willows wherever occurring (and particularly in Planning Units VoCC2 and SMC2); and



- removal of state weeds of significance, noxious weeds and environmental weeds – particularly targeting species already identified by Council as environmental issues.

Liaison and collaboration with neighbouring landholders will be required to support, or ensure complete coverage, of weed control works on some creek sections – notably Planning Units FC1, FC2, FC4, FC9-North, FC10 (none of which is Council land) and SMC2.

In undertaking weed control, as well as for general grounds and plantings maintenance, Council should consider the current independent advice regarding the use of “Glyphosate” before developing maintenance programs that heavily rely on the use of this herbicide.

### 6.3.4 Proposed Plantings – Typical Treatments

A palette of the main landscape or amenity plantings envisaged are identified in the accompanying cross-sections, showing typical proposed treatments suggested. These primarily apply to the central sections of Farmers Creek where additional plantings are proposed to enhance the visual and recreational appeal of these reaches (as discussed in Section 6.3.2 above) particularly along the shared path's route, as well as to soften or screen channelised creek sections plus contribute to biodiversity values and connectivity. The cross-sections identify the location (e.g. large canal, small stormwater canal, or road edge) and the configuration or style of plantings proposed. Cross-sections are also provided for narrower creek sections, typically in the upstream “eastern upstream environmental zone” to show the relationship between rear fencelines, plantings and the positioning of a shared path or boardwalk.

For landscape or amenity plantings it is recommended that the selection of species has regard to:

- the original endemic riparian vegetation of the creek, that occurred prior to past/historic clearing and removal;
- the amenity role the planting may play (e.g. winter solar access and summer shade, which may necessitate exotic species being selected in some instances);
- potential for species to become weeds – such species are to be avoided;



- environmental and microclimatic conditions;
- expected level of ongoing maintenance;
- Crime Prevention through Environmental Design (CPTED) issues – avoid planting that allows concealment;
- habit and growth of trees as they mature – avoiding trees with aggressive and invasive root systems; and
- ability to manage and control potential weed invasion by other species

Figure 17 shows a “stylised typical” treatment for creek plantings – with a tree layer over groundcovers/vines and low shrub cover on wider creekbanks/slopes that offer a greater planting area, and native grasses (and sedges) in those situations where space is limited.



As a general approach it is recommended that, at a minimum, a “filter strip” of planting be located immediately adjacent to the creek where possible to ensure that stormwater drains and filters through this planting prior to entry into the creek waters (see Section 6.3.5 for further discussion). The filter strip

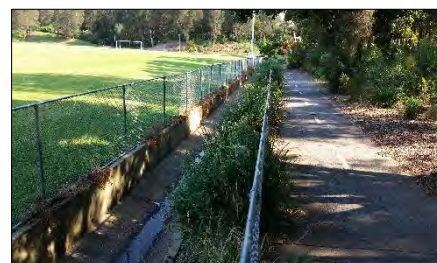
would essentially contain native grasses, both dry and wetland species, to accommodate fluctuating levels of the creek (in natural situations) and varied/extreme weather conditions.

Typical cross-sections for landscape or amenity plantings in particular situations commonly encountered along the “central urban recreation and open space zone” of Farmers Creek include the following.

- Small stormwater canal adjacent to open space or sports fields (see Figure 18) – such as north and west of Marjorie Jackson Oval in Planning Unit FC7-East, Glanmire Oval in Planning Unit FC7-West, and south of Geordie Street in Planning Unit FC8-West.

It is recommended that existing mature trees, where possible, be retained. Understorey weed species, however, should be removed as soon as possible and replaced with indigenous riparian species (if weed removal is delayed or staged on-going control of suckering or

regrowth should occur to avoid expanding the number of problem specimens), and introduced trees progressively replaced with native trees over time. A shared path if/where developed should be offset from the roots of retained mature trees, unless this encroaches into the outfields of sports grounds (where it may be necessary to provide a ground level boardwalk over the root zones – such as proposed north



of Glanmire Oval in Planning Unit FC7-West). Again provide a filter strip of planting between the path and the edge of the canal to manage stormwater runoff (due to the absence of in-stream or stream bank vegetation). Avoid leaving turf areas between the path and the creek vegetation, to

avoid encroachment of exotic species such as Kikuyu. As an adjunct, where required or already planned, stormwater management and flood mitigation works should be undertaken preferably in as natural a style as possible (avoiding large, creek-width, concrete canals to reduce visual and physical impacts and minimise the loss of green space and environmental values – see Section 6.3.5).

- Large stormwater canal adjacent to an open space or sports fields (see Figure 19) – such as north of Marjorie Jackson Oval in Planning Unit FC7-East and in Planning Unit FC8-East.

As space permits, it is proposed that large trees be planted at regular intervals to create an “avenue”. Each tree should be contained in a large mulched area (say 5 metres by 5 metres) of low plantings, such as native grasses and low shrubs. A mid-storey planting layer is not proposed so as to retain clear visibility under the trees. A filter strip of planting should be planted between the shared path and the edge of the canal to manage stormwater runoff (due to the absence of in-stream or stream bank vegetation). In any future constructed stormwater canals, where possible sufficient room should be left to enable a shared path to be offset at least 1 metre from the canal edge to ensure that a densely planted filter strip can be provided. The filter planting would not only contribute to water quality and creek health but also to a site’s amenity and micro-habitat values.

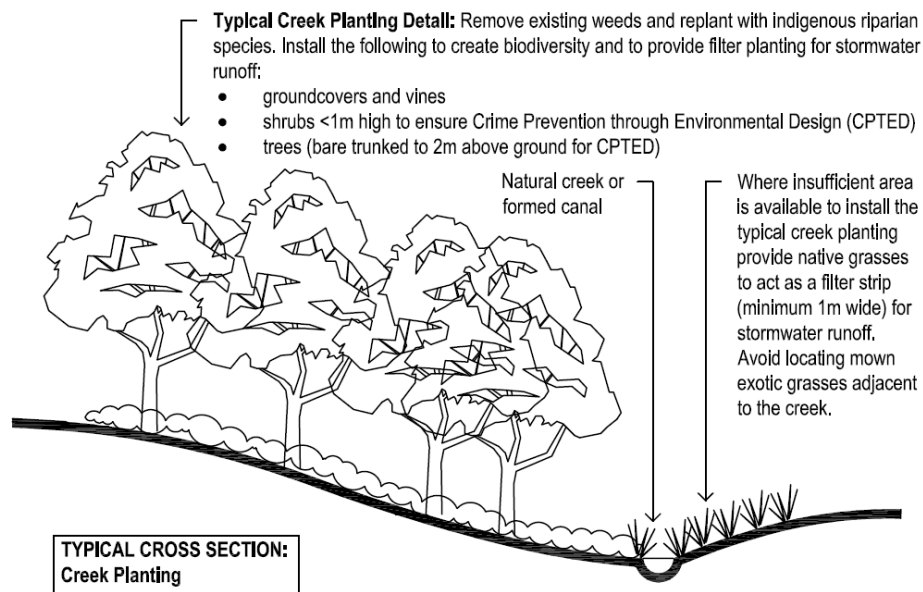


Figure 17 Typical creek planting treatment

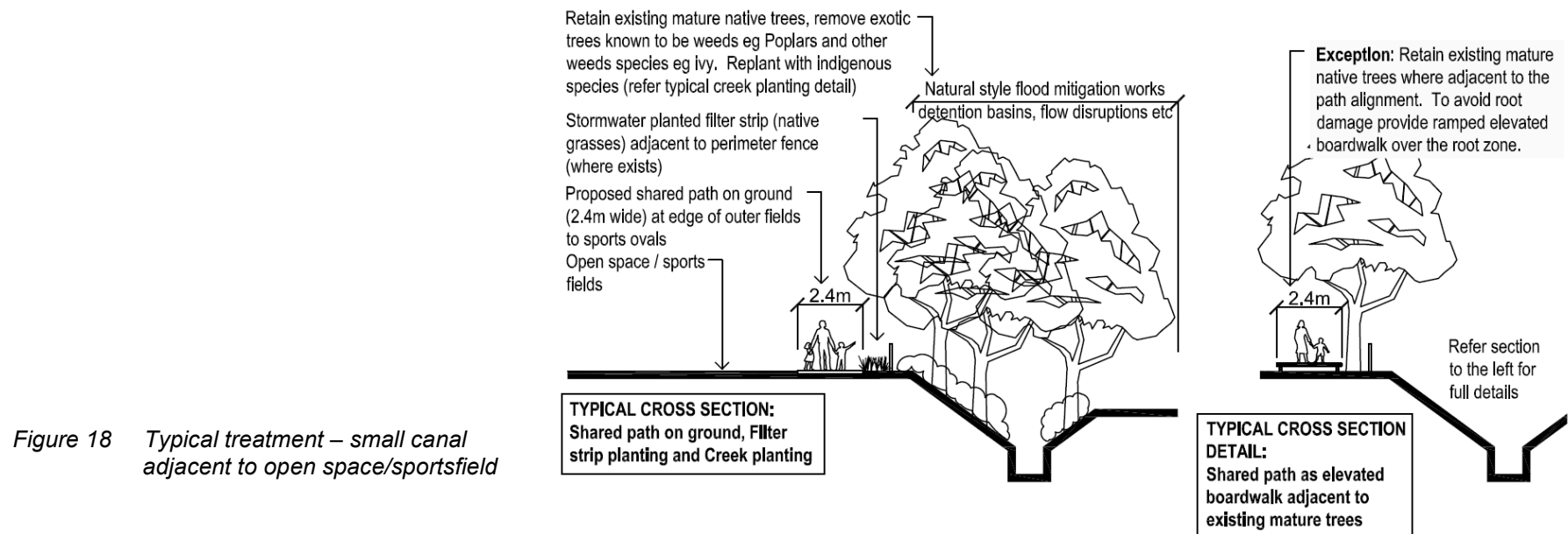


Figure 18 Typical treatment – small canal adjacent to open space/sportsfield



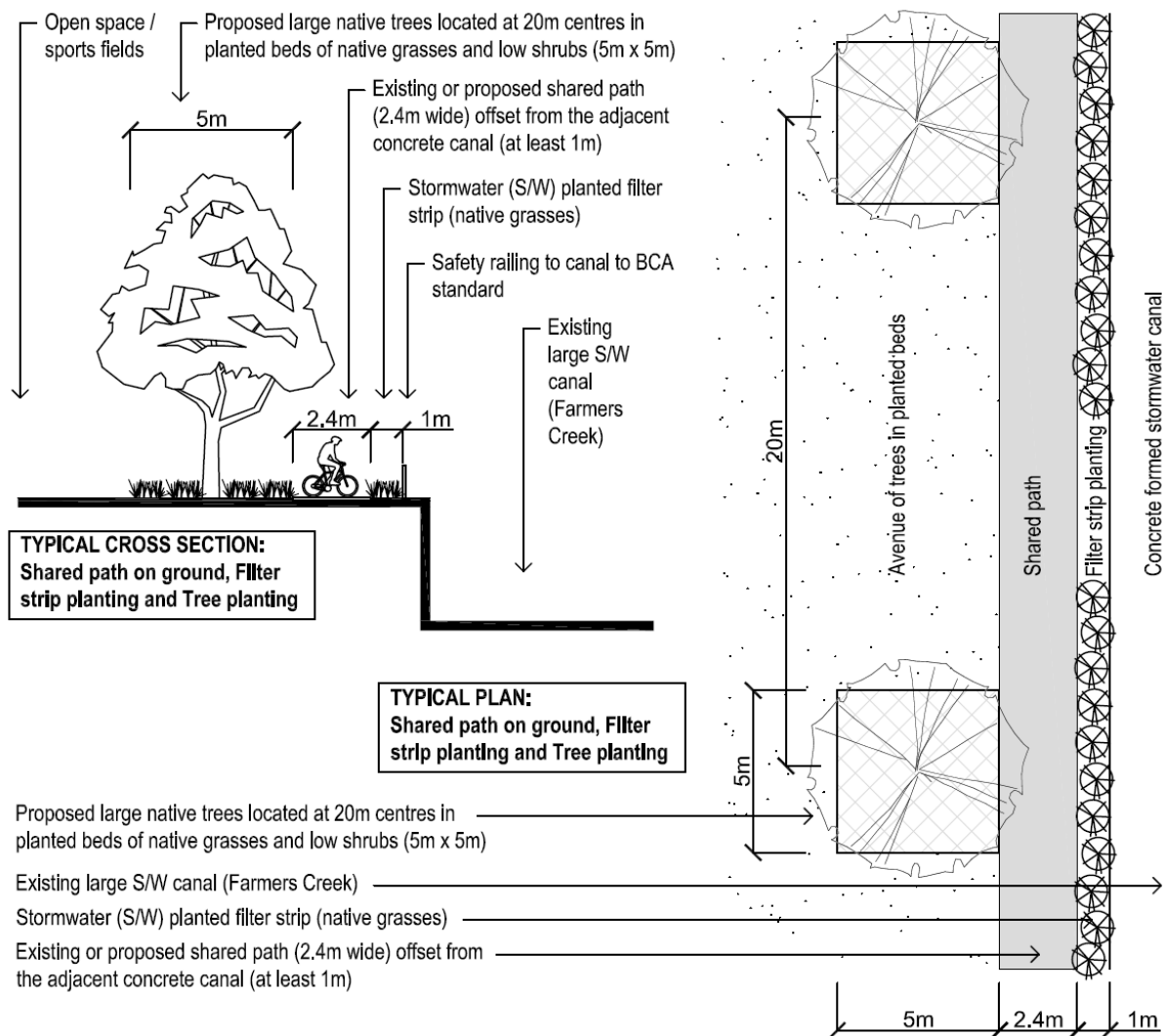


Figure 19 Typical treatment – large canal adjacent to open space/sportsfield

- Wide road reserves or passive open space areas along the creek corridor offer greater flexibility in the size and location of planted areas, alignment of a shared path or siting of recreational facilities. In these locations – such as south of Geordie Street in Planning Unit FC8-West, parts of Planning Unit FC7 around Marjorie Jackson Oval, and through Saywell Street Park in Planning Unit 5 – planting bands/islands can be more extensive, a shared path can be aligned to meander through and around these plantings (and/or located under any overhead wires [if possible] to better accommodate trees plantings either side) (see

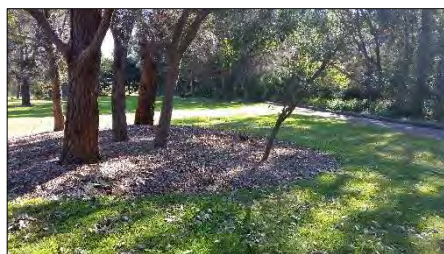


Figure 20). Islands of plantings could be located between the road pavement and the proposed shared path where possible. Trees should be grouped into mulched areas (allowing for better outcomes for plantings) to avoid single trees in grass (which would create increased maintenance

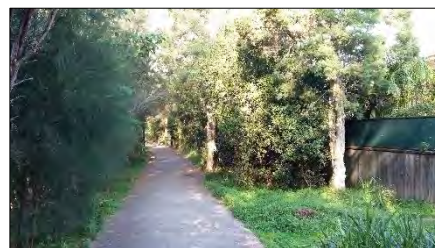
issues). Avoid planting trees under overhead wires. As elsewhere remove weed species from the creek vegetation and replace with native riparian plantings.

- Where the proposed shared path is adjacent to an un-kerbed road (such as along the south-east side of Macauley Street in Planning Unit FC6) locate a strip of densely planted native grasses with bollards between the path and the road pavement (see Figure 21). Provide a filter strip of planting between the path and the creek vegetation – avoid leaving thin strips of exotic mown grasses to minimise mowing maintenance and reduce invasion by exotic grass species. Undertake weed removal and control of creek vegetation, and replant with native riparian species.
- Where the existing, or proposed, shared path is an extension of the road pavement (notably beside Sandford Avenue in Planning Unit FC7-East) locate guard rails or crash barriers and trees with substantial tree guards to ensure the safety of path users and to improve user amenity (see Figure 22). A vehicle safety barrier (such as an Armco railing) could be employed along the road-path boundary if warranted. Provide a filter strip of planting between the path and the creek vegetation –

avoid leaving thin strips of exotic mown grasses to minimise mowing maintenance and reduce invasion by exotic grass species. Undertake weed removal and control of creek vegetation, and replant with native riparian species.

The following two typical cross-sections apply to narrower creek sections, where plantings and a shared path or boardwalk have to be realised within a very limited “useable” creek corridor.

- In a narrow creek corridor where a level area is available – such as upstream of Burton Street in Planning Unit FC5 and parts of Planning Unit FC3 – offset the proposed shared path from the adjacent rear boundary fences, allowing sufficient space to plant hedge species against rear boundaries (see Figure 23). Provide at least a filter strip of planting, avoiding thin strips of exotic mown grasses, adjacent to the creek. Remove weed species and replant with indigenous riparian species.



- In a narrow creek corridor where limited to no level area is available – such as several sections of Planning Units FC4 and FC4, and isolated/smaller lengths in Planning Units FC2 and FC3 – develop an elevated boardwalk with a safety rail creek side (to BCA standard) where required by height/slope (see Figure 24). Undertake weed control and removal within the creek corridor and replanting of riparian native species. Avoid retaining or planting exotic grass species.

### 6.3.5 Water Quality Improvement and Water Sensitive Urban Design (WSUD) Measures

Water Sensitive Urban Design (WSUD) aims to integrate stormwater management systems into the urban landscape, design and development processes, and land management practices. It is aimed at delivering stormwater quality improvements, water savings and efficiencies, reduced



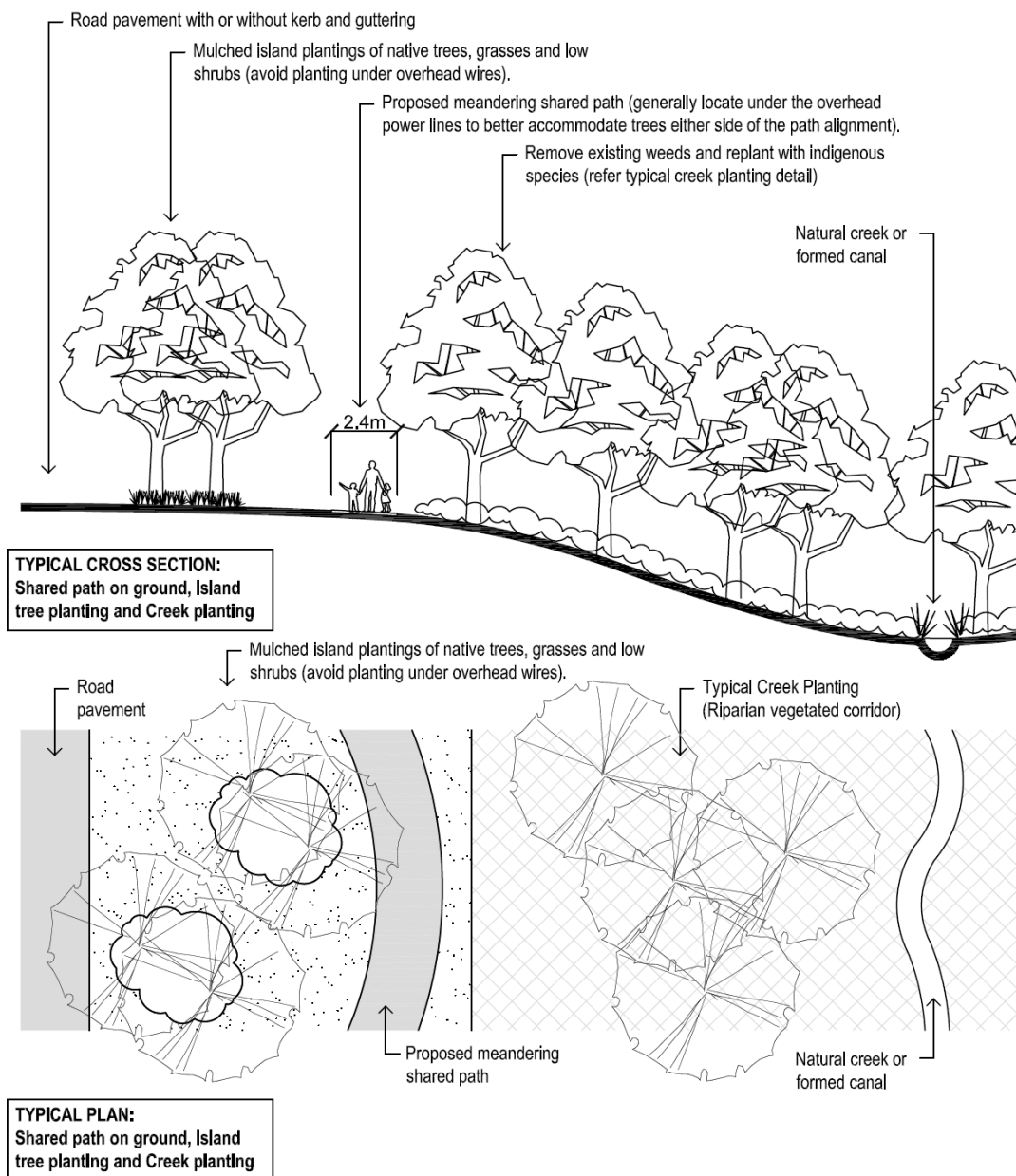


Figure 20 Typical treatment – wide road reserve or nature strip

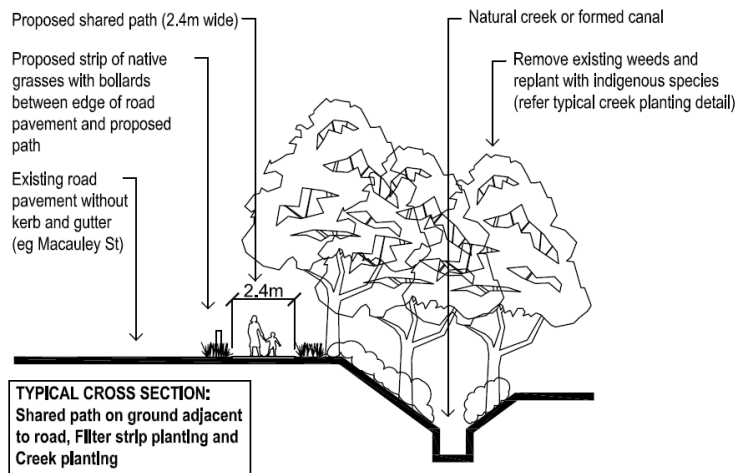


Figure 21 Typical treatment – adjacent un-kerbed road

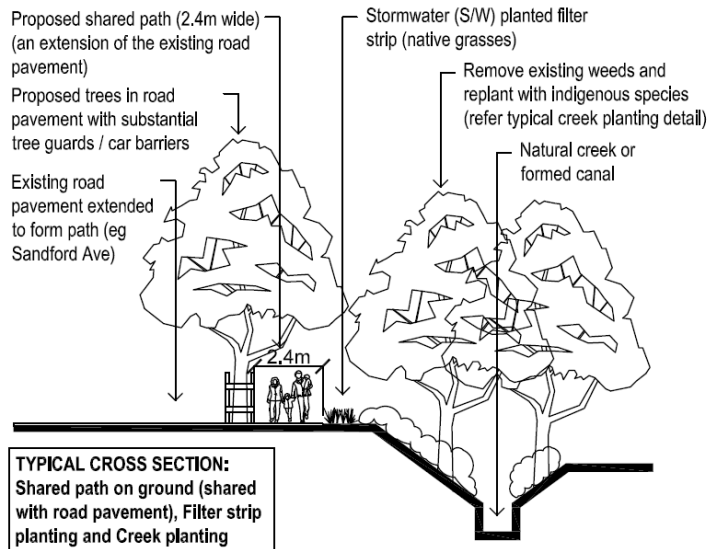


Figure 22 Typical treatment – extension of roadway

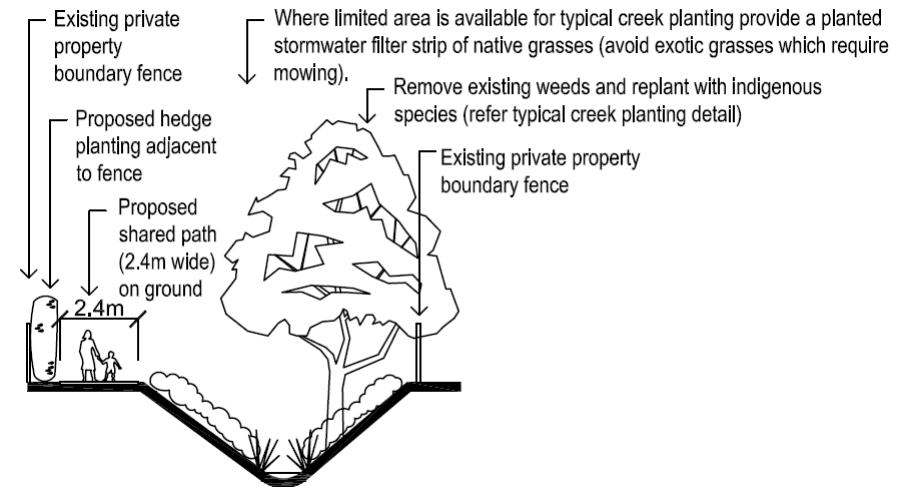


Figure 23 Typical treatment – narrow creek corridor (with level bench)

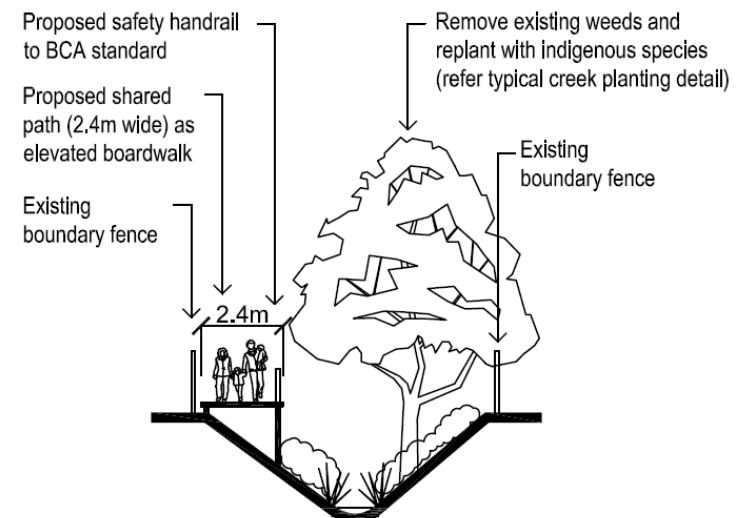


Figure 24 Typical treatment – narrow creek corridor (with little or no level area)



environmental degradation, and improved aesthetic outcomes. Ideally WSUD is applied on a broad scale, such as a sub-catchment or whole-stream level, and early in the planning and land development process. However existing urban areas can be “retrofitted” to achieve improved WSUD and water quality outcomes.

Due to its “bottom” valley location, Farmers Creek offers limited opportunities for applying WSUD principles. Liaison and collaboration with neighbouring landholders will also be required to support water quality improvement measures on some creek sections – notably Planning Units FC1, FC2, FC4, FC9-North and FC10.

A number of approaches have been proposed to realise improved water quality in the urban sections of Farmers Creek and downstream.

### Filtering Creekside Vegetation

The most common and widely applied direct WSUD measure proposed in the masterplan is to install a “filter strip”, of native grasses and/or sedges where suitable, between the proposed shared path and the creekbank or channel. This is to ensure that stormwater drains and “filters” through this band of planting prior to entry into the creek waters. Filtering stormwater in this way allows silt and other debris to be removed from surface waters draining into the creek, and thus assists in improving creek health.



This measure would be focused on those creek sections where vegetation (or revegetation potential) of the creekbanks and/or channel is limited due to channelisation, and especially where the existing or proposed shared path is close to the canal edge – as shown in Figures 18, 19, 21 and 22. This is mainly Planning Units FC7-East, FC7-West, FC8-East and FC8-West. As shown in Table 4 a total of 2,545 metres of the creekbank (along Farmers Creek only) will be treated with filter strip planting over all proposed stages – made up of 1,740 metres in Stage 1, 230 metres in Stage 2 and 575 metres in Stage 3.

**Table 4 Proposed Filter Strip Plantings**

Planning Unit	Approximate Length of Creekside Filter Strip Plantings (metres) *			
	Stage 1	Stage 2	Stage 3	TOTALS
FC1				0
FC2			30 <sup>1</sup>	30
FC3				0
FC4				0
FC5	55	25	35	115
VoCC3 North & South	Managed wetland setting (and parkland away from creek channel)			0
VoCC2				0
FC6				0
SMC2				0
FC7 East <sup>2</sup>	525	40	70	635
FC7 West	325	165	115	605
FC8 East	520	0	190	710
FC8 West	315	0	135	450
FC9 South				0
FC9 North				0
FC10 south east & north-west	No Council managed lands along creek corridor			0
<b>ENTIRE PROJECT TOTAL</b>	<b>1,740</b>	<b>230</b>	<b>575</b>	<b>2,545</b>

#### Key:

Existing vegetated (usually weedy) creek corridor
Weed control and native species riparian plantings / revegetation of creek corridor
Bushland setting

#### Notes:

\* Cumulative lengths

<sup>1</sup>.... Creekside at picnic area at north end of shared path

<sup>2</sup> Includes length of weed control and native riparian plantings / revegetation downstream (west) of Tank St to start of existing large stormwater canal

Elsewhere the existing creekside vegetation (typically weed infested in most parts) and the subsequent proposed native species riparian plantings and revegetation of the creek corridor (after weed control measures) will act to



filter local surface waters, or stormwater running off a path surface, before entering the creek channel – and so negate the need for specific/additional filter strip plantings. These more “passive” WSUD measures will be the case in most other planning units – as also identified in Table 4 (and shown on Figures 17 and 20). In these areas

a continuous planted edge of un-slashed native grasses could be provided to the creekbank, where there is none currently (“pulling back” mown exotic grasses, as necessary, in areas that are now mown/managed open space), to also provide a stormwater filter strip upslope of more dense native riparian plantings. However where the un-slashed native grasses strip is wider than 3 metres a mown grass edge, between the shared path and the residual grass strip, should be considered if practical to allow for regular mowing. Such a grass edge will help to avoid potential issues arising with exotic gasses invading the native species and developing as a weed issue.

### Stormwater Quality Improvement Devices

As noted in Section 2.4, at present there are no stormwater quality improvement devices (SQIDS) on the Lithgow stormwater network – this includes those pipes and channels discharging directly into Farmers Creek. Priority locations for the installation of SQIDS – such as gross pollutant traps, gully pit baskets/nets, trash racks, sediment or stilling ponds, biofiltration ponds, etc. – have been identified as Planning Units FC6, FC7-



West, FC8-East and FC8-West. A more site-specific assessment will be required to determine the type of SQID suited to each discharge point, and priority points to target with available funding.

### Off-line Detention Basins and Constructed Wetlands

The Lake Pillans Wetlands, on the lower reaches of Vale of Clywdd Creek, is a good example of a constructed wetland (and an on-line flow storage and detention area).

Off-line constructed wetlands are located away from a waterway’s main channel – typically on creek flats, flood terraces and other areas subject to periodic inundation. Comprising one or more shallow constructed ponds, usually densely-planted, they offer a “natural” method to remove pollutants



Source: [landscapesolutions.com](http://landscapesolutions.com)

from stormwater or creek flows. This is achieved by three processes – physical, biological and chemical uptake, and pollutant transformation. Shallow ponds densely planted with aquatic plants, such as macrophytes, are the heart of this system and work to remove fine particles and dissolved pollutants. Constructed wetlands can also

retain or slow small to medium flows, but generally are not suited to managing large flows (under these conditions a high flow bypass system is required to direct/avoid larger flows and prevent damage to the plantings or the integrity of the system). Wetlands also require inlet protection, to catch sediment and gross pollutants that would otherwise block or infill the system. Wetlands can also have biodiversity, visual or amenity, and recreation values – as demonstrated by the Lake Pillans Wetlands.

Dry detention basins – off-line on larger waterways, but also on-line along ephemeral or stormwater drainages – are intended to temporarily detain and store stormwater or diverted flows for a period of time before allowing this storage to slowly discharge. This detention and slow release is mainly intended to reduce flow peaks and flood potential, but can also remove pollutants by allowing solids or particulates to settle out of the ponded waters. Dry detention basins typically include inlet protection, to catch sediment and gross pollutants, as well as a detention mechanism (often an





earth bund) and delayed outflow feature. They are usually turfed (to assist sediment capture and for erosion protection), and can also serve open space and recreation use when dry. Dry detention basins can also be planted with native grasses and shrubs tolerant of short periods of inundation to improve

their sediment/pollutant capture functions, as well as enhancing their biodiversity and visual/amenity values (but limiting open space and recreation potential).

Both off-line constructed wetlands and detention basins require careful siting and design to perform effectively, fit the hydrological characteristics of a waterway, and not exacerbate flood risks.

Opportunities for off-line constructed wetlands and detention basins are severely constrained by the limited and usually narrow area of public land available along Farmers Creek (and its tributaries). The incised character of the creek in most areas, with limited flood terrace development, also makes relative levels for diverting flows from the channel into off-line water quality features challenging in many locations. Flood performance requirements also severely constrain opportunities for in-stream detention measures (notably no such features were identified for Farmers Creek in Council's *Lithgow Flood Study Review*, 2015).

Nevertheless potential sites for off-line constructed wetlands or off-line/diversion detention basins (vegetated) occur in the following planning units (as shown on Figures 58, 61, 62 and 63). All proposed sites would require hydraulic performance and flood risk impact assessments and engineering feasibility investigations, as well as detailed designs, if likely to proceed.

- Planning Unit FC6 – two potential sites on the lower broad creekflats on the south side of the creek, opposite Guy Street and the (existing) Guy-Macauley Streets intersection. A wetland opposite the Guy Street open space would also enhance the visual and recreational appeal of this area.

- Planning Unit FC7-East – potential (small) site on the creekflat on the north side of the creek, west of the existing dog park and south of Sandford Ave. A wetland would also enhance the visual and recreational (and possible educational/interpretive) appeal of the shared path in this area.

- Planning Unit FC7-East – two potential sites on the creekflats on the south side of the creek, inside the sweeping bend opposite Sandford Avenue. Wetlands would enhance the visual and recreational appeal of these areas.



- Planning Unit FC7-West – potential (small) site on the narrow creekflat on the north side of the creek Farmers Creek, south of Coalbrook Street.

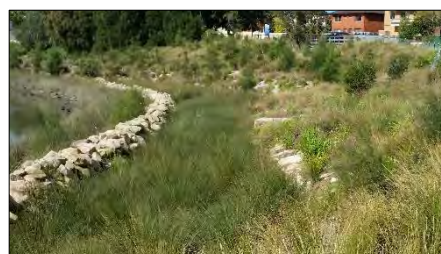
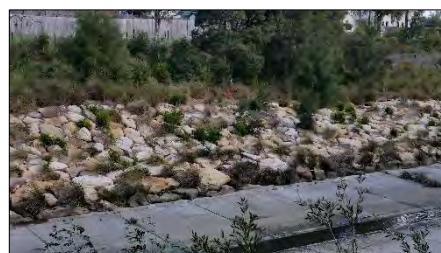
A large potential site for a constructed wetland or vegetated flood detention basin is found in Planning Unit FC5, on an area of Crown land abutting the creek's northern bank (situated on a flood terrace opposite the north end of Saywell Street). Being Crown land development of a basin or wetland on this site would require approval, or concurrence, from the Department of Industry (Lands).

### Improving Water Quality, and Habitat, Outcomes on Engineered or Constructed Creek Channels

The investigation of possible measures to improve water quality and enhance the habitat value of those existing sections of large stormwater canal along Farmers Creek (in Planning Units FC7-East, FC7-West and FC8-East) is also warranted. Potential measures to investigate – where they can be realised with minimal detriment to hydraulic and flood mitigation performance, can be adequately maintained, pose minimal health or amenity risks (such as mosquito breeding or odours), and are sufficiently cost-effective – include such treatments as:

- embedded rock bars or riffles set into the base of concrete canals;

- staggered/offset concrete block riffles and mini bulkheads across the bottom of a canal, with possible stone/block beds, to retain/slow smaller flows and create areas of micro-habitat;
- retrofitting or replacing sections of vertical wall with layback or sloped stone/block revetments, allowing for vegetation to be planted (or to self-seed) between the blocks (where space permits such sloped stone walls could also include small perched wetlands– as has been recently done by Sydney Water on sections of the Cooks River Canal);
- modifying vertical concrete block walls into a stepped or irregular cross-section; or
- stepping or terracing sections existing side walls to create rock armoured and/or planted benches.



Plans are also under consideration to extend the existing large stormwater canal east of Albert Street upstream around the west side of Glanmire Oval (Planning Unit FC7-West). Rather than simply extending/replicating the adjacent large concrete block canal Council has the opportunity to consider alternative design approaches. These should aim to balance hydraulic and environmental (chiefly water quality and habitat issues) performance, as well as aesthetic outcomes, for replacement of the current narrow concrete canal in this area. In view of the number of existing mature native (and other) trees along this section of the creek, which provide a scenic backdrop

to Glanmire Oval, a type of flood mitigation and stormwater management design that protects or incorporates these features warrants serious consideration. Alternative treatments to evaluate, among others, include:

- large grassed swales (with or without a low-flow pipe system beneath);
- large grassed swales with top-of-bank and overbank tree/shrub plantings;
- large grassed swales with a rock-lined vegetated central canal and bank/overbank tree plantings;
- rock-lined swales or trapezoid channels;
- channels with rock armoured and planted sloped banks;
- vegetated detention basins “staggered” along the creek corridor (and possible off-line detention ponds); or
- semi-natural channel designs.



Examples of all the above treatments can be found, operating successfully, in a number of large urban development areas in metropolitan Sydney – such as measures employed by Sydney Water across their “trunk drainage lands” in the Rouse Hill area.

### Turf Management

In view of the multiple playing fields adjacent to the middle reaches of Farmers Creek, Council should also endeavour to manage fertiliser and turf management on these expansive grassed areas to minimise impacts on water quality (nutrient loads, weed spread, etc.) in Farmers Creek. These playing fields also offer the opportunity for Council to investigate options for large scale stormwater harvesting and re-use schemes (including underground tanks or water storage beds) where relative levels and other design factors permit and such measures are cost-effective.



### 6.3.6 Interpretive and Educational Measures

An enhanced Farmers Creek corridor, and the proposed shared path specifically, will connect and provide access to a number of other features of interest with interpretive and/or educational potential – particularly historic heritage attractions. However all such major features of interest – apart from the Lake Pillans Wetlands and Blast Furnace Complex (and the Bowenfels Rail viaducts, which are not in Council ownership) – are not located within the public lands of the creek corridor. The Lake Pillans Wetlands and Blast Furnace Complex already have on-site interpretive panels. The Blast Furnace Complex is also part of the wider “Furnace Fire and Forge Heritage Trail”, and improved interpretation is planned for this attraction.

While a more-accessible, connected and attractive Farmers Creek corridor may link these surrounding features, their presentation/interpretation (for those that are publicly accessible) would be more appropriate – and far more effective – if undertaken on-site, rather than “remotely” from a distance on the creek or shared path.

Consequently interpretive and educational opportunities within an enhanced Farmers Creek corridor would be more focused on generic themes and



messages, mainly dealing with environmental elements – such as “bringing back the bush”, the habitat value of the creek and creekbank vegetation, environmental issues associated with Farmers Creek and urban waterways generally, micro-habitats, flora and fauna features of interest (where these are readily visible or are likely to be seen by

most visitors), the value of urban green space and natural areas, improving water quality, Council’s environmental management efforts, flood management, being a “good bush neighbour”, the history and past character of Farmers Creek, historical “then and now” images of certain sections of the creek showing changes through time, and so on.

Interpreting Aboriginal cultural heritage values of the creek and its environment would require consultation with Aboriginal knowledge-holders.

An enhanced Farmers Creek corridor would also offer numerous educational opportunities for local schools and others. Zig Zag Public School has already constructed informal steps to access the adjacent creekbed, presumably to support for educational uses and outdoor classes. To encourage, and take full advantage of the creek’s education potential appropriate curriculum materials, matched to suitable creek locations, could be developed for use by surrounding schools.

### 6.3.7 Community Involvement

An enhanced Farmers Creek corridor will enable surrounding residents and the wider the Lithgow community to access, enjoy and reconnect with the creek corridor as a leisure, recreation and environmental asset. This in turn can be expected to generate a degree of community support for these works and the creek’s continuing visual, recreational and environmental improvement – as well as possibly fostering increased appreciation and understanding of the creek and its importance. Implementation of the masterplan would also presents a significant community education opportunity.

This greater engagement and appreciation has the potential to be converted into increased community action and involvement in the creek’s rehabilitation and improvement – such as through local bushcare groups, waterwatch groups or programmes, schools groups, community planting or clean-up days, and similar volunteer programmes or events. However it

also needs to be acknowledged that such involvement needs to be directed or managed by Council to ensure that it coincides with the masterplans’ directions, and that these community programmes and activities/events do require Council resources to organise and run.



## 6.4 Stage 1 Masterplan

### 6.4.1 Stage 1 Masterplan Priorities

Following are the key “drivers” for the Stage 1 masterplan actions and works.

- To fill in missing links, to shared path standard, in Council’s existing path network and undertake associated amenity/landscape plantings between the Geordie Street causeway and Sandford Avenue (in the Showground and sportsfields precinct, an area of higher potential use) (Planning Units FC7-West and FC8-East).
- To improve the connection between Marjorie Jackson Oval and the Montague Street area, along Macauley Street and Burton Street (mostly as shared path), to Inch Street (Planning Units FC6 and FC7-East) and allowing improved links to the Lake Pillans Wetlands.
- To target recreation, environmental and amenity improvements to highly visible sections of Farmers Creek – to establish the masterplan project’s identity, promote its profile and community awareness, and encourage community support/involvement.
- To upgrade existing paths, and establish the start of a shared path loop route, through the Lake Pillans Wetlands and Blast Furnace Park (a major investment in Planning Units VoCC3-North and VoCC3-South).
- To connect the existing path network, via a new shared path west from the Geordie Street causeway, to the Lithgow Tourism Information Centre and existing urban pathway network (Planning Unit FC8-West).
- To undertake amenity/landscape plantings to enhance the existing concrete pathway south of Geordie Street (Planning Unit FC8-West).
- To commence shared path development (but to varying standards and user suitability) in the “western heritage zone”, along Coerwull Road (in Planning Unit FC9-North).

- To support new path construction with WSUD measures (mainly creekside filter strip plantings), and undertake appropriate stormwater quality improvement measures (mainly retrofitting) in conjunction with open space upgrading efforts along these sections of creek corridor.
- To commence the confirmation of public land boundaries, and removal of encroachments, upstream (east) of Burton Street (Planning Units FC2, 3, 4 and 5).
- To undertake weed control and riparian vegetation community restoration works in State Mine Creek, a high weed area and source of weeds for downstream sections of Farmers Creek (Planning Unit SMC2).

### 6.4.2 Stage 1 Masterplan Overview

#### Introduction

The proposed Stage 1 path network, for the entirety of Farmers Creek through the Lithgow urban area, is shown in overview on Figure 25.

The proposed Stage 1 path works, in conjunction with the existing path network will form a continuous, mostly creekside, pathway from Burton Street in the east to the Tourism Information Centre in the west. Most of this route would be to a shared path standard, with the exception of the existing Geordie Street and Sandford Avenue (Marjorie Jackson Oval) sections which, while not to shared path width at present, are nevertheless signposted for both walker and cyclist use.

This initial stage includes a considerable investment in landscape/amenity plantings, to support Stage 1 recreation and access upgrades and to enhance the creekside settings for subsequent works. Limited, and targeted, weed control and riparian community restoration also commence in Stage 1.

The total estimated order of costs for all Stage 1 works is over \$1,996,000 – as detailed in Table 5 and Section 7.1.



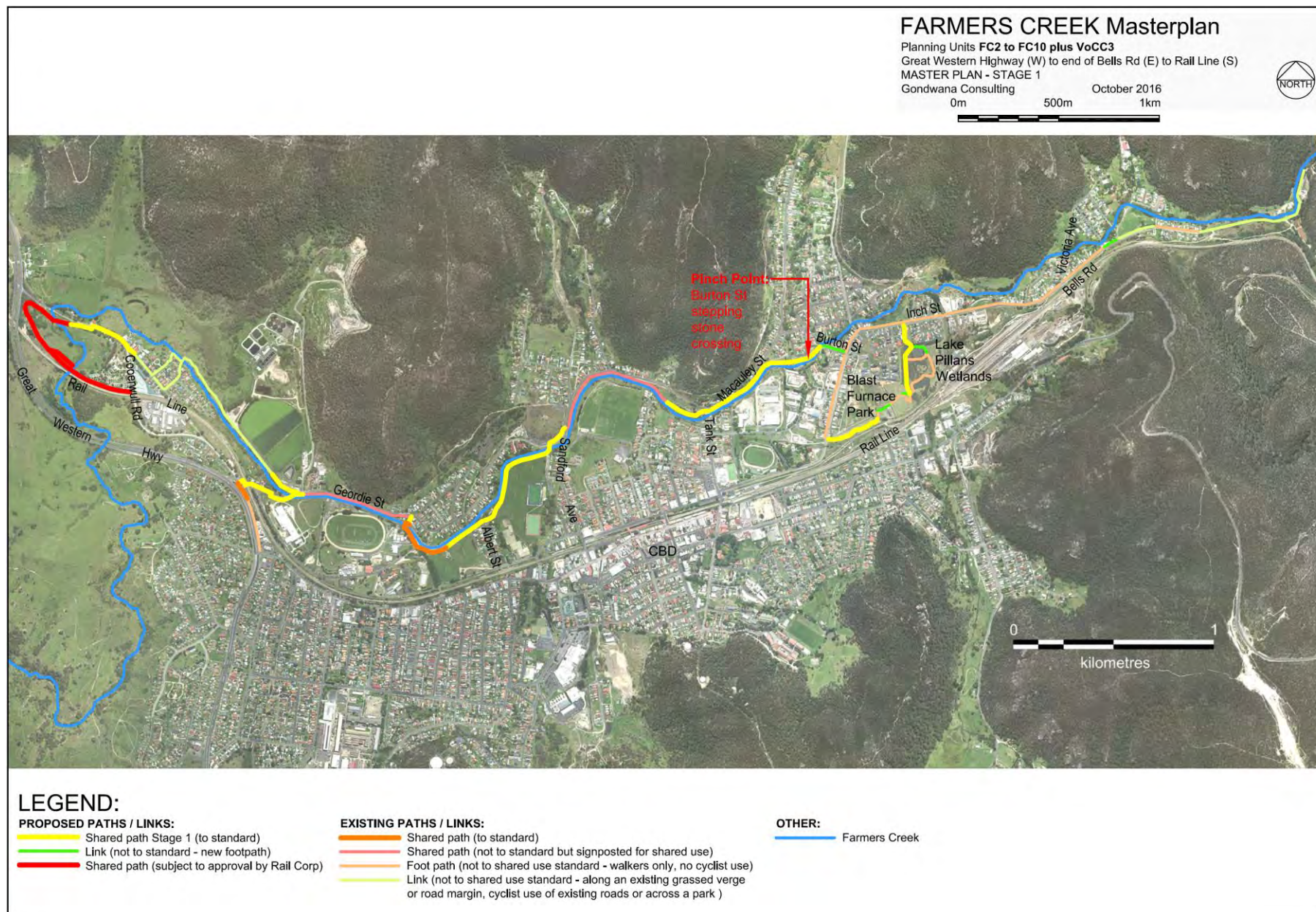


Figure 25 Stage 1 path network overview



Of this over \$1,394,000 is for shared path infrastructure and other “hard” works, over \$322,000 is for “soft” landscape works and amenity plantings, and over \$279,000 is for weed control and riparian vegetation community restoration.

The following description only highlights the major elements or works within Stage 1. For a summary description and location of all proposed “hard” facility works – principally the proposed Stage 1 path network – refer to the individual masterplan for each Planning Unit at Figures 26 to 40 (with reference to the masterplan legend at Figure 16). A detailed description of all Stage 1 works – “hard” facility works, “soft” landscape/amenity works, and weed control and natural vegetation restoration works – can be found in the Implementation and Cost Estimates Schedules in Appendix 4.

### Overview Description

Within the “central urban recreation and open space zone” the extended shared path’s eastern end will be the crossing of Farmers Creek (off the west end of Burton Street). This is proposed as an interim “stepping stone” type crossing, and so would be a “pinch point” in the network unsuitable for cyclists and mobility scooters. Downstream from here a new shared path would run along the creek’s northern side, through the Guy Street open space (including a short bridge over State Mine Creek), then continue down the south-east side of Macauley Avenue, separated from the adjacent carriageway, to Tank Street.



Weed control measures, and a mix of both amenity plantings and bushland (riparian community) restoration works, are proposed in advance of (or in conjunction with) development of this shared path between Burton Street and the Montague Street dog park.



Source: Pittwater Council

These plantings aim to capitalise on this highly visible section of the creek corridor to “showcase” the upgrading of Farmers Creek to the Lithgow community, and encourage public awareness of and support for the project (as well as presenting opportunities for community involvement).

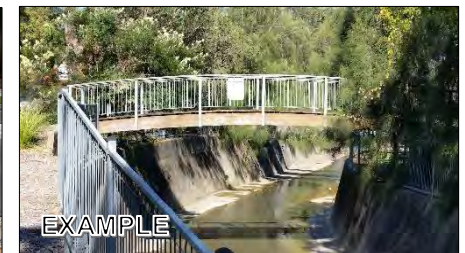
Crossing to the west side of Tank Street, a new shared path would be developed south of the Montague Street dog park to link with the existing bitumen path. Beyond the Montague Street dog park the existing bitumen path, which is signposted for shared use, but does not meet shared path standards, runs west then south between the creek (here as a large, then smaller, canal) and Sandford Avenue to near the junction with Coalbrook Street.



Source: Google Earth



At the south-western end of the bitumen path a new crossing of Sandford Avenue would lead to a short section of shared path before crossing Coalbrook Street and accessing Glanmire Oval via a new short bridge.







A new shared path would run around the edge of Glanmire Oval to cross Albert Street, and then continue along the southern edge of the large stormwater canal to join the recently constructed shared path leading to the Geordie Street footbridge (built to shared path standards).

A low-speed “shared zone” – for pedestrians, cyclists and vehicles – would be demarcated in the laneway at the northern end of the existing Geordie Street footbridge, and a short section of shared path developed northwards to connect with the existing Geordie Street path (signposted for shared use, but not to shared path width).

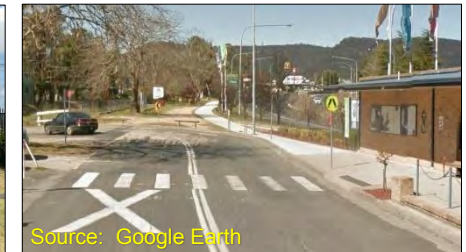


At the western end of this existing path, near the Geordie Street causeway, a new section of shared path would access a new bridge, aligned north-south, over the stream channel (small canal). A new shared path would continue along the south side of the creek, west past the causeway, and along the southern then the northern side of Geordie Street westwards to an upgraded crossing point on the Main Western Rail Line.



The design requirements for the shared paths’ crossing of the rail line (northside of the existing vehicle crossing) would require negotiation with Rail Corp. From here a new shared path would run a short distance north

then west, through the existing information centre parking area (with appropriate signage and/or line-marking) to the existing zebra crossing accessing the Lithgow Tourist Information Centre to link into the wider urban pathway network.



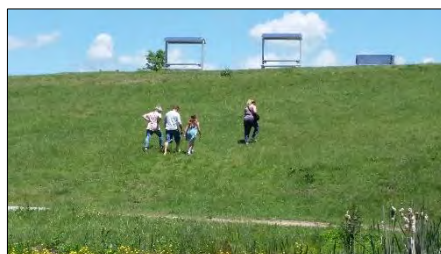
Amenity plantings would be undertaken in association with, or in advance of, construction of the above sections of new shared path between Sandford Avenue and the Tourist Information Centre (see Figure 18). These would include dense grass and/or sedge “filter strip” plantings along the creek/canal side of the path to improve the quality of runoff to the creekline (see Figure 19). “Island” plantings are also proposed for the wide grassy slope between Geordie Street and the existing concrete path (not to shared path standards) to improve the amenity of this area (see Figure 20).



Elsewhere in the “central urban recreation and open space zone” a new shared path leads south, from a new crossing on Inch Street, through the existing park (and floodway) to a new entry node at the north-west corner of the Lake Pillans Wetlands.



From here a new footpath connects south-east to the existing walks around the wetlands, and a new bridge (to shared path standard) would allow walkers and cyclists to cross the narrow outlet to the wetlands and link with the recently constructed path down the wetland's western edge. This path would be widened to shared path standards. Steps are also developed at the south end of this is widened path to safely separate walkers and cyclists on the slope between the Lake Pillans Wetlands and Blast Furnace Park, as well as new supporting amenity plantings.



West from Blast Furnace Park a shared path would meander down the open grassy slope south of Blast Furnace Road to a new crossing point on Inch Street. The former rail bridge over Inch Street, just south of the Blast Furnace Road intersection, could be used as an alternative means of crossing to the western side of Inch Street. It would also offer a connection to Eskbank House and Museum and the existing footpath "sculpture walk" to the CBD. However this option would not



be suitable for cyclists and would require additional infrastructure (safety rails, steps and a diverting/higher path for walkers on the eastern bridge approach).

At Stage 1 the Lake Pillans Wetlands and Blast Furnace Park are not fully integrated into the creek's shared path network, and a shared path loop route through these attractions remains only partially realised (relying on the existing north-south footpath on Inch Street).



East from Burton Street in Stage 1 walkers would be reliant on existing footpaths, often well away from the Farmers Creek corridor and not to shared path standard, and cyclists would be required to use the existing roadways. This encompasses the entire "eastern upstream environmental zone".

At multiple places along Farmers Creek encroachments by adjacent private properties intrude into the public land corridor (based on cadastral data supplied by Council, as KML files). These encroachments are most often lawns, gardens, car parking or access, storage and works areas, and fill – but also occasionally larger intrusions including fenced enclosures and even larger structures. Confirmation of the public land boundaries (and clearly marking these on-ground) and the negotiated progressive removal of encroachments from the creekside public lands is warranted early in the Farmers Creek enhancement project. Priority locations for the confirmation of public lands and encroachment removal are Planning Units FC2, FC3, FC4, FC5, FC7-East and FC7-West.

In the "western heritage zone", north-west from the Georgie Street causeway, a road crossing and short section of unsealed compacted shared path will link the existing Georgie Street path to the Council depot and Sewage Treatment Plant access road. An existing informal route, alongside Farmers Creek, beside the access road and continuing north-west through an unmanaged reserve already provides a connection Chivers Close. While navigable by walkers and possibly by cyclists (in dry conditions), this link is not to a shared path standard and is not suitable for mobility scooters.





An existing footbridge (older style, and not to shared path standards) crosses Farmers Creek. From here cyclists would continue via the carriageway on Chivers Close and Fullagar Avenue to Coorwull Road. Walkers divert north-west, along a “pedestrians only” creekside path, to Evans Close and then continue on the grassed road verge, past Methven House, on to the Fullagar Avenue verge.



From its junction with Fullagar Avenue a new section of new shared path (partly sealed and partly compacted only) would link along Coorwull Road leading to a viewing point to the heritage railway viaducts, just east of the James Kirkwood Bridge.



At Stage 1, and also in subsequent stages, there is the potential to significantly enhance the recreational appeal - as well as the potential tourism interest – of the western end of the proposed shared path network. The twin rail viaducts over Farmers Creek are significant heritage assets

and visitor attractions. These features can be viewed from Coorwull Road – as realised under the proposed Stage 1 works.

However there is also the potential to develop a loop route using the Rail Corp owned corridor – from Coorwull Road in the north just west of the James Kirkwood Bridge, north-west then south-east along the rail corridor (including passing across the older heritage rail viaduct), to Coorwull Road at the existing rail overpass in the south-east (as shown on Figures 39 and 40).

While offering an outstanding experience for users, realising this route would require negotiation and approval from Rail Corp as well as addressing heritage approval, safety, aesthetic, trafficability and service access issues. A major bridge would also be required downstream of the James Kirkwood Bridge (or this existing road bridge modified/widened to accommodate a shared path).







Figure 26 Masterplan FC2 – Stage 1 (and Stage 2)





Figure 27 Masterplan FC3 – Stage 1



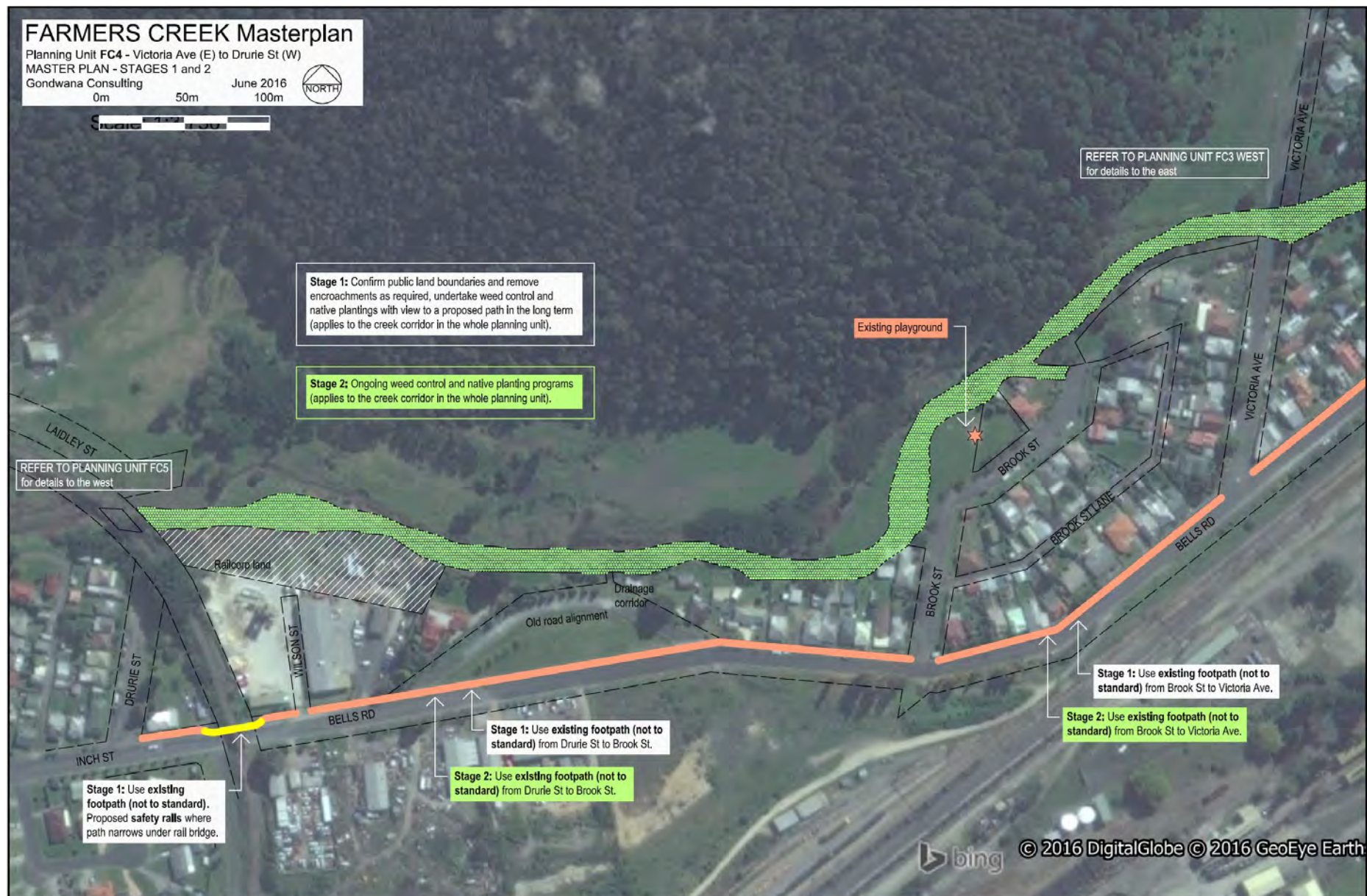


Figure 28 Masterplan FC4 – Stage 1 (and Stage 2)





Figure 29 Masterplan FC5 – Stage 1



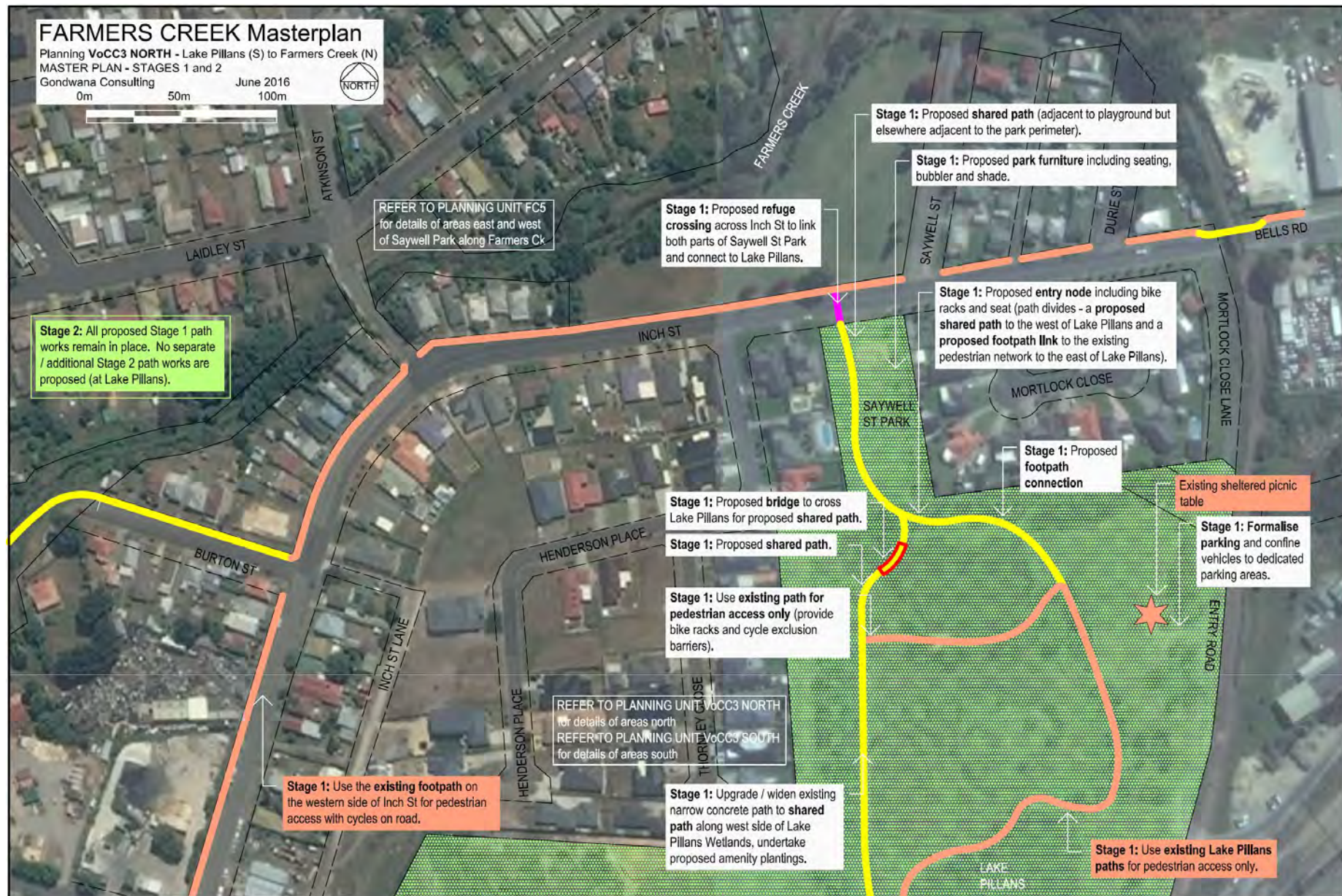


Figure 30 Masterplan VoCC3-North – Stage 1 (and Stage 2)





Figure 31 Masterplan VoCC3-South – Stage 1



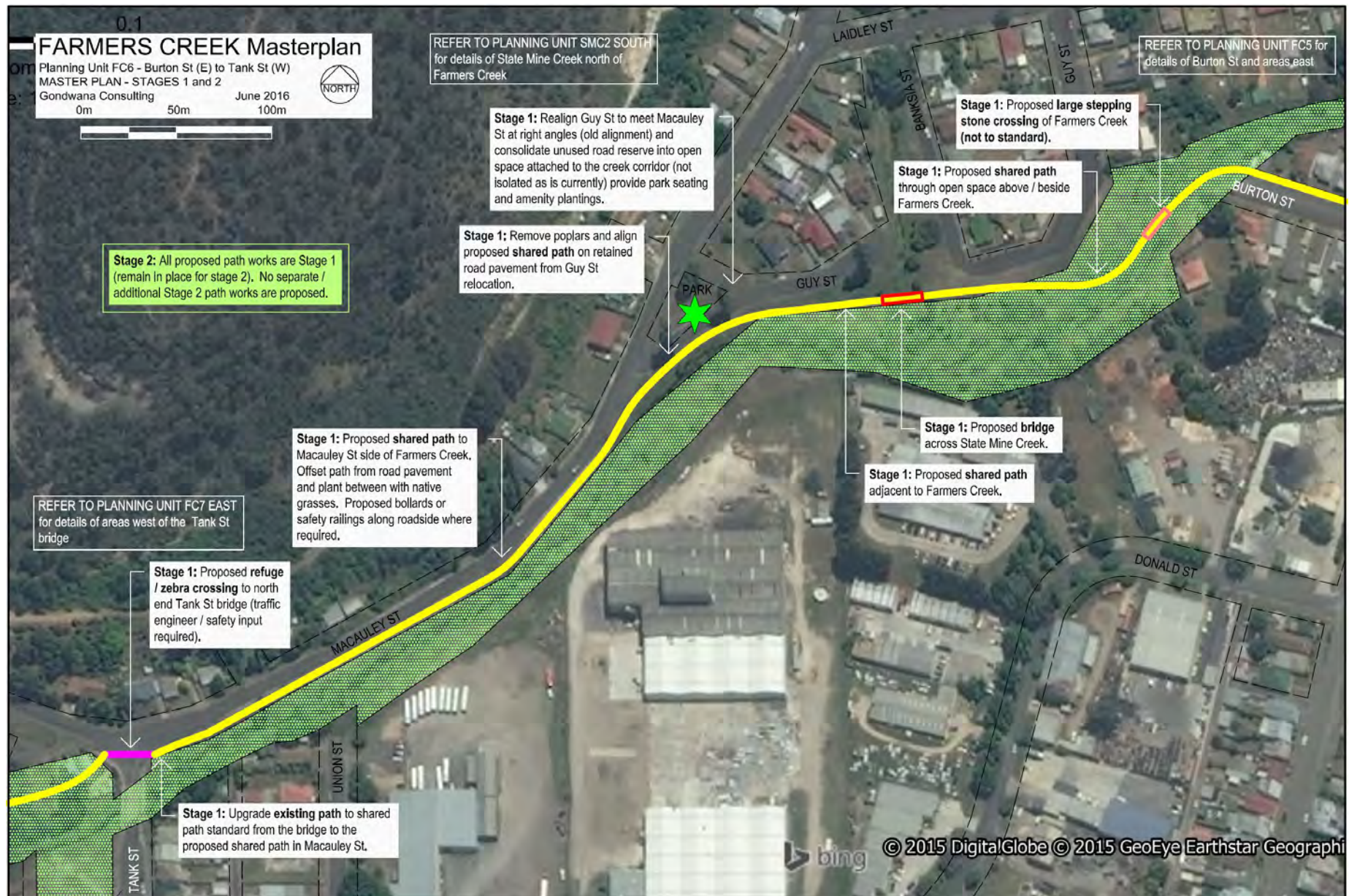


Figure 32 Masterplan FC6 – Stage 1 (and Stage 2)



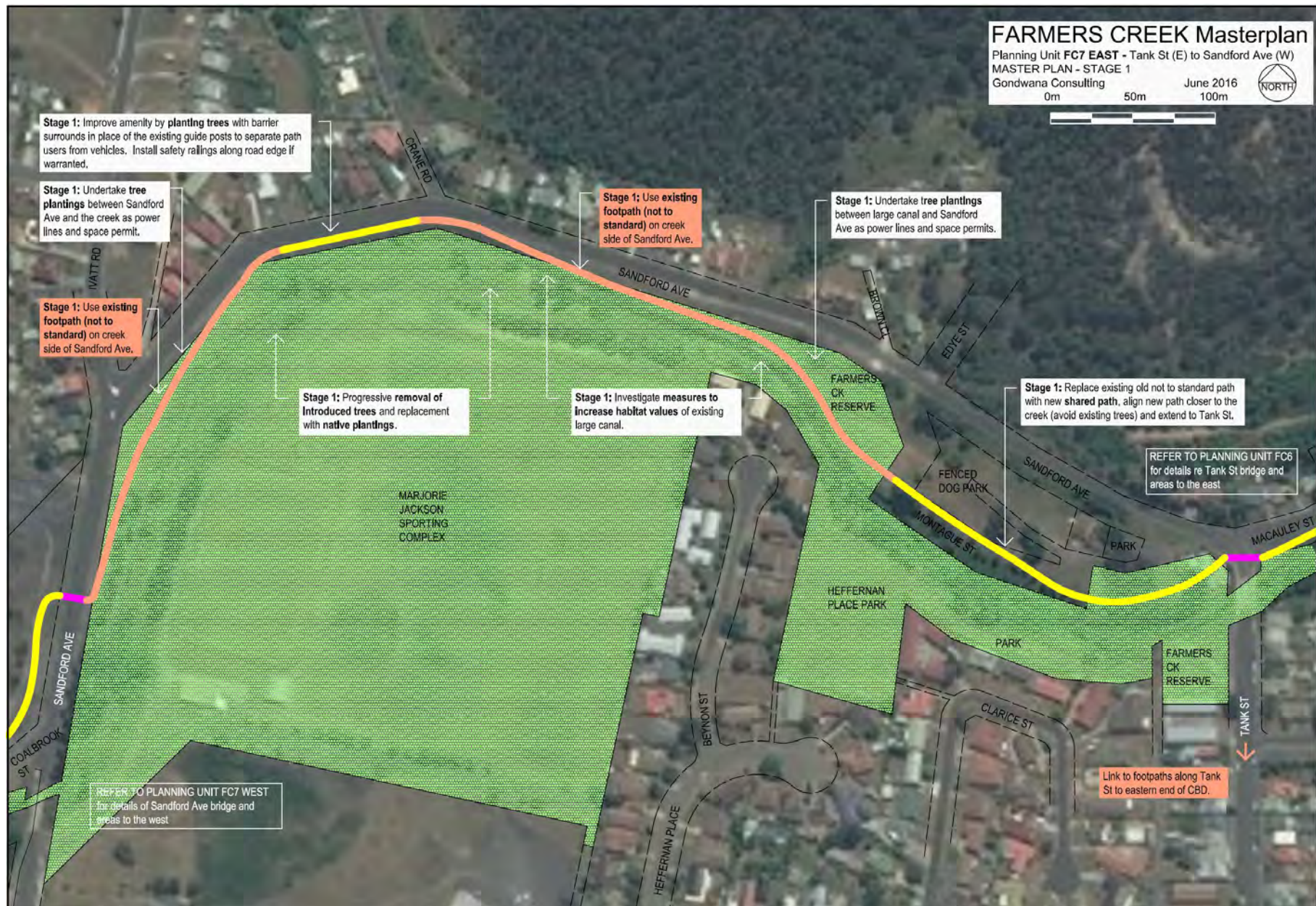


Figure 33 Masterplan FC7-East – Stage 1





Figure 34 Masterplan FC7-West – Stage 1







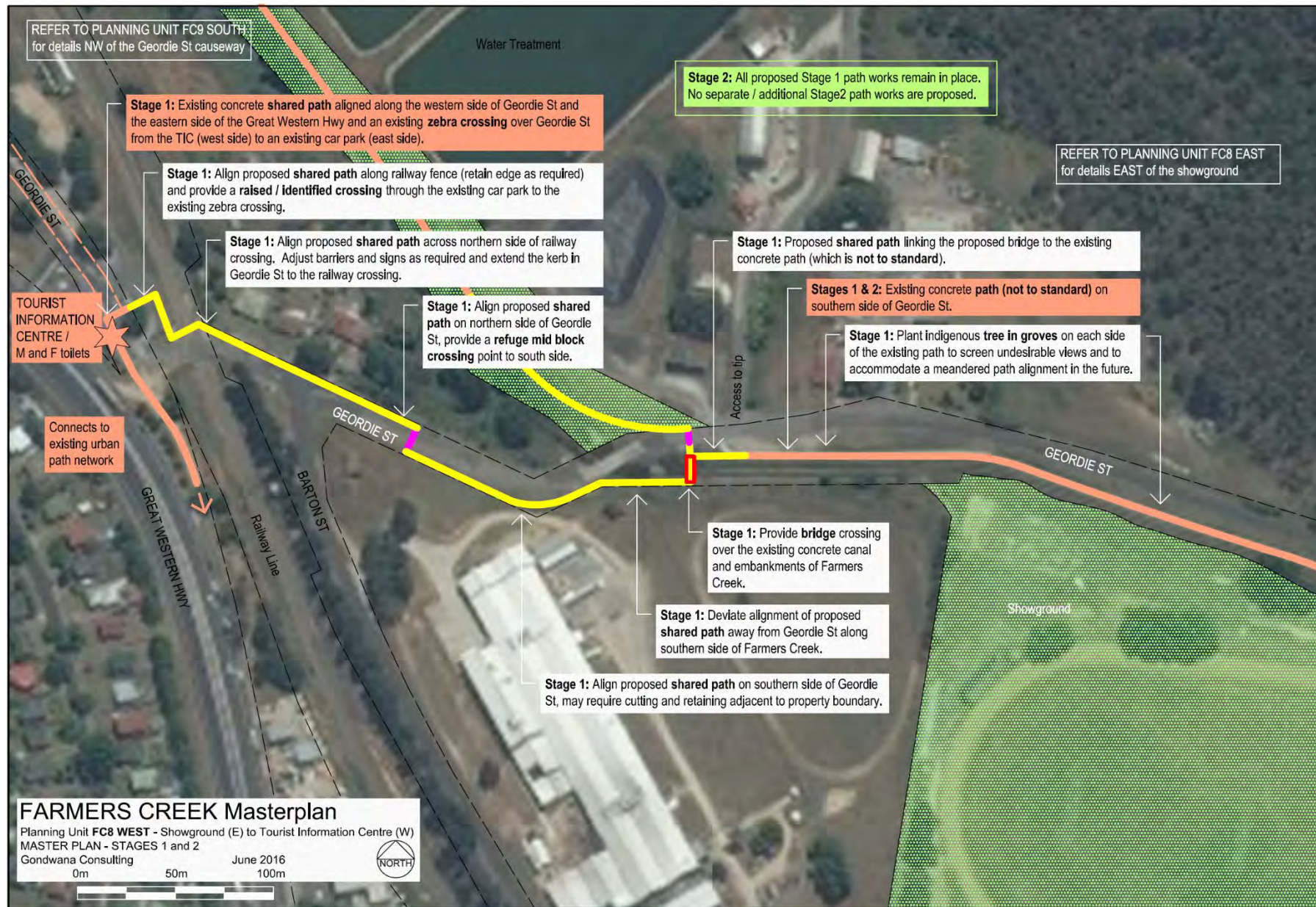


Figure 36 Masterplan FC8-West – Stage 1 (and Stage 2)





Figure 37 Masterplan FC9-South – Stage 1





Figure 38 Masterplan FC9-North – Stage 1



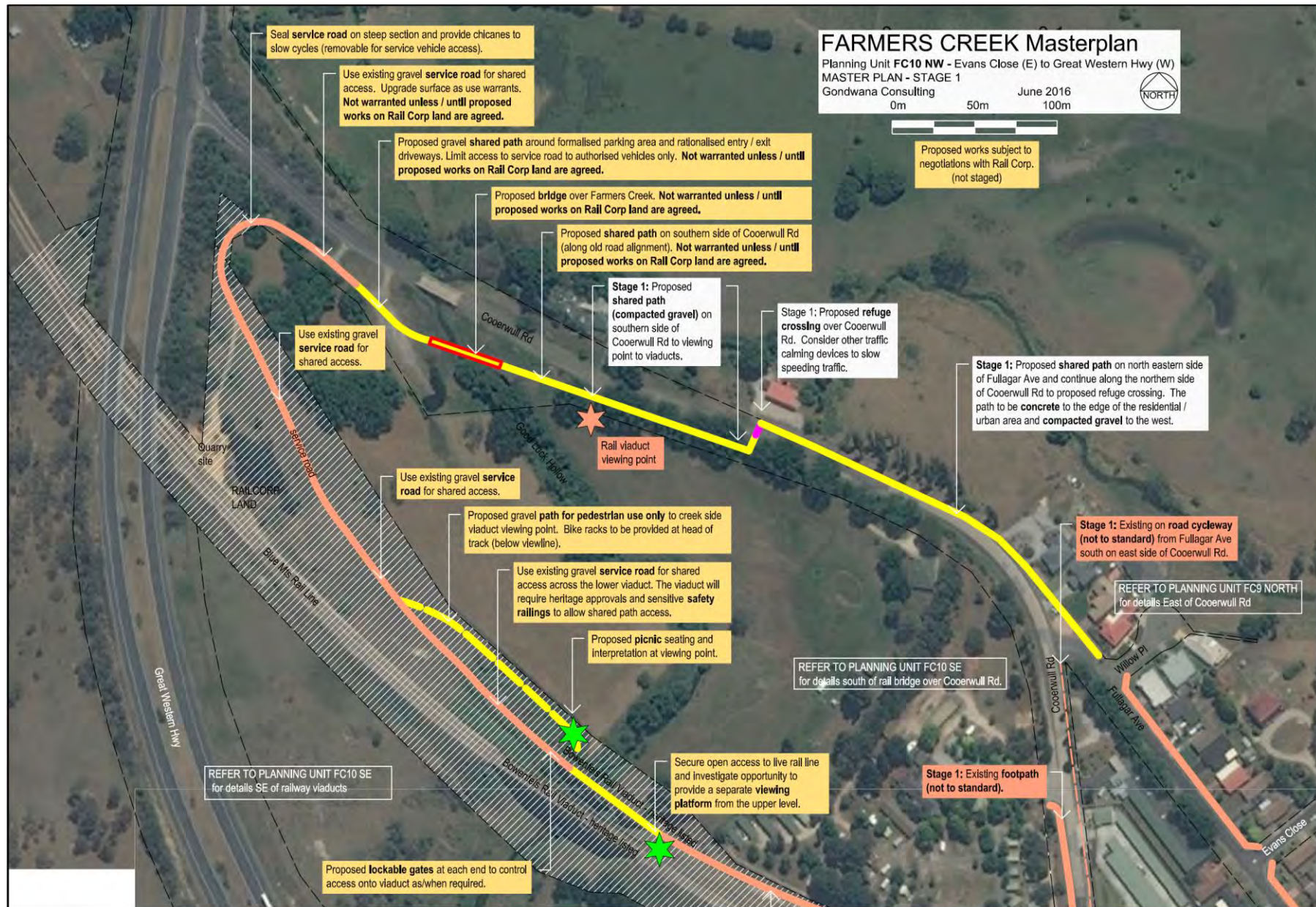


Figure 39 Masterplan FC10-Northwest – Stage 1





Figure 40 Masterplan FC10-Southeast – Stage 1



## 6.5 Stage 2 Masterplan

### 6.5.1 Stage 2 Masterplan Priorities

Following are the key “drivers” for the Stage 2 masterplan actions and works.

- To build on Stage 1 works in the “central urban recreation and open space zone”, with additional sections of shared path to increase the amount of creekside pathway and associated amenity plantings (Planning Units FC7-East and FC7-West).
- To improve the shared path connection towards the Lake Pillans Wetlands, by extending the creekside shared path east from Burton Street (Planning Unit FC5).
- To establish a continuous shared path connection through the Lake Pillans Wetlands and Blast Furnace Park, from north to south-west (Planning Units VoCC3-North and VoCC3-South).
- To commence the limited provision of a shared creekside path in the “eastern upstream environmental zone”, between Oakey Park and Hay Street (Planning Unit FC3).
- To complete a shared path connection through the “western heritage zone”, but to varying standards and user suitability north-west from the Geordie Street causeway to Chivers Close (Planning Units FC9-South and FC9-North).
- To support new path construction with WSUD measures (mainly creekside filter strip plantings in areas of engineered or semi-natural creek channel with less riparian vegetation), and undertake appropriate stormwater quality improvement measures (mainly retrofittings) in conjunction with open space upgrading efforts.
- To undertake weed control and riparian vegetation community restoration works in the “eastern upstream environmental zone” – in conjunction with, or preferably in advance of, the development of a

shared path, recreation facilities and amenity or other plantings (Planning Units FC2, FC3, FC4, FC5 and VoCC2).

### 6.5.2 Stage 2 Masterplan Overview

#### Overview

The proposed Stage 2 path network, for the entirety of Farmers Creek through the Lithgow urban area, is shown in overview on Figure 41.

The proposed Stage 2 path works, in conjunction with the Stage 1 works and existing path network, would secure a continuous, mostly creekside, pathway from Atkinson Street in the east, to the Tourism Information Centre in the west, and continuing through to Coerwull Road in the north-west – as shown on Figure 41. Most of this route would be to shared path standard – with the exception of the existing bitumen path (not-to-standard but signposted for walker and cyclist use) and the unsealed service road, both to the north-west of Marjorie Jackson Oval, and the existing concrete path along Geordie Street (also not-to-standard but signposted for walker and cyclist use). The proposed unsealed (compacted gravel) shared path north-west from the Geordie Street causeway to Chivers Close may also be less suited to some users (such as those in mobility scooters).

Stage 2 also includes a major investment in weed control and riparian community restoration works upstream from Burton Street, in the “eastern upstream environmental zone”.

The total estimated order of costs for all Stage 2 works is over \$2,205,000, as detailed in Table 5 and Section 7.1.

Of this over \$1,390,000 is for shared path infrastructure and other “hard” works, over \$42,000 is for “soft” landscape works and amenity plantings, and over \$773,000 is for weed control and riparian vegetation community restoration.

The following description only highlights the major elements or works of Stage 2. For a summary description and location of all proposed “hard” facility works – principally the proposed Stage 2 path network – refer to the individual masterplan for each Planning Unit at Figures 42 to 51 (with

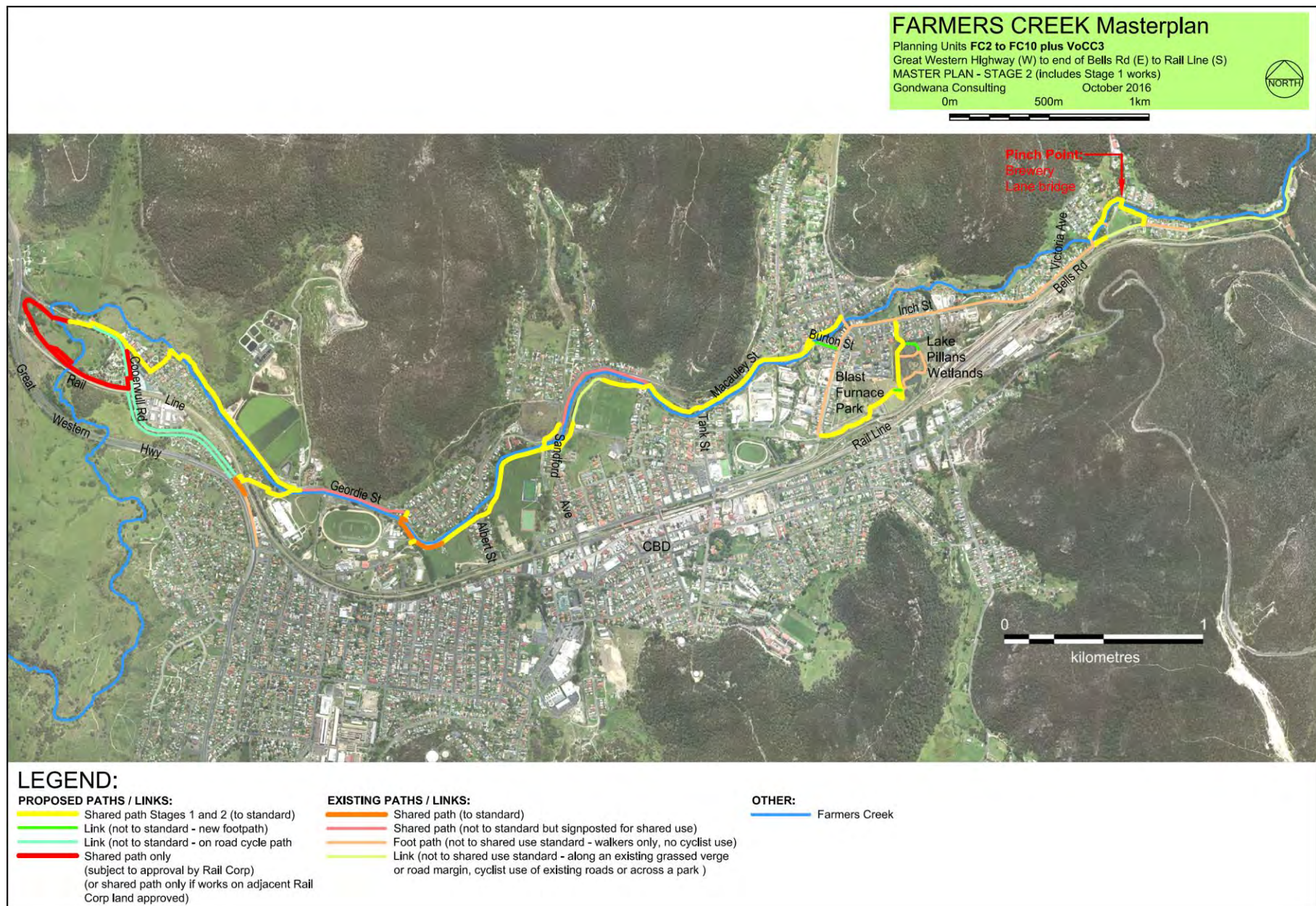


Figure 41 Stage 2 path network overview

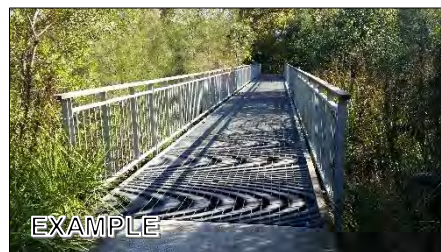


reference to the masterplan legend at Figure 16). Note that there are no separate Stage 2 path works proposed for Planning Units FC1, FC2, FC4, FC6 and FC8-West). A detailed description of all Stage 2 works – “hard” facility works, “soft” landscape/amenity works, and weed control and natural vegetation restoration works – can be found in the Implementation and Cost Estimates Schedules in Appendix 4.

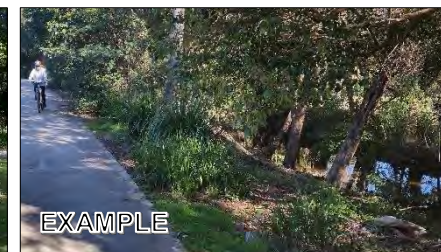
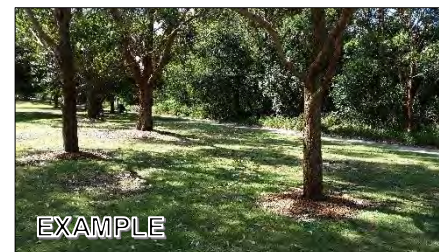
## Overview Description

In the “central urban recreation and open space zone” major new sections of shared path would be developed:

- from Atkinson Street running creekside to Burton Street along the creek’s northern bank, likely requiring a significant (cumulative) length of partially elevated boardwalk (see Figure 24); and
- from the Montague Street dog park west across the existing large canal (at a new, long, bridge) and along the northside of Marjorie Jackson Oval.



The works around Marjorie Jackson Oval, in conjunction with existing bitumen path along Sandford Avenue, would also offer a “local loop path” option, for walkers, to the oval’s north and west.



Amenity plantings to enhance the presentation and appeal of this reach, and “filter strip” plantings to improve the quality of runoff to the creek channel (canal), would be undertaken in association with these shared path works. Weed control and riparian vegetation community restoration works would also occur between Burton Street and Saywell Street Park with, or ahead of, path works in this area.



A short section of shared path and a new road crossing links from the south-west corner of Marjorie Jackson Oval across Sandford Avenue, to the shared path around the northside of Glanmire Oval (as developed in Stage 1) and areas further west.

Although the creekside shared path extends to Atkinson Street in Stage 2, the Lake Pillans Wetlands and Blast Furnace Park are still not fully connected to the Farmers Creek path network. A shared path route through these attractions is completed at this stage, with upgrading of the existing switchback path on the slope up to Blast Furnace Park and path





widening/upgrading across the southern side of the main Blast Furnace heritage site. However a larger loop route to/from the creek corridor remains only partially realised (still relying on the existing north-south footpath on Inch Street).

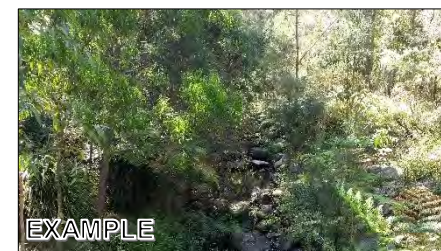
In the “eastern upstream environmental zone” a short section of stand-alone shared path is developed between Bells Road (at Bells Road Lane [West]) and Hay Street, offering a small “local loop route” option along with amenity plantings to enhance the presentation and appeal of Oakey Park. This new path includes a short bridge over a large roadside drain west of Brewery Lane. However the existing sub-standard timber plank footpath across the single lane Brewery Lane bridge remains a “pinch point” on this new link.



Elsewhere east from Atkinson Street walkers would remain reliant on existing footpaths (as in Stage 1), often well away from the Farmers Creek corridor and not to shared path standard, and cyclists would still be required to use the existing roadways.

Substantial weed control and riparian vegetation community restoration works are undertaken in the “eastern upstream environmental zone” in this stage, to:

- support the discontinuous Stage 2 path/recreation works and amenity plantings in this area;
- treat a significant upstream weed zone and source of propagules for downstream sections of Farmers Creek; and
- enhance these areas ahead of subsequent path/recreation works and amenity plantings in Stage 3.



Weed control and riparian vegetation community restoration works are also carried out in the Vale of Clywdd Creek (Planning Unit VoCC2) in this stage. Downstream in Planning Units FC6 and the eastern end of Planning Unit FC7-East (from Burton Street to past the Montague Street dog park) the weed control and riparian vegetation community restoration works commenced in Stage 1 are continued into Stage 2.

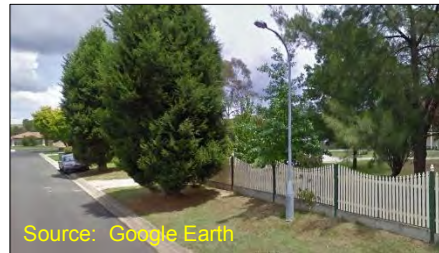


In the “western heritage zone” the Stage 1 informal route beside the Sewage Treatment Plant access road, and extending to the Chivers Close footbridge, will be upgraded to an unsealed (compacted gravel) shared path, and the Chivers Close footbridge rebuilt to shared path standard.





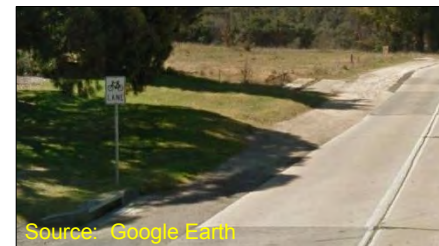
The Stage 1 “walkers only” path north-west from the bridge to Evans Close is upgraded to shared path standard. A new shared path will be developed on the road verge in Evans Close, extending onto the carriageway (with kerb delineation/protection and signage, and the road narrowed) across the front of Methven House in order to protect the street trees and presentation of this (private) heritage site. This new shared path continues along the road verge in Fullagar Avenue to link to the Stage 1 shared path in Coerwull Road and the unsealed (compacted) section of the Stage 1 Coerwull Road shared path will be upgraded.



Stage 2 holds the same potential to develop a heritage focused loop route using the Rail Corp owned corridor (as described in Stage 1 above). If this route is to be fully realised additional upgrades to Coerwull Road – a new/upgraded shared path between the rail overpass and Fullagar Avenue – will also be warranted, and have been included in Stage 2.



Development of an on-road cycleway link, connecting the Farmers Creek shared path (at the north-western crossing on Coerwull Road) and the Tourism Information Centre, is also proposed in Stage 2. This two-way road shoulder cycleway would replace the existing southbound cycleway,



that is signposted in part at present but not marked on-ground (and largely non-existent), and would offer cyclists (only) the option of a loop route (in conjunction with the FC9 paths) to/from the Tourism Information Centre and then connecting into the remainder of the creekside or urban path networks.









Figure 43 Masterplan FC5 – Stage 2





Figure 44 Masterplan VoCC3-South – Stage 2





Figure 45 Masterplan FC7-East – Stage 2





Figure 46 Masterplan FC7-West – Stage 2





Figure 47 Masterplan FC8-East – Stage 2





Figure 48 Masterplan FC9-South – Stage 2





Figure 49 Masterplan FC9-North – Stage 2



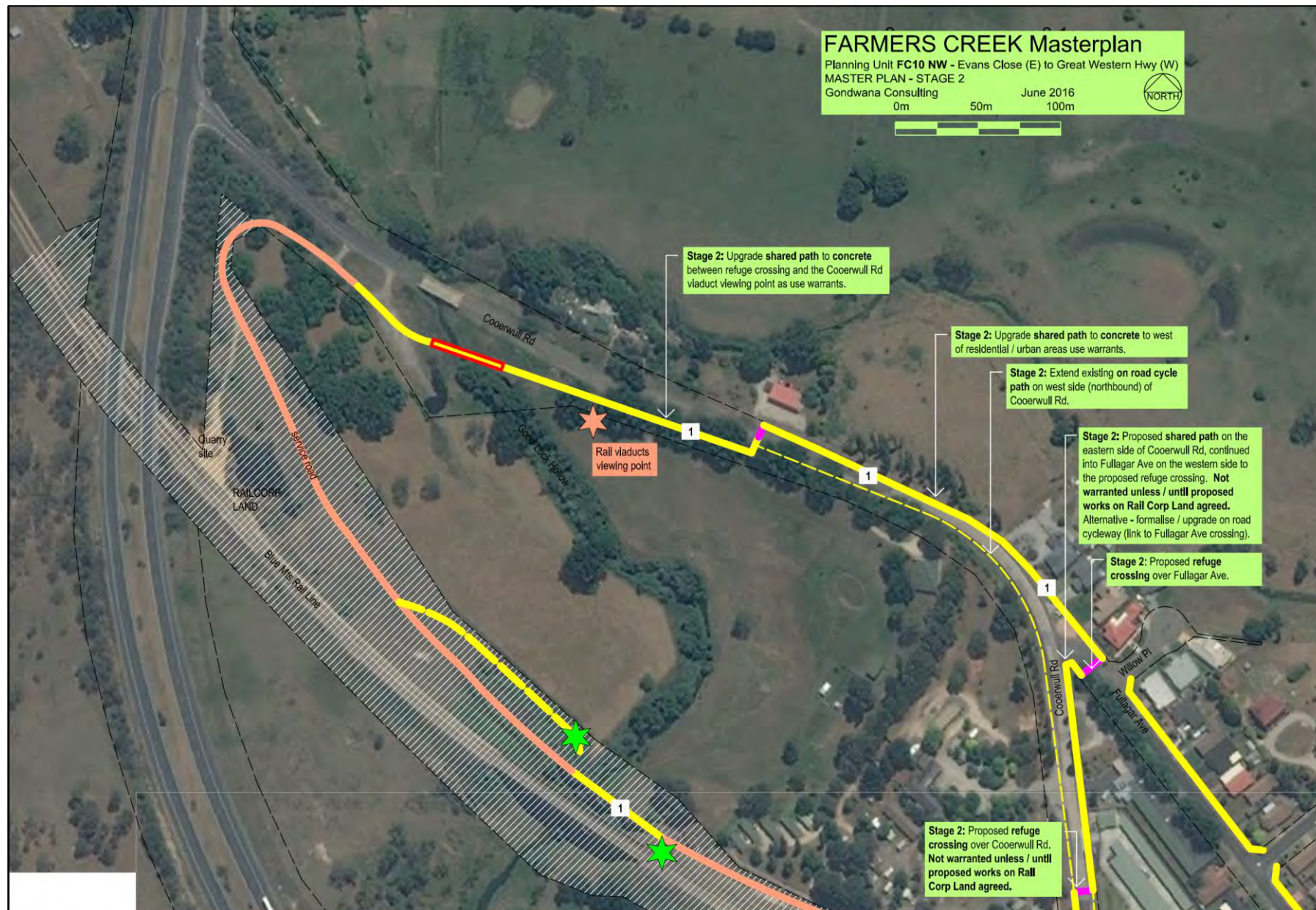


Figure 50 Masterplan FC10-Northwest – Stage 2





Figure 51 Masterplan FC10-Southeast – Stage 2

## 6.6 Stage 3 Masterplan

### 6.6.1 Stage 3 Masterplan Priorities

Following are the key “drivers” for the Stage 2 masterplan actions and works.

- To build on Stage 1 and 2 works in the “central urban recreation and open space zone”, with sections of new and upgraded shared path as the final links in a continuous route (to shared path standard) through this zone (Planning Units FC2, FC3, FC4 and FC5).
- To focus shared path construction in the more challenging “eastern upstream environmental zone”, to build on the limited Stage 2 works and establish a shared path link – along creek corridor as far as practicable – from a terminal creekside picnic area north-west of the Oakey Park Water Treatment Plant downstream to Atkinson Street (Planning Units FC7-East, FC8-East and FC8-West).
- To identify alternative route options, mainly in the “eastern upstream environmental zone”, in those reaches where a creek corridor route may not be feasible (due to land tenure, constructability, cost, or potential demand/usage factors) in order to still offer some degree of connectivity along the entire, wider, Farmers Creek corridor.
- To capitalise on environmental works (weed control and native species plantings to the creek corridor) and amenity plantings in Stage 1 and 2 in the alignment and development of new/upgraded shared paths.
- To link the Lake Pillans Wetlands, and Blast Furnace Park, completely into the Farmers Creek shared path network – including completing the extended loop route, off the creek corridor through these features, to shared path standard (Planning Units FC5, VoCC3-North and VoCC3-South).
- To develop additional, local, loop routes along main creek corridor shared path “spine”.

- To upgrade sections of lower standard shared path links in the “western heritage zone”, north-west along the Sewage Treatment Plant access road and beyond to Chivers Close (Planning Units FC9-South and FC9-North).
- To undertake weed control and riparian vegetation community restoration works along Farmers Creek downstream of the Geordie Street Causeway (Planning Unit FC9).
- To support new path construction with WSUD measures (mainly creekside filter strip plantings in areas with less riparian vegetation), and undertake appropriate stormwater quality improvement measures (mainly retrofittings) in conjunction with shared path development and open space upgrading efforts.
- To identify potential sites for off-line wetlands or detention works.

### 6.6.2 Stage 3 Masterplan Overview

#### Introduction

The proposed Stage 3 path network, for the entirety of Farmers Creek through the Lithgow urban area, is shown in overview on Figure 52.

The Stage 3 path works, in conjunction with the Stage 1 and 2 works and existing path network, would secure a continuous and mostly creekside pathway from north-east of the Oakey Park Water Treatment Plant (at the “end” of Bells Road) through the entire Lithgow urban area to Coorwull Road and the planned heritage rail viaducts viewing point (just east of the James Kirkwood Bridge), and include a link to the Tourism Information Centre in the west.

However the “eastern upstream environmental zone” presents a number of challenges for the development of a creekside shared path. Consequently a number of “off-creek” alternatives have also been identified for this upstream section of Farmers Creek. Several bridges are required in Stage 3, chiefly in the upstream planning units where the narrow creek corridor



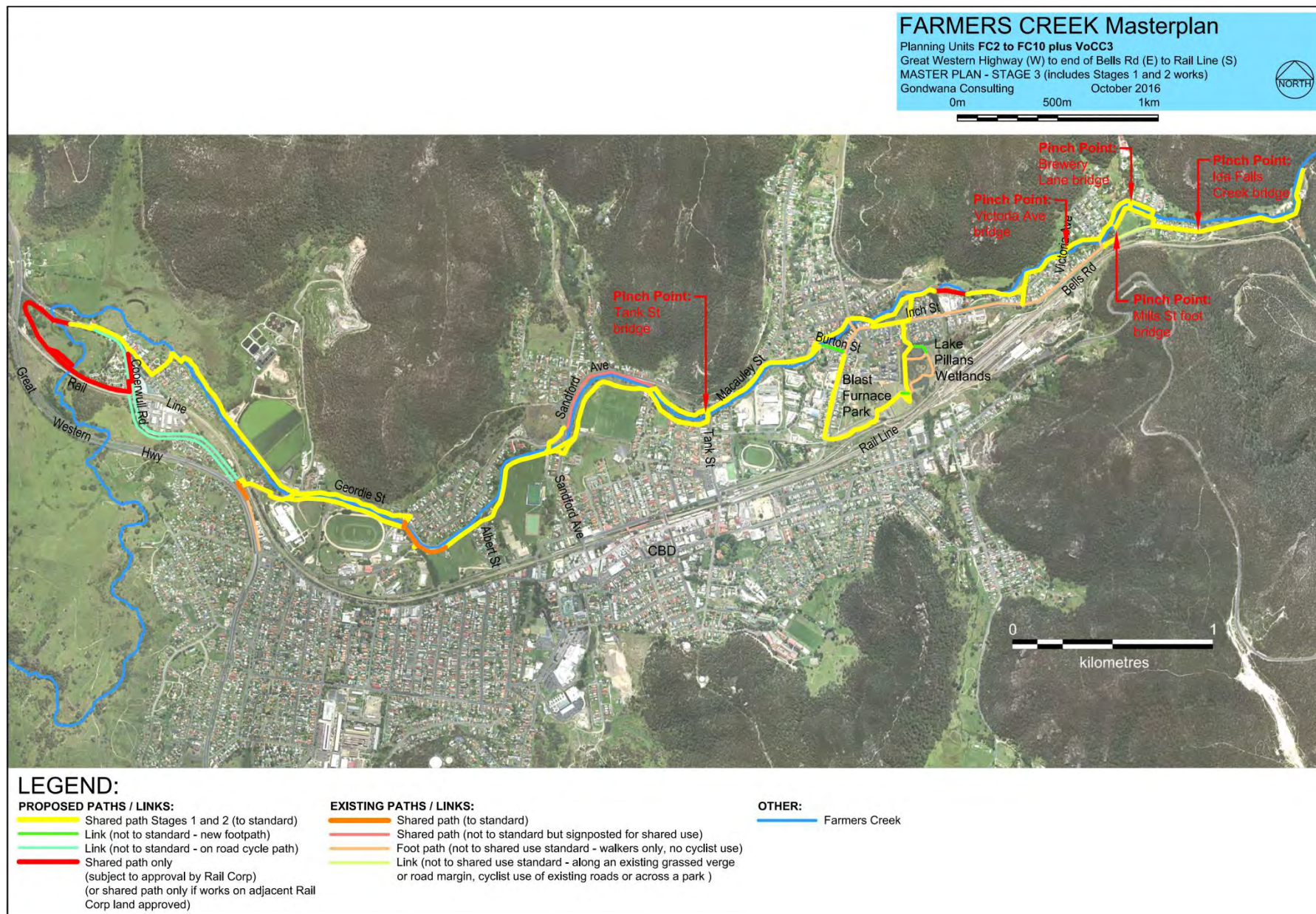


Figure 52 Stage 3 path network overview



presents several challenges for aligning a shared path, as well as the extended bridge/boardwalk required to connect the path under the State Mine rail line. This, combined with substantial additional path works in the “central urban recreation and open space zone” (mostly to establish local loop routes), makes this the most expensive stage of the entire masterplan.

The total estimated order of costs for all Stage 3 works is over \$4,803,000 – as detailed in Table 5 and Section 7.1.

Of this the majority, of over \$4,406,000, is for shared path infrastructure and other “hard” works. Over \$150,000 is for “soft” landscape works and amenity plantings, and over \$246,000 is for weed control and riparian vegetation community restoration.

The following description only highlights the major elements or works of Stage 3. For a summary description and location of all proposed “hard” facility works – principally the proposed Stage 3 path network – refer to the individual masterplan for each Planning Unit at Figures 53 to 65 (with reference to the masterplan legend at Figure 16). Note that there are no separate Stage 3 path works proposed for Planning Units FC1, FC10-North-west and FC10-Southeast. A detailed description of all Stage 3 works – “hard” facility works, “soft” landscape/amenity works, and weed control and natural vegetation restoration works – can be found in the Implementation and Cost Estimates Schedules in Appendix 4.

## Overview Description

In the “central urban recreation and open space zone” a new section of shared path would be developed around the western margin of Marjorie Jackson Oval (linking two sections of shared path constructed in Stage 2) and a new, more direct, shared path link developed under the southern side



of the Sandford Avenue bridge between Marjorie Jackson and Glanmire Ovals.

A new shared path link would also be established from the bridge over the large stormwater canal off the north-east corner of Marjorie Jackson Oval (from Stage 2) running along the south side of Farmers Creek, past



Heffernan Place Park. This would connect to Tank Street, and then north via an upgrade to the present footpath, to the shared path’s road crossing (from Stage 1) north of the existing road bridge. The western footpath across the Tank Street bridge would remain a “pinch point”, unless significant works are undertaken to widen/upgrade this

existing bridge to cater for a shared path. This new link would also require a bridge over a large stormwater drain (west of Tank Street). However it would offer another, smaller, “local loop route” in the Marjorie Jackson Oval area – to complement, or extend, the loop to the oval’s north and west developed in Stage 2.

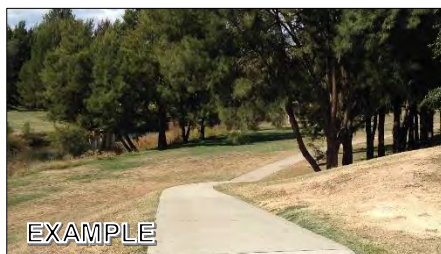
Both amenity plantings, and “filter strip” plantings to improve the quality of runoff to the creek channel, would be undertaken in association with these new sections of shared path in Planning Unit FC7-East (see Figure 18).



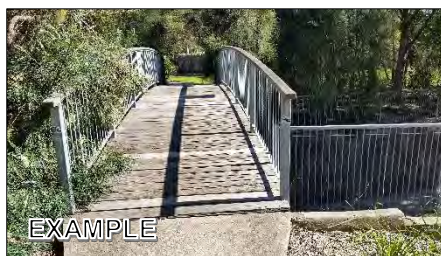
Further east the northern ramp off the Geordie Street footbridge (shared use) would be reconfigured to remove the need for a “shared zone” in this back lane, but instead would connect directly with Stage 2 works along the west side of Geordie Lane.



A major new section of shared path would continue from the south side of the Georgie Street footbridge to run along (just inside) the boundary of the



Tony Luchetti Showground. This would continue out the Showground's north-western corner, cross a small tributary stormwater canal via a short bridge, and along the northern edge of the Ferrero Australia Pty Ltd lands (requiring the agreement of this owner). This southern shared path rejoins the existing path (from Stage 1) just east of the Georgie Street Causeway, where the shared path splits to run both west to the Tourist Information Centre and north-west along Farmers Creek. Both amenity and "filter strip" plantings would accompany this path's development (see Figure 18).

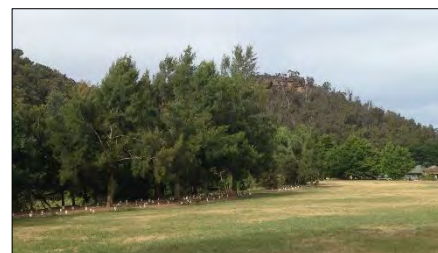


Opposite this new path through the Showground, the existing concrete path along/below Georgie Street (signposted for shared use, but not to the

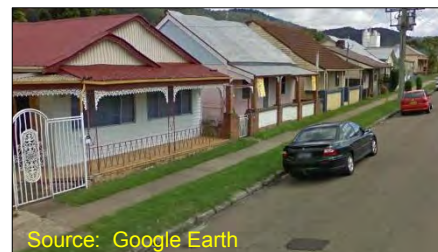


required width) would be replaced and realigned in places, for greater interest and to gently meander among the Stage 1 amenity plantings on this wide road verge (see Figure 20). Elsewhere this existing path would be widened to meet the required shared path standards.

Together these two shared paths, from the Georgie Street footbridge to the Georgie Street Causeway, would offer a "local loop" in the current Showground open space and recreation precinct. (Alternatively, if the southern shared path is developed there is also the option of retaining the existing Georgie Street path as "walkers only" route [but offering improved amenity as a result of the Stage 1 plantings] as a potential cost saving outcome.)



These works would finally, fully, connect the Lake Pillans Wetlands (and Blast Furnace Park) into the Farmers Creek shared path network.



The Stage 2 shared path would be extended from Atkinson Street to Saywell Street Park, requiring a bridge angled across the creek channel, and new shared paths established around the margins of Saywell Street Park (including upgrading/widening the current southside footpath) (see Figure 19).

Stage 3 also proposes upgrading or rebuilding the existing footpath along the west side of Inch Street – between Blast Furnace Road and Burton Street – to shared path width (possibly slightly narrowing the Inch Street carriageway), to complete the larger loop route through these attractions to/from Farmers Creek.

Extending a shared path along Farmers Creek upstream from Saywell Street Park, past the State Mine rail line, and through the "eastern upstream environmental zone" would be a significant and, by comparison with the other sections of Farmers Creek, a costly undertaking.



The State Mine rail line is a major barrier to establishing a continuous shared path along Farmers Creek. Stage 3 identifies two options for such a connection at this point – a bridge/boardwalk combination passing under the existing rail bridge, or a tunnel through the rail embankment (potentially capitalising

on an existing brick tunnel part way through the rail embankment at the north-eastern end of Drurie Street). Both options will require approval from the owners/operators of the State Mine rail line, and also from Rail Corp who own the large block of land on the south bank of Farmers Creek



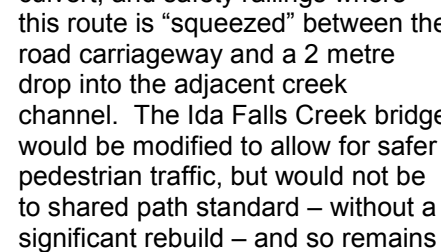


Bells Road footpath under the existing rail bridge and eastwards.

In the “eastern upstream environmental zone” the eastern endpoint of a Farmers Creek shared path is proposed as a small low-key creekside picnic area, and associated limited capacity (unsealed) car park, north-west of the Oakey Park Water Treatment Plant (at the “end” of Bells Road).



From here a compacted gravel shared path would run mostly along the shoulder of Bells Road downstream to the Ida Falls Creek bridge in the west – including a short low boardwalk (or bridge) beside an existing culvert, and safety railings where this route is “squeezed” between the road carriageway and a 2 metre drop into the adjacent creek channel. The Ida Falls Creek bridge would be modified to allow for safer pedestrian traffic, but would not be to shared path standard – without a significant rebuild – and so remains a “pinch point”.



would present some challenges, in terms of alignment and construction, it would access an additional major attraction as well as a useful public transport point at the eastern end of the path. This possible connection warrants further consideration as/when the shared path is established along the eastern end of Bells Road (Planning Unit 2).

Downstream from the Ida Falls Creek bridge to Bells Road Lane (West) a creek corridor route is not viable (as the public land narrows to 6 metres in places, with this being almost entirely active creek channel), and the existing footpath along the north side of Bells Road would require upgrading to shared path standard to secure this link to the Stage 2 shared path at Oakey Park reserve. At Oakey Park reserve an additional shared path is proposed along Island Parade (requiring upgrading or replacing the existing footbridge between Bells Road Lane and Island Parade to shared path standard) and south down the west side of Brewery Lane. This would offer a short “local loop route” at Oakey Park reserve (although the Brewery Lane bridge remains a “pinch point”



from Stage 2, and the existing Mill Street footbridge is not to standard for shared use).

From Hay Street (and the Stage 2 shared path) downstream to Victoria Avenue a creekside shared path could be established, and would offer an







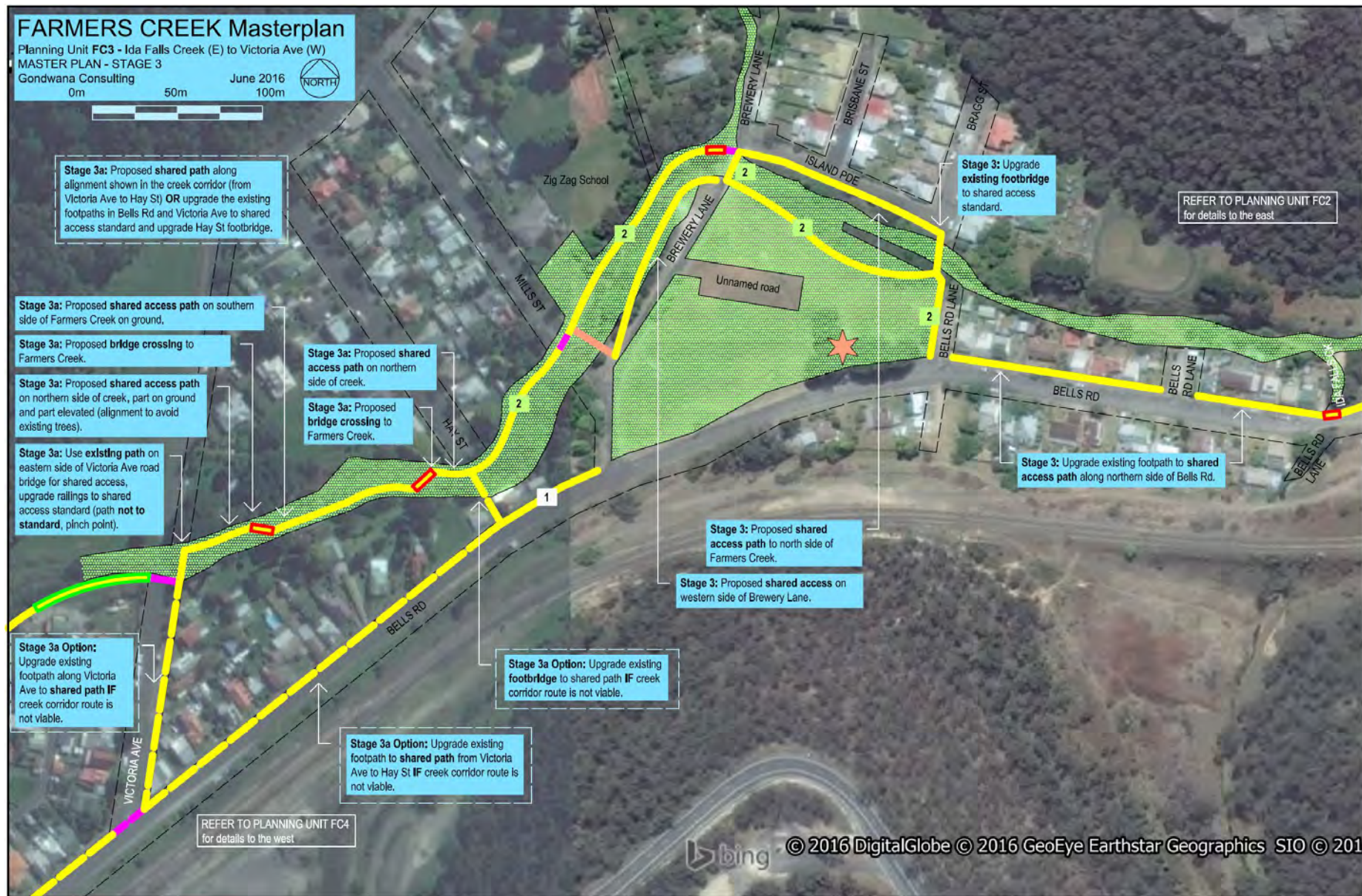


Figure 54 Masterplan FC3 – Stage 3



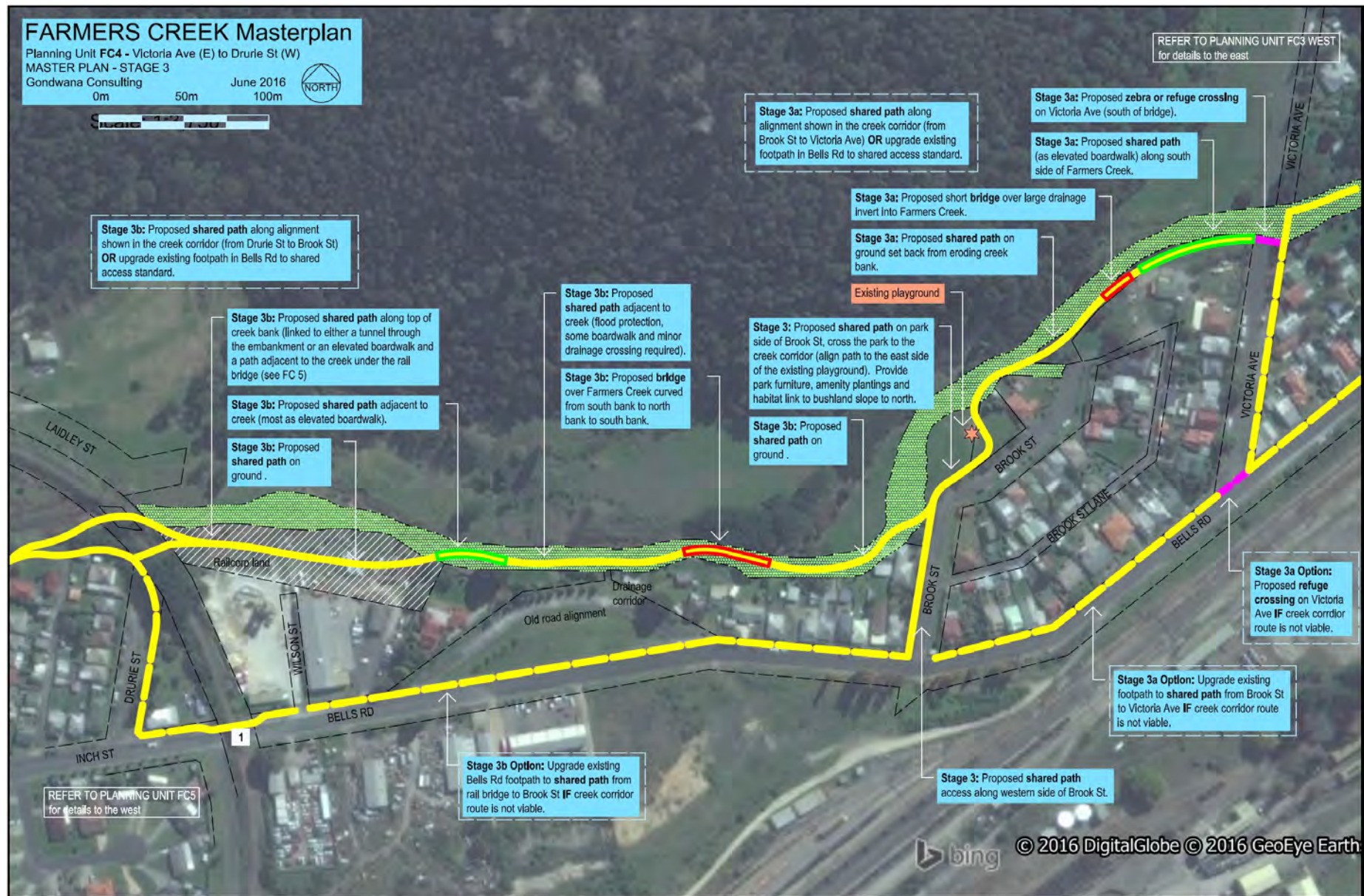


Figure 55 Masterplan FC4 – Stage 3





Figure 56 Masterplan FC5 – Stage 3





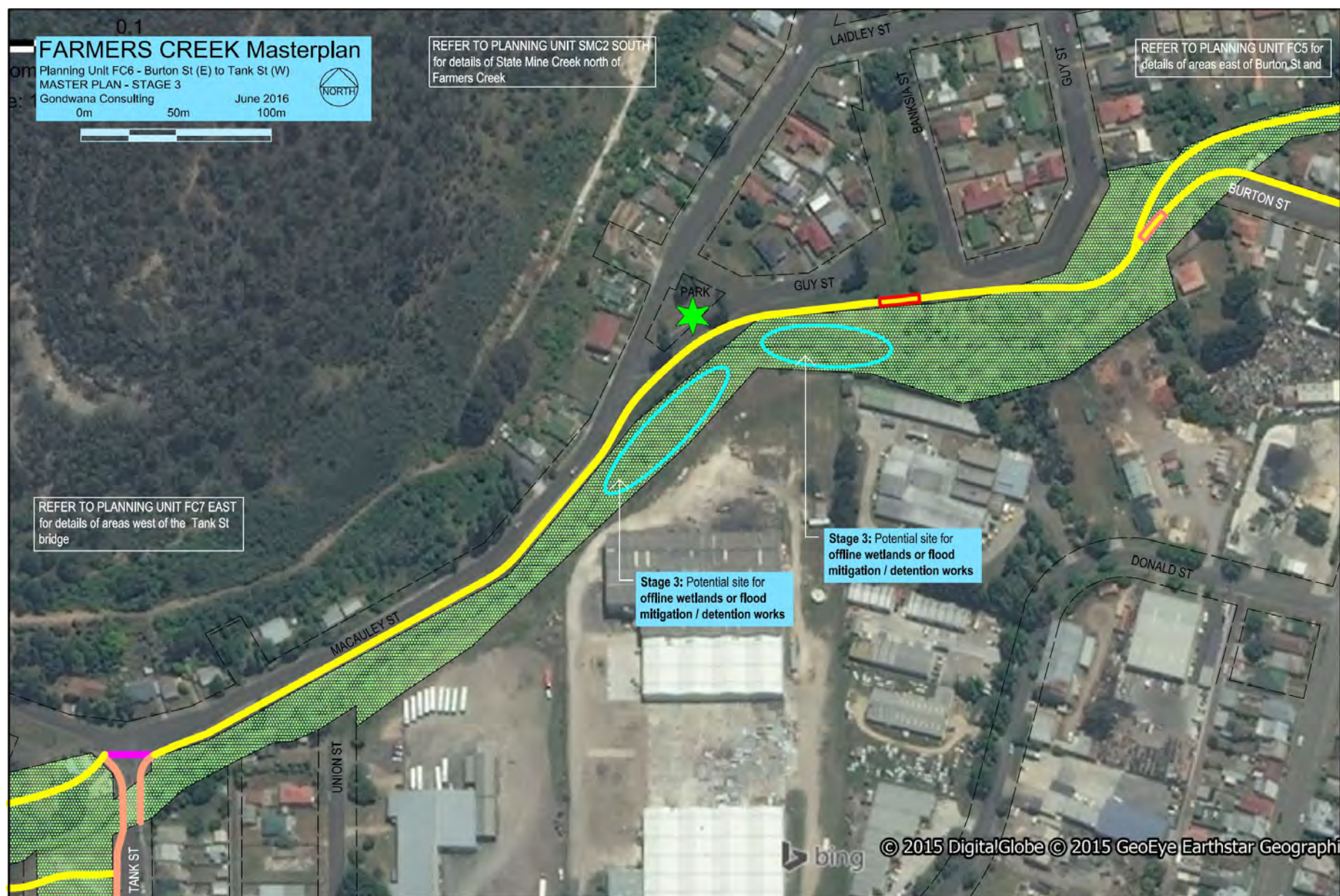
Figure 57 Masterplan VoCC3-North – Stage 3





Figure 58 Masterplan VoCC3-South – Stage 3







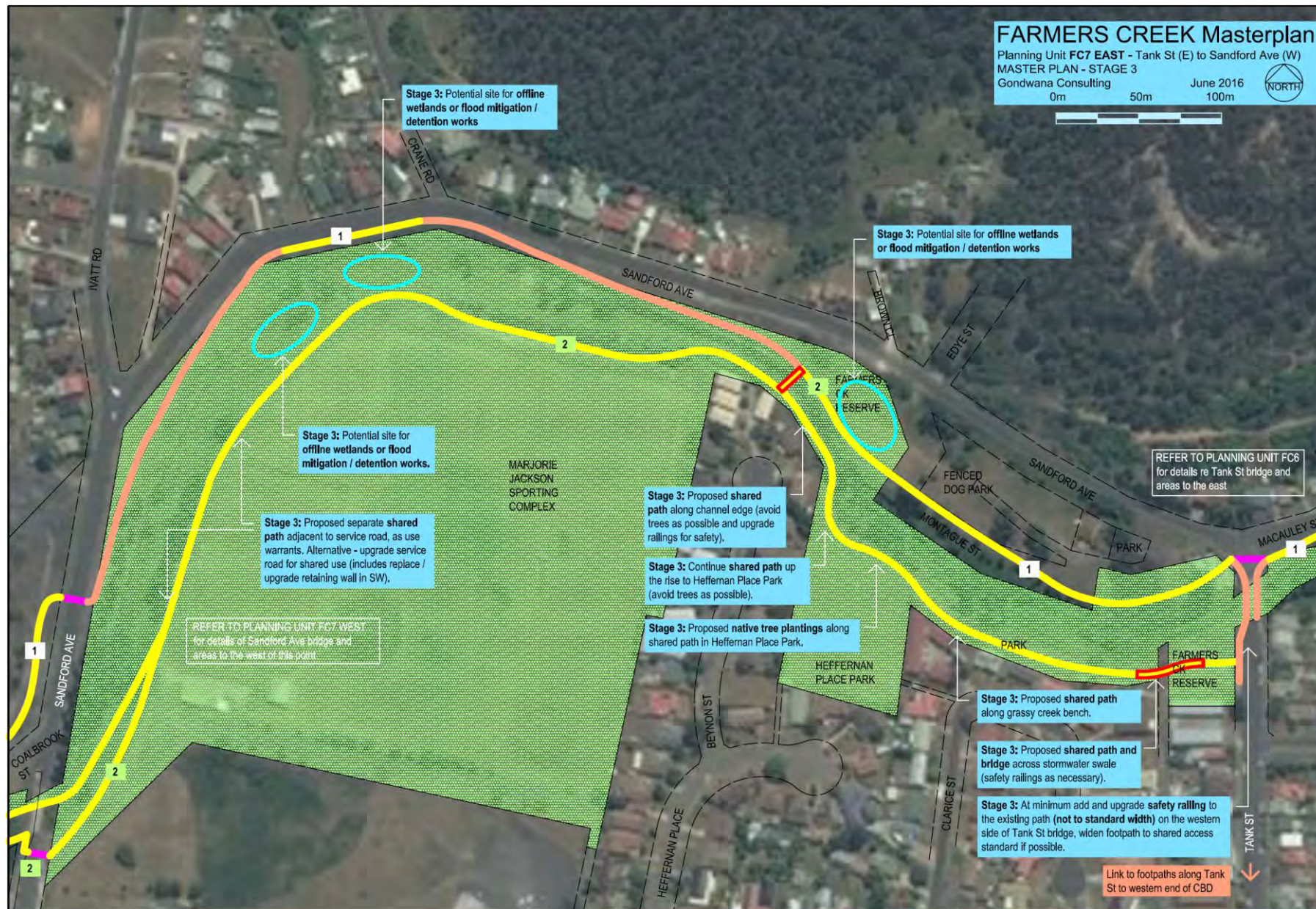


Figure 60 Masterplan FC7-East – Stage 3





Figure 61 Masterplan FC7-West – Stage 3



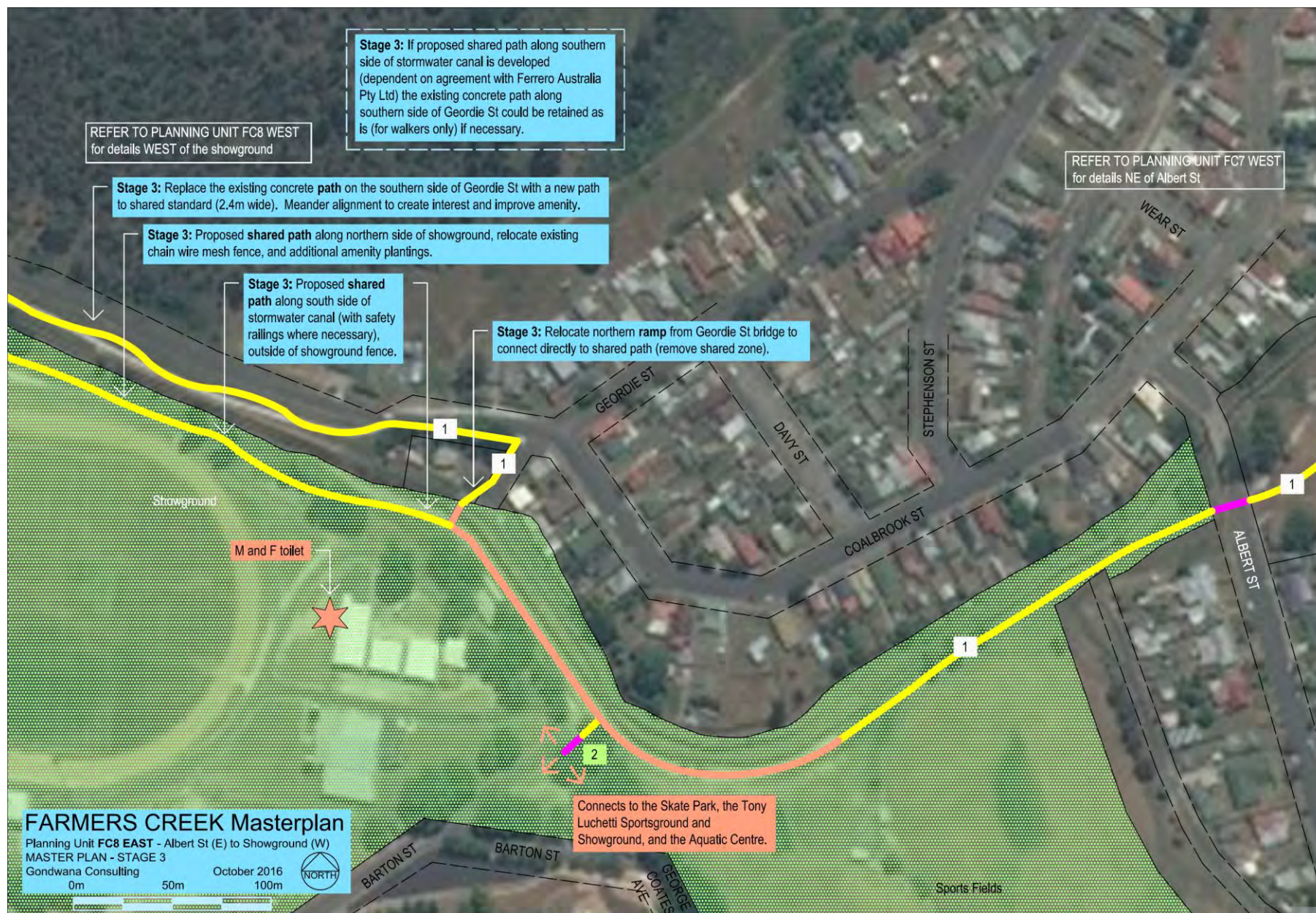


Figure 62 Masterplan FC8-East – Stage 3



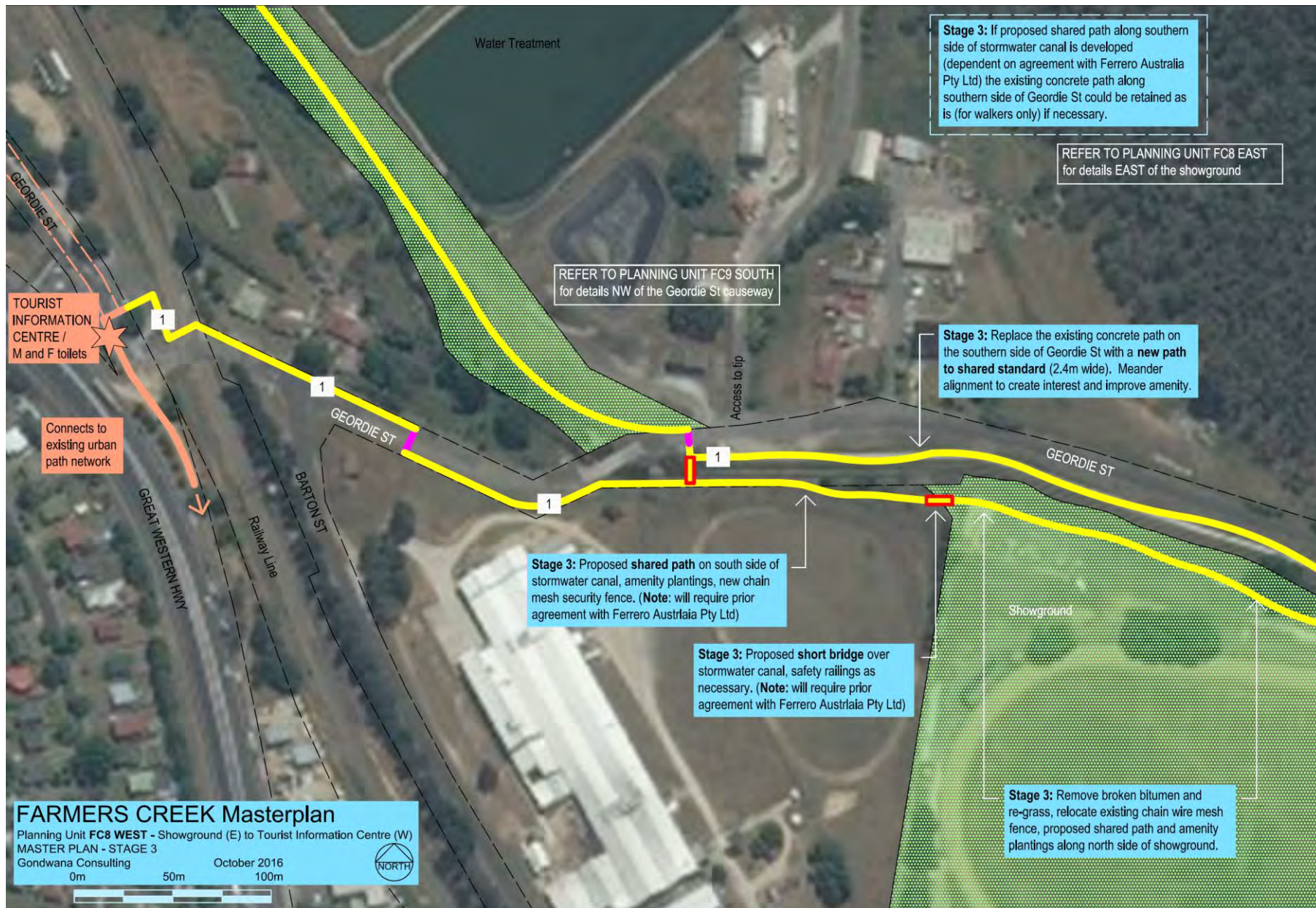


Figure 63 Masterplan FC8-West – Stage 3





Figure 64 Masterplan FC9-South – Stage 3

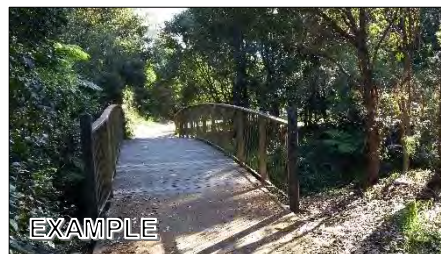
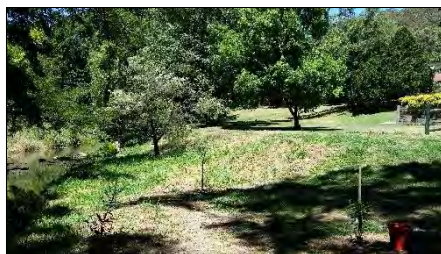




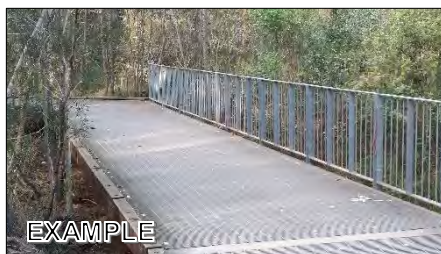
Figure 65 Masterplan FC9-North – Stage 3



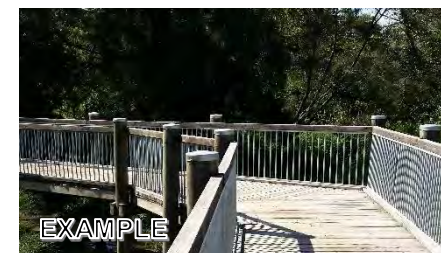
attractive alignment, but would require two bridges across the stream channel. The existing footpath on the eastern side of the Victoria Avenue bridge would also remain a “pinch point” not to shared path standard (without major works to widen or rebuild this single lane bridge). If this section of creekside shared path is not tenable, an alternative (“off creek”) connection has been identified via upgrading the existing footpaths along Bells Road and Victoria Avenue.



From Victoria Avenue downstream to the Brook Street Park a creekside shared path could be established, with attractive views to the adjacent bush hillslope, but would require an extended section of elevated boardwalk and a short bridge. Additional amenity plantings and low-key facilities could be provided at the existing park. If a creekside shared path is not tenable, an alternative (“off creek”) connection could be realised by upgrading the existing footpath along Bells Road to connect to a proposed shared path along the west side of Brook Street (between Bells Road and the park).



Downstream from the Brook Street Park a creekside shared path could be established but would require considerable built infrastructure (mainly due to the narrow public land corridor). This would include a large curved bridge (southern bank, to the northern bank and back to the southern bank), a probable section of elevated boardwalk (see Figure 24), and a possible low-



level boardwalk or drainage works. Upgrading the existing Bells Road footpath, between Brook Street and the rail bridge, would offer an alternative (“off creek”) route to all or part of this section (with a possible access point half-way along at the former road reserve). The western end of this link is also reliant on negotiations with Rail Corp and the owners/operators of the State Mine rail line (as discussed above).



sealed (concrete) shared path – as warranted by use or demand.



In the “western heritage zone” the Stages 1 and 2 unsealed (compacted gravel) shared path from the Geordie Street crossing and running beside the Council depot and Sewage Treatment Plant access road, then extending to the new Chivers Close bridge (from Stage 2) , will be upgraded to a

Elsewhere in this zone Stage 3 offers the same potential to develop a heritage focused loop route using the Rail Corp owned corridor (as described in Stages 1 and 2 above), depending on negotiations with Rail Corp and the resolution of key safety and heritage issues.

Stage 3 includes the identification of a number of locations warranting further investigation for the possible siting and development of “off-line” (that is, out of the main stream channel) wetlands or vegetated flood detention basins. Possible sites (as shown on Figures 56, 59, 60 and 61)



include – a large site in Planning Unit 5 (on Crown land abutting the creekline), two sites in Planning Unit FC6, three sites (one only small) in Planning Unit FC7-East, and a small site in Planning Unit FC7-West. All sites would require hydraulic performance and flood risk impact assessments and engineering investigations to assess their feasibility, as well as detailed designs if they are to proceed.

These sites, and the role of constructed wetlands or vegetated flood detention basins in contributing to improved water quality outcomes, are discussed further in Section 6.3.5.

## 6.7 Planning Unit FC1, and Farmers Creek Tributaries

### 6.7.1 Planning Unit FC1

A separate masterplan sheet has not been prepared covering Planning Unit FC1 beyond the eastern edge of the Lithgow urban area and upstream to the historic Farmers Creek No. 2 Dam.

Upstream of the Oakey Park Water Treatment Plant sections of Farmers Creek are located on private land (outside the cadastral creek corridor) with an unsealed, largely unmaintained, vehicle track (also part on public land and part on private land) more-or-less paralleling and occasionally crossing the stream channel. Both the creek and the vehicle track enter the Newnes State Forest to the north, and then the water supply reserve.



Given the character of this area, as well as the indeterminate and mixed land tenures, the development of a formalised shared path in this area would not be consistent with the area's undeveloped bush setting. Therefore the only (path) work proposed in Planning Unit FC1 is the installation, in Stage 1, of a heavy

duty lockable vehicle gate at the entry to Newnes State Forest (after consultation with the Forestry Corporation of NSW) to control unauthorised vehicle access to tracks beyond the limit of the private land block (as described further in the relevant Implementation and Cost Estimates Schedule in Section 7.2).

### 6.7.2 Vale of Clwydd Creek - Planning Units VoCC1 and VoCC2

Separate masterplan sheets have not been prepared covering the two planning units on the Vale of Clwydd Creek upstream of the Main Western Rail Line – Planning Units VoCC2 and VoCC1.

Planning Unit VoCC2 contains two areas of creekside public land – the developed (low-key) and managed Vale Park south of Mort Street, and a less intensively managed block north of Mort Street. Upstream, Planning Unit VoCC1 does not contain any public land.

In access, linkages and recreational use terms these parcels of public land are a considerable distance from other open space areas and only tenuously linked into the town's wider path network – by an extended narrow footpath along one side of Mort Street. There is no connection down the creek, to the Lake Pillans Wetlands or to Farmers Creek, due to private landholdings and the barrier formed by the embankment of the Main Western Rail Line. It is not considered viable, or cost effective, to connect these public lands into the proposed Farmers Creek shared path in the foreseeable future.

Vale of Clwydd Creek was recorded as heavily weed infested. Council has undertaken Willow eradication and other weed control and revegetation efforts on both areas of public land on the creek in Planning Unit VoCC2 in the past. The Lake Pillans Wetlands downstream acts, to some degree, as a “sink” and buffer to weed propagule spread from the Vale of Clwydd Creek into

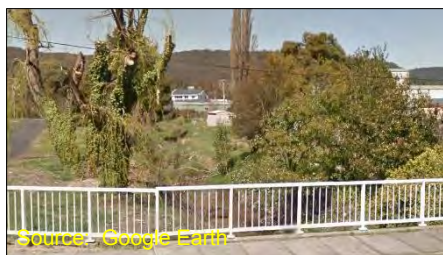


Farmers Creek. However on-going Willow and weed control measures, supported by native species revegetation, are warranted on these upstream reaches of Vale of Clwydd Creek. Therefore weed control and revegetation efforts in these areas have been proposed for Stage 2 of the masterplan, and are the only works proposed in this planning unit.

### 6.7.3 State Mine Creek - Planning Units SMC1 and SMC2

Separate masterplan sheets have not been prepared covering the two planning units on State Mine Creek – Planning Units SMC1 and SMC2.

The upstream Planning Unit SMC1 no longer contains any public land (following Council's decision to sell the site of the former Lithgow Power Station). On the lower reaches of the creek the public land estate is limited and discontinuous. The section of State Mine Creek north from its junction with Farmers Creek to Laidley Street is within a road reserve, and a creekside Council reserve extends from Laidley Street north to Selwyn Street. However between Selwyn Street (and another small Council block off the west end of Willes Street) the tenure of the creek corridor is undetermined. Another larger elongated block of Council land runs along the creek corridor off the north-west corner of Pillans Road – but is totally separate from other parks and reserves, and is entirely “land-locked” by private properties.



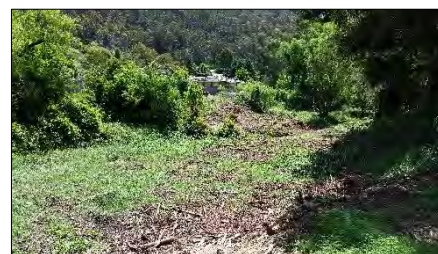
Given the above land tenure situation, a creekside shared path could only be established for approximately 220 metres north up State Mine Creek, from its junction with the proposed Farmers Creek shared path (Stage 1), before having to rejoin the residential street network. In addition such a path would be in two sections, due to crossing Laidley Road midway. Other creekside roads in this area are low speed, low traffic volume, residential streets. In view of this it is not considered cost-effective to propose the development of a shared path for a short distance along the State Mine Creek corridor. A more practical solution would be pedestrian access along

the residential streets' grass verges and the delineation of on-road bicycle lanes for cyclists on the adjacent roadways.

Despite the above it would still be desirable to identify a route for walkers and cyclists between the proposed Farmers Creek shared path and the



State Mine Heritage Park to the north. The preferred route for such a link would be to exit the State Mine Creek corridor at Laidley Street then follow Macauley Street – pedestrians using the existing westside footpath and cyclists on new delineated on-road bicycle lanes (Macauley Street has a gentle but steady grade) – north to its end point at the boundary of the State Mine Heritage Park block (with the Heritage Park operators providing access from this point north to the main attractions and activity area). An alternative route via the residential streets on the east side of State Mine Creek is also possible – but not preferred due to the absence of footpaths, the slope between Pillans Road and Atkinson Street, and the greater volume of traffic along Atkinson Street (until it crosses the State Mine rail line).



were also observed to be heavily weed impacted.

State Mine Creek was recorded as heavily weed infested. Council has undertaken some weed control efforts along this creek in the past, and works are on-going in the elongated public land parcel off the north-west corner of Pillans Road. Upstream sections of the creek into the State Mine Heritage Park block



Given the potential State Mine Creek to be a continuing source of weed infestations into Farmers Creek, on-going weed control and native species revegetation measures are warranted (and would be a higher priority weed control zone than the Vale of Clwydd Creek). Accordingly the masterplan identifies weed control and riparian vegetation community restoration works as Stage 1 activities continuing into Stage 2, and are the only works proposed in this planning unit.



## 7. COST ESTIMATES AND IMPLEMENTATION

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This masterplan describes the full range of proposed actions to develop Farmers Creek as a more connected and continuous public land corridor that offers enhanced recreation opportunities as well as environmental and landscape quality outcomes.

To fully realise the masterplan's objectives will be a long term undertaking, requiring the implementation of a substantial set of development or management actions.

Council does not have the capacity to undertake all of these works immediately, or even into the foreseeable future. Development and management of Farmers Creek to enhance its recreational, environmental and aesthetic values will ultimately be reliant on, and largely determined by, the funding and resources available to Council. As such the works required to upgrade the creek corridor, as guided by this masterplan, must be assessed against the other priorities of Council and determined by the budget allocations assigned in Council's rolling Delivery Programmes and Operational Plan.

Hence the masterplan sets out a prioritised and staged approach to the proposed actions and works – as described in Section 6, and detailed in the Implementation and Cost Estimates Schedules for each planning unit in Appendix 4. The indicative staging adopted by this masterplan – Stages 1, 2 and 3 – is previously described in Section 6.2.1.

Capital works (major projects) and other tangible on-ground works (such as weed control and riparian community restoration, or significant amenity plantings) involving a considerable commitment of funds and resources should be programmed into Council's prioritised "forward works" schedule.

However recognising that funding and resources may come from many sources – including specific-purpose grant funding, volunteer programmes, community initiatives and contributions, corporate sponsorship, or access to

low-security prison work crews, to cite a few – a degree of flexibility and opportunism is warranted in the masterplan's implementation. Developments or management actions of differing priority, or from later stages, may also proceed "out of order" as funding or resources become available. The flexibility to maximise implementation "pathways" to capitalise on funding and resource opportunities as they become available will be essential.

### 7.1 Cost Estimates Summary

Table 5 provides a summary of the estimated orders of cost (in 2016 dollars) for the masterplan's implementation – by planning unit by stage, with accompanying totals for each planning unit and for each stage.

Full realisation of the upgrading of the Farmers Creek urban corridor, and main tributaries, as set out in this masterplan is estimated to cost in the order of \$9,005,000.

The total estimated orders of cost to implement each stage of this masterplan are as follows (rounded to the nearest \$000):

- Stage 1 – \$1,996,000;
- Stage 2 – \$2,205,000; and
- Stage 3 – \$4,803,000.

"Hard" works, the project's built infrastructure and facilities (such as the proposed shared path, bridges, boardwalks, etc.) dominate the project's total estimated cost, making up 80% of the total – as shown in Figure 66. These "hard" works are estimated to cost over \$7,191,000 in total – comprising over \$1,394,000 in Stage 1, \$1,390,000 in Stage 2 and \$4,406,000 in Stage 3.



**Table 5 Summary of estimated orders of cost, by planning unit and project stage**

Planning Unit	Order of Cost (\$) *			
	Stage 1	Stage 2	Stage 3	TOTALS
FC1 – Lower (Historic) Dam (north-east) to End of Bells Rd (north of Water Treatment Plant) (south/south-west)	3,200	0	0	3,200
	0	0	0	0
	0	1,170	0	1,170
	3,200	1,170	0	4,370
FC2 – End of Bells Rd (north of Water Treatment Plant) (east) to Ida Falls Creek (west)	1,080	0	168,400	169,480
	0	0	3,140	3,140
	0	52,950	0	52,950
	1,080	52,950	171,540	225,570
FC3 – Ida Falls Creek (east) to Victoria Ave (west)	5,300	218,950 <sup>1</sup>	912,410	1,136,660 <sup>1</sup>
	13,650	3,600	21,250	38,500
	0	215,230	0	215,230
	18,950	437,780 <sup>1</sup>	933,660	1,390,390 <sup>1</sup>
FC4 – Victoria Ave (east) to State Mine Rail Line (at Drurie St) (west)	8,400	0	984,900	993,300
	0	0	24,590	24,590
	0	77,760	0	77,760
	8,400	77,760	1,009,490	1,095,650
FC5 – State Mine Rail Line and Drurie St (east) to Burton St (west)	25,920	280,800	910,990	1,217,710
	3,690	4,150	18,730	26,570
	0	149,610	0	149,610
	29,610	434,560	929,720	1,393,890

Planning Unit	Order of Cost (\$) *			
	Stage 1	Stage 2	Stage 3	TOTALS
VoCC3 North & South – Inch St (north) to Main Western Railway (south) and Inch Street (south-west)	467,850	25,850	231,670	725,370
	23,940	5,000	3,310	32,250
	0	0	0	0
	<b>491,790</b>	<b>30,850</b>	<b>234,980</b>	<b>757,620</b>
VoCC2 – opposite, west of, Berry St (south) to opposite, east of, Boundary St (north)	0	0	0	0
	0	0	0	0
	0	83,190	0	83,190
	<b>0</b>	<b>83,190</b>	<b>0</b>	<b>83,190</b>
FC6 – Burton St (east) to Tank St (west)	215,860	0	0	215,860
	49,950	0	0	49,950
	89,050	65,040	0	154,090
	<b>354,860</b>	<b>65,040</b>	<b>0</b>	<b>419,900</b>
SMC2 – confluence with Farmers Creek (south) to NW of end of Pillans Rd (north)	0	0	0	0
	0	0	0	0
	154,060	102,830	0	256,890
	<b>154,060</b>	<b>102,830</b>	<b>0</b>	<b>256,890</b>
FC7 East – Tank St (east) to Sandford Ave (west)	87,960	236,770	538,240	862,970
	53,420	5,520	36,560	95,500
	36,150	25,300	0	61,450
	<b>177,530</b>	<b>267,590</b>	<b>574,800</b>	<b>1,019,920</b>



Planning Unit	Order of Cost (\$) *			
	Stage 1	Stage 2	Stage 3	TOTALS
FC7 West – Sandford Ave (east) to Albert St (west)	232,160	60,520	46,480	339,160
	78,990	8,850	6,370	94,210
	0	0	0	0
	<b>311,150</b>	<b>69,370</b>	<b>52,850</b>	<b>433,370</b>
FC8 East – Albert St (east) to Showground (west)	43,090	28,090	165,300	236,480
	49,240	0	13,220	62,460
	0	0	0	0
	<b>92,330</b>	<b>28,090</b>	<b>178,520</b>	<b>298,940</b>
FC8 West – Showground (east) to Tourist Information Centre (TIC) (west)	239,040 <sup>2</sup>	0	283,850	522,890 <sup>2</sup>
	40,500	0	23,190	63,690
	0	0	0	0
	<b>279,540 <sup>2</sup></b>	<b>0</b>	<b>307,040</b>	<b>586,580 <sup>2</sup></b>
FC9 South – Geordie St Causeway (south) to Council Depot Area (north)	28,980	52,080	95,050	176,110
	5,000	0	0	5,000
	0	0	101,160	101,160
	<b>33,980</b>	<b>52,080</b>	<b>196,210</b>	<b>282,270</b>
FC9 North – Council Depot Area (south) to Coerwull Rd (north)	11,400 <sup>3</sup>	380,060	69,230	460,690 <sup>3</sup>
	530	15,010	0	15,540
	0	0	145,410	145,410
	<b>11,930 <sup>3</sup></b>	<b>395,070</b>	<b>214,640</b>	<b>621,640 <sup>3</sup></b>

Planning Unit	Order of Cost (\$) *			
	Stage 1	Stage 2	Stage 3	TOTALS
FC10 (SE and NW) – Fullagar Ave (east) and Coerwull Rd rail bridge (south) to Great Western Hwy (north-west)	24,240	107,390 <sup>4</sup>	0 <sup>5</sup>	131,630 <sup>4 5</sup>
	4,000	0	0	4,000
	0		0	0
	28,240	107,390 <sup>4</sup>	0 <sup>5</sup>	135,630 <sup>4 5</sup>
<b>ENTIRE PROJECT</b>				
All “Hard” Works (Built Infrastructure and Facilities)	1,394,480 <sup>2 3</sup>	1,390,510 <sup>1 4</sup>	4,406,520 <sup>5</sup>	7,191,510 <sup>1 2 3 4 5</sup>
All “Soft” Works (Landscape Works and Amenity Plantings)	322,910	42,130	150,360	515,400
All Weed Control and Native Vegetation Replanting / Regeneration	279,260	773,080	246,570	1,298,910
<b>TOTAL</b>	<b>1,996,650 <sup>2 3</sup></b>	<b>2,205,720 <sup>1 4</sup></b>	<b>4,803,450 <sup>5</sup></b>	<b>9,005,820 <sup>1 2 3 4 5</sup></b>

**Key:**

“Hard” Works (Built Infrastructure and Facilities)
“Soft” Works (Landscape Works and Amenity Plantings)
Weed Control and Native Vegetation Replanting / Regeneration
Total – By Stage
Total – All Stages and All Cost Categories

**Notes:**

- \* Refer to Implementation and Cost Estimates Schedules (Appendix 4) for a detailed breakdown of order of cost estimates
- <sup>1</sup> Excludes upgrades to Brewery Lane bridge/path subsequent to engineering input and detailed design (cost to be determined)
- <sup>2</sup> Excludes cost of proposed rail crossing to Rail Corp specifications (cost to be determined)
- <sup>3</sup> Excludes safety railings and other upgrades to the Chivers Close bridge, subsequent to an engineering and safety inspection (cost to be determined)
- <sup>4</sup> Works proposed on Coerwull Rd that require (or are consequent to) negotiation and agreement with Rail Corp have not been costed.
- <sup>5</sup> Proposed works on Rail Corp land that require negotiation with (and approval from) Rail Corp to proceed, and associated proposals reliant on these Rail Corp endorsed works, have not been costed.



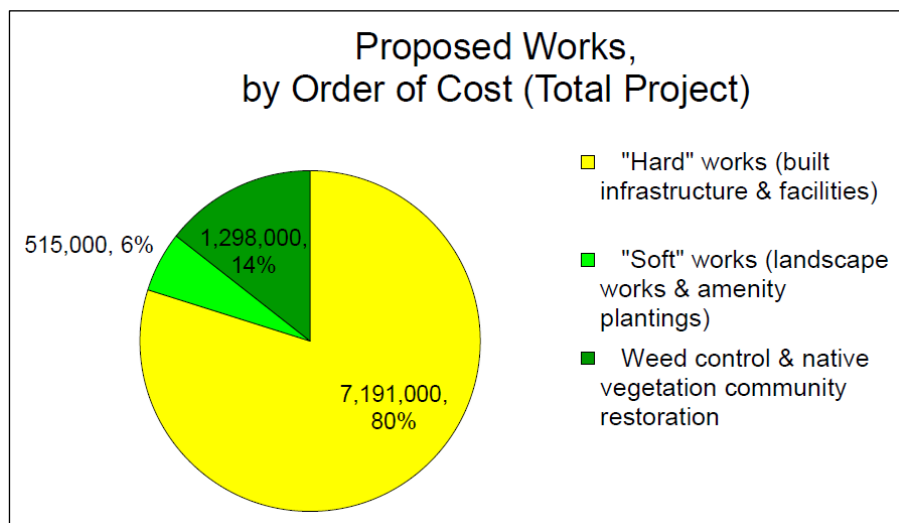


Figure 66 Total Order of Cost for Proposed Works, by Type

Weed control and native riparian vegetation community restoration works make up 14% of the project's total estimated cost. These environmental works are estimated to cost over \$1,298,000 in total – comprising over \$279,000 in Stage 1, \$773,000 in Stage 2 and \$246,000 in Stage 3.

"Soft" works, the proposed amenity plantings and other managed landscape works (including "filter strip", "island" and screen plantings and other open space improvements), are the smallest cost item making up 6% of the project's total estimated costs. These "soft" works are estimated to cost over \$515,000 in total – comprising over \$322,000 in Stage 1, \$42,000 in Stage 2 and \$150,000 in Stage 3.

### 7.1.1 Basis for Order of Costs

Orders of cost estimates have been prepared on an item-by-item basis, for each planning unit and stage, as detailed in the Implementation and Cost

Estimates Schedules in Appendix 4. The cost basis for these estimates have been drawn from a number of sources, including:

- advice from Council regarding local (Lithgow) rates;
- industry charge-out and rate guidelines - notably the *Guideline Schedule of Rates for Landscape Works* by the Landscape Association of NSW and ACT;
- advice from commercial suppliers – such as Landmark (bridges and park furniture), BlueDog Fences Australia (for cycleway barriers/railings), Ingal Civil Products (for road barriers), and others;
- cost data from comparable projects (by Gondwana Consulting and others).

All order of cost estimates are in 2016 dollars.

Further details of the rates used in the preparation of the order of cost estimates are included in the Implementation and Cost Estimates Schedules in Appendix 4.

### 7.1.2 Cost Estimate Exclusions, Unknowns and Variables

The order of costs estimates do not include the following "general exclusion" items:

- survey costs – for public land boundary determination, path alignment (where required), for infrastructure set-out, etc.;
- re-fencing of private property boundaries following the removal of encroachments (both assumed to be at the landholder's expense);
- soil, contamination, geotechnical or subsidence investigations;
- flooding investigations;
- engineering details/specifications where required (unless specifically identified or otherwise indicated for particular items);
- design and approval costs (unless specifically identified in the Implementation and Cost Estimates Schedules in Appendix 4);
- disposal fees for demolition materials and waste;
- erosion and sediment control works, during and after construction;
- on-pavement marking and general wayfinding for the sealed shared path;

- costs of Lithgow City Council's current, and on-going, landscape maintenance/management works at the Lake Pillans Wetlands and Blast Furnace Park; and
- spot removal of introduced trees (e.g. Poplars and Pines) and replacement native tree plantings.

Non-essential works requiring detailed engineering assessment and/or design have not been included in the above order of cost estimates. This is primarily where footpaths on existing road bridges require widening to accommodate a shared path, with such works requiring substantial modifications to these structures – such as the bridges on Brewery Lane, Victoria Avenue, Atkinson Street, and Tank Street. In the absence of proposed (and costed) works at these sites the masterplan identifies them as remaining ‘pinch points’ on the shared path. Similarly no order of cost estimates have been included for possible off-line constructed wetlands or vegetated detention basins.

No order of cost estimates have been prepared for proposed works in Planning Unit FC10 on Rail Corp land that require negotiation with (and approval from) Rail Corp to proceed, and associated proposals reliant on these Rail Corp endorsed works (notably along Cooerwull Road). Works at the Main Western Rail Line crossing in Planning Unit FC8-West (near the Tourist Information Centre) have similarly not been estimated.

While orders of cost have been estimated for weed control and natural vegetation community restoration works these may vary according to the scale/extent and location of treatment sites as well as how these works are carried out (mechanical, manual, etc.). Similarly the orders of costs identified for amenity plantings within each planning unit (and stage) are also variable – depending on the scale/extent, species mix, planting densities and implementation methods for these planted areas (with these only be able to be approximated until the layout, or detailed designs, for each section of the creek corridor's open space are determined).

Further details of exclusions and assumptions applied in preparing the order of cost estimates are provided in the Implementation and Cost Estimates Schedules in Appendix 4.

### 7.1.3 Design and Approval Costs

Design and approval expenses have not been included in the order of cost estimates. As a guide these ‘front end’ project expenses typically require an additional 5% of a project's total estimated construction cost. As upgrading of the Farmers Creek corridor is a Council initiated project, with many of these design tasks being carried out in-house and approvals not required in many cases, this 5% allowance may be an over-estimate.

However, by way of example, applying this 5% allowance to the ‘hard’ and ‘soft’ works proposed in Planning Unit FC7-East and FC7-West (from Tank Street downstream to Albert Street) would give the following (rounded) costs for design and approval (by stage):

- FC7-East and FC7-West, Stage 1 – \$22,650;
- FC7-East and FC7-West, Stage 2 – \$15,600; and
- FC7-East and FC7-West, Stage 3 – \$31,400.

Front end and project management costs for weed control and natural vegetation community restoration would be lower, and for this same reach of creek have been estimated at 3% of project value, as follows:

- FC7-East and FC7-West, Stage 1 - \$1,100; and
- FC7-East and FC7-West, Stage 2 - \$800.

## 7.2 Priority Works and Early Achievements

As discussed above, upgrading of the Farmers Creek corridor to deliver enhanced recreation opportunities and improved visual, environmental and water quality outcomes will be a staged and long-term undertaking.

However several sections of Farmers Creek can be identified as priority locations for upgrading, development and environmental improvement efforts. These sections, once completed, will act as ‘flagships’ for the project – providing exemplar sites and promotional benefits, as well as being heavily used locations where the improvements can be expected to generate majority community support for the project.



Planning Unit FC6 – from Burton Street downstream to Tank Street, and continuing downstream past the Montague Street dog park (into Planning Unit FC7-East) – is one such high profile area where Council has already programmed environmental works. Continuing the recently constructed shared path (now stopping west of Albert Street) into Planning Units FC7-

West and FC7-East around the edge of Glanmire and Marjorie Jackson Ovals, with accompanying amenity plantings and open space improvements, would be another high visibility location in which to promote the benefits of a wider Farmers Creek enhancement project.

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#### **Lithgow City Council GIS Data Layers (2015)**

- 2m contour
- Crown land
- Cadastre clip
- Creeks 1
- Hydro Area
- Land Register 1
- Main creeks
- Minor creek
- Names roads
- National parks
- Parks 1
- Railway
- River and hydro
- Road 1
- State Forest
- Tracks
- Unidentified
- Zoning





# APPENDIX 1

## Rapid Waterway Condition Assessment Template

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### Stream Rapid Condition Assessment – DRAFT (V4 – 16-5-16)

Date/time: .....

Assessor: .....

Weather: .....

Water level and flow strength: .....

Transect Location (transect/band width of 20m)

- location description (streets, features, etc): .....

- ends points (GPS): .....

- compass bearing (from "south" end): .....

- length: .....

Photos: ☐ upstream, ☐ downstream, ☐ left bank, ☐ right bank,  
☐ transect south end to north, ☐ transect north end to south

Note: "Left" bank and "right" bank applied as facing downstream (ie. looking in the direction of flow).

Cross Section



### C. CHANNEL / WATERWAY FORM AND FEATURES (Descriptors Only, Not Scored)

#### C1. Waterway type (select one):

- ☐ Natural
- ☐ Modified or semi-natural (includes minor fill and bank modifications)
- ☐ Engineered/constructed (includes formalised or substantially shaped channel form)

#### C2. Channel style and modifications (briefly describe using relevant or applicable characteristics):

- sinuous
- meandering
- chain of ponds, or discontinuous channel
- incised
- flood benches/terraces
- wetlands
- degree of "containment" (ability for channel migration, natural or developed constraints)
- diverted or straightened channel
- engineered stream features – grassed swale, bank armouring, channelisation, levees, bridges, causeways, etc

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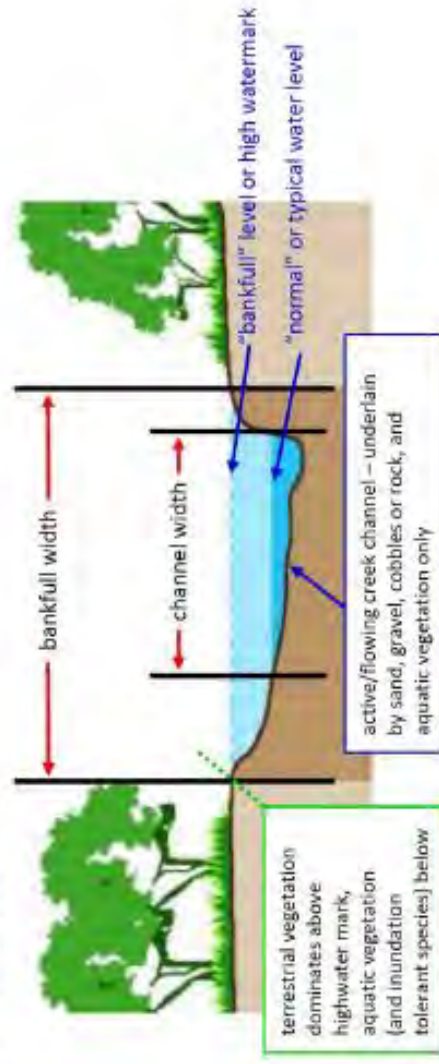
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#### C3. Widths:

- channel or baseflow width
- bankfull width



**C4. Bed type/features description** (briefly describe using relevant or applicable characteristics):

- run/flow, pool, pool/riffle sequence, bar, point bar, braiding
- bed material (bedrock, boulders, cobbles, pebbles, gravel, sand, silt/clay)
- gradient/fall

.....

.....

.....

.....

**C5. Bank slope and shape** (select slope [left] and shape [right] for left and right bank, annotate diagrams as necessary):

Slope		Shape	
Left bank	Right bank	Left bank	Right bank
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

64/10/30

**C6. Bank height** (bed to top of bank, in 0.5m intervals):

Left bank .....

Right bank .....

**C7. Bank material** (type, in-situ or imported, etc):

.....

.....

.....



## B. BANK AND BED STABILITY / GEOMORPHOLOGY

**Note** – assess immediate banks along main stream channel (or to bankfull width if stream banks are largely absent or on a single/simple channel profile), do not apply to outer banks on larger/complex stream corridors or floodways

### B1. Bank slope:

		
Undercut	Steeply sloping (> 25°)	Gently sloping (< 25°)
Both banks <b>12</b> One bank <b>6</b> Both banks <b>6</b>	Both banks <b>6</b> One bank <b>3</b>	Either bank <b>0</b>

NSW 9-16

### B2. Bank height (bed to top of bank, at bankfull height):

- over 2 metres, both banks **4**
- over 2 metres, one bank only **2**
- under 2 metres, both banks **0**

### B3. Bank erosion and stability (undercutting and slumping, gullying and channels, rills, sheet erosion and bare soil/substrate, exposed tree roots or infrastructure [eg. fencing, culverts], knickpoints and head-cutting, gully development):

- extensive (> 70% of banks) **20**
- considerable (40 to 70% of banks) **16**
- moderate (15 to 40% of banks) **8**
- minor (5 to 15% of banks) **5**
- negligible or absent (< 5% of banks) **0**

### B4. Stabilising bank vegetation (effectiveness of vegetation in stabilising the streambank – especially grasses, herbs/forbs and deep-rooted plants – as a percentage ground surface coverage)

- <40% ground surface coverage – or limited or poor bank stabilisation **8**
- 40–70% ground surface coverage – or good bank stabilisation **4**
- >70% ground surface coverage – or very good bank stabilisation **0**

### B5. Bed erosion and stability (eroded/eroding stream bed [bedrock exposure, sand/sediment removal, channel edge undercutting], scouring, bed/channel deepening, increased sediment flux/movement):

- Extensive (> 70% of bed) **5**
- Considerable (40 to 70% of bed) **2**
- Minor to Moderate (5 to 45% of bed) **0**

### B6. Stabilising in-stream vegetation (aquatic vegetation in, or along margins of stream – non-floating vegetation only that will assist in bed stabilisation, exclude dryland species)

- no stabilising in-stream vegetation (<10% or absent) **1**
- stabilising in-stream vegetation present, >10% coverage **0**

**TOTAL SCORE - Bank and Bed Stability / Geomorphology (max. 50)** .....

## R. RIPARIAN VEGETATION AND HABITAT

**Note** – assess “natural” or “free-growing” unmanaged riparian vegetation cover only, but include regeneration/replanted areas, exclude open mown/landscaped grassed areas and managed parklands

**R1. Width of riparian vegetation** (include both native and introduced species) (excluding open mown/landscaped grassed areas and managed parklands):

- narrow <10 metres from high water mark *Left bank 7 Right bank 7*
- medium 10 to 25 metres from high water mark *Left bank 3 Right bank 3*
- wide >25 metres from high water mark *Left bank 1 Right bank 1*

**R2. Longitudinal continuity of riparian vegetation** assess canopy and understorey continuity only (excluding groundcover and grass layers) (include both native and introduced species) (**NOTE** – assess a transect/band width of **50 metres**):



Very fragmented (no canopy or understorey continuity)  
*Left bank 3 Right bank 3*



Discontinuous cover (frequent gaps of 25 to 30 metres canopy or understorey continuity)  
*Left bank 2 Right bank 2*



Continuous cover (occasional/minor gaps in canopy or understorey continuity)  
*Left bank 0 Right bank 0*

NSW 9.4.9

**R3. Riparian vegetation cover** by stratum (canopy >5 metres, understorey 1 to 5 metres, and groundcover <1 metre (include both native and introduced species) (estimate % canopy cover or foliage density):

**Canopy (>5 metres)**

- zero to low, <30% canopy cover *Left bank 6 Right bank 6*
- moderate, 30-60% canopy cover *Left bank 2 Right bank 2*
- high, >60% canopy cover *Left bank 1 Right bank 1*

**Understorey (1 to 5 metres)**

- zero or sparse, <5% ground surface area *Left bank 2 Right bank 2*
- low to moderate, 5-30% ground surface area *Left bank 1 Right bank 1*
- moderate to high, >30% ground surface area *Left bank 0 Right bank 0*

**Groundcover (<1 metre, and including leaf litter)**

- low, <20% ground cover *Left bank 2 Right bank 2*
- moderate, 20-60% ground cover *Left bank 1 Right bank 1*
- high >60% ground cover *Left bank 0 Right bank 0*



**R4. Percentage of introduced species** by stratum (canopy >5 metres, understorey 1 to 5 metres, and groundcover <1 metre), :

Percentage of introduced species	Canopy (>5 m)	Understorey (1 to 5 m)	Groundcover (<1 m)
Introduced species dominating (>75%), high levels of weed invasion	3	5	2
Mix of introduced and native species (each within the approximate range of 40 to 60%), moderately to heavily weed infested	2	3	1
Few (or no) introduced species, and predominantly (> 80%) native vegetation, low level of weed invasion	0	0	0

(Note: If no canopy or understorey layer present score 0 for that strata)

Record significant weeds or dominant introduced species present (for canopy and understorey only) and any declared noxious weeds (across any strata):

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.....

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**R5. Integrity of native riparian vegetation** (considering strata present and structural integrity, species diversity/density, age classes, tree health, and regeneration/recruitment):

- poor/degraded (substantially modified/impacted) 4
- fair 1
- good to excellent (natural or near natural condition) 0

**R6. Habitat features** (standing dead trees, hollow-bearing trees, fallen logs, boulders):

- absent 1
- present (at least 2 features within transect) 0

**TOTAL SCORE - Riparian Vegetation and Habitat (max. 55)**

## A. AQUATIC (IN-STREAM) HABITAT

**A1. In-stream and stream-edge aquatic vegetation** (submerged, floating and emergent aquatic vegetation – algae, macrophytes, stoneworts, ribbon weeds, reed/rushes/sedges, etc – exclude dryland species along channel/water edge):

- negligible, absent or greatly modified **7**
- sparse (<10% coverage of bed/edge) **3**
- moderate (10-40% coverage of bed/edge) **1**
- abundant (>40% coverage of bed/edge) **0**

**A2. Percentage of introduced aquatic vegetation species:**

- moderate to high levels of introduced aquatic species (>35%) **2**
- low levels of introduced aquatic species (<35%) **1**
- negligible levels of, or no, introduced aquatic species **0**

Record any declared noxious aquatic weed species present:

.....

.....

.....

**A3. Extent of stream cover/shading** (from all sources – shading/overhanging vegetation [canopy cover], root/bank overhang, trailing vegetation [in-stream or stream-edge], man-made structures, etc) assess as percentage shade offered under "high sun"

- little or no stream cover/shading (<30%) **6**
- moderate to good stream cover/shading (30-60%) **3**
- extensive stream cover/shading (>60%) **1**

**A4. In-stream habitat features** (snags, logs and large woody debris [>10 centimetre diameter], roots, snags, dumped aquatic vegetation, accumulated organic matter, grouped rocks/boulders, pools and riffles, deeper pools, etc):

- negligible or absent **4**
- occasional /scattered habitat features **2**
- abundant/frequent and/or varied habitat features **0**

**A5. Smothering by mobile sediments and sediment deposition in channel** percentage of streambed covered by fine/mobile sediment (sufficient to smother stones/cobbles):

- large area of bed covered by mobile fine sediment (>80% bed coverage) **6**
- significant build-up of gravel, sand or fine sediment (50 to 80% bed coverage, typically on bends and at obstructions) **2**
- some deposits of sand, gravel and silt (20 to 50% bed coverage, typically in pools and on bars and bends) **1**
- Little sediment deposited (<20% bed coverage, no obvious reduction in channel depth) **0**

**TOTAL SCORE - Aquatic (In-Stream) Habitat (max. 25)** .....



## D. DISTURBANCES AND PRESSURES

**Note** – assess a transect/band width of 50 metres.

<b>D1. Stormwater outlets/pipes and water discharge points:</b>	
• present, bank/discharge guttering or erosion evident	6
• present, without GPT/SQID	3
• present, with GPT/SQID	1
• absent	0
<b>D2. Surrounding land use and potential levels of waterway impacts:</b>	
• high impact land uses – industrial areas, service stations and fuel/chemical storage, activities with extensive excavation/fill/stockpiles [including disused sites]), unsewered residential areas, unfenced grazing and stock access, etc	6
• medium impact land uses – residential and commercial areas, major transport corridors (road and rail), sewer vents and overflow points, etc	2
• low impact land uses – parkland, open space, etc	1
• negligible/zero impact land uses – bushland, national parks, etc	0
<b>D3. Bank disturbances, encroachments and developments (score any present):</b>	
• unauthorised encroachments (stream bank alienation, lawns and gardens, unapproved clearing of riparian vegetation or impediment of regeneration)	2
• excavation or fill (unauthorised works only) (excluding garden waste)	2
• stock access/tracking and grazing pressures	1
• unsealed causeways or vehicle access	1
• extensive trample tracks and footpads and/or recreational use (including informal/unapproved facilities)	1
• managed/landscaped parks and open spaces	0
• negligible or absent	0
<b>D4. Occurrence of in-stream and stream-edge litter and gross pollutants:</b>	
• large litter common (tyres, drums, bricks, shopping trolleys, etc)	2
• occasional large pieces of litter, or small litter common (drink containers, plastics, paper/wrappings, etc)	1
• occasional small litter items, or negligible litter obvious	0
<b>D5. Garden/green waste dumping:</b>	
• present	2
• absent	0
<b>D6. Visible water pollution/pollutants (algal blooms or filamentous algae, water surface sheen, discolouration, rust deposits, odours, etc):</b>	
• present	1
• absent	0

**TOTAL SCORE - Disturbances and Pressures (max. 20)** .....

### Total Condition Assessment Scores:

Bank and Bed Stability / Geomorphology (50)

Riparian Vegetation and Habitat (55)

Aquatic (In-Stream) Habitat (25)

CONDITION ASSESSMENT TOTAL (max. 130)

Score Range	Stream Condition
0 - 15	Excellent
16 - 35	Good
36 - 60	Fair
61 - 85	Poor
> 85	Highly Degraded

Disturbances and Pressures (max. 20)

Adjusted Total (max. 150)



# APPENDIX 2

## Policy and Planning Context – Relevant Plans/Reports Summary

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### Open Space and Recreational Needs Study 2011

#### *Recommendations*

- No. 22 - Complete the first stage of the walkway along Farmers Creek and commence detailed designed for stage two. High priority (not costed).
- No. 28 - Continue to develop the recreation corridor along Farmers Creek (mapped in Appendix 2 as extending from Saywell Street Park to the council depot on the Sewage Treatment Plant access road). High and ongoing (not costed).
- No. 18 - Walking and cycling are likely to continue to increase in popularity, so too will the demand on Council to provide safe, quality connections and meandering paths. Walking is the preferred physical activity option for the majority of people and is growing as the population ages. The community will continue to demand more walking options to meet this need.
- No. 7 - Any significant park upgrade or new park proposed by Council ... should be designed by, or reviewed by, a person with the appropriate skills – most often a landscape architect. High priority and ongoing (cost will vary depending upon the role).
- Priority Recommendations (for the Lithgow Precinct) - Continue to develop the recreation corridor along Farmers Creek, linking residential areas and key community hubs (retail hubs, schools and so on).

#### *Council Views*

Councillors recognised that “development of additional walking and cycling opportunities is important, particularly for our aging community”.

The Section 355 Sports Advisory Committee acknowledged that “walking and cycling will continue to be popular activities” and that “a foot/bike path along Farmers Creek safely linking Tony Luchetti Sportsground, Watsford Oval, Conran Oval, Glanmire Oval and Marjorie Jackson Oval (collectively where major junior sports are played) would be beneficial”.

The Section 355 Environmental Advisory Committee considered “the most important priority Council should consider for the Lithgow LGA” was “access to a quality walking system” which included “long distance trails, short walks in natural areas; a series of urban walks and cycling circuits”. The walk along Farmers Creek was cited in particular and that “access to seats for resting, water and shade need to be considered along this circuit”.

Parks Management and Engineering Services officers identified the development of “a good pedestrian (walk and cycle) path system in the urban areas” as one of Council’s two highest priority for their department, and that “the first stage is to complete a link along Farmers Creek in Lithgow”.

“A better quality walk/cycle network” was identified as one of three “top priority infrastructure needs” by Council’s Community Development officers.

#### *Community Views*

One of two key messages from the Lithgow Community Workshop was the “need to further promote and develop walking and cycling opportunities”.

The Strategy summarised the workshop’s walking and cycling discussions noting that – “Walking and cycling are also popular pursuits within Lithgow. Opportunities exist to further promote and develop walk and cycleways. Ideally, Lithgow would enjoy a network of walking and cycling opportunities that provide loops and links to key facilities and open space areas. It may

be worth pursuing access to unused railway easements to help create these links. Additional seating is required along these walking circuits. In large parks ... simple walking loops (potentially with exercise stations) could be developed.”

#### *Recreation and Physical Activity Demand, Participation and Constraints*

The Strategy cites (then) current Recreation and Physical Activity data for New South Wales as a whole noting that:

- walking is the single most frequently undertaken activity at a 35.8% population participation rate;
- running (10.7%) and cycling (9.0%) are also in the top five activities;
- informal, unstructured activities have substantially higher participation rates than organised sports; and
- older people are more likely to participate in informal or unstructured activities;

Considering these trends, and the specific demographic and socio-economic of the Lithgow LGA, the Strategy identifies that:

- it will be important for Council to maximise opportunities for walking and cycling, as these are popular physical activity options;
- unstructured recreation and physical activity pursuits, such as walking (and swimming), will be more sought by the area’s aging population;
- the provision of “low cost and easily accessible recreation and physical activity opportunities” will be an imperative, in recognition of the area’s older population and high proportion of low income earners; and
- an aging population will “put pressure on Council to implement and continue to extend its footpaths and trails network particularly linking residential areas with parks and senior-orientated venues”.

A survey of more than 200 households across the Lithgow LGA identified “more walk and cycling tracks” as the second highest need (or priority) for the region – with 14% of respondents citing the lack of these facilities as a “negative” limiting their participation in recreation and physical activity.

The “main barriers” identified as preventing people from walking and cycling in the Lithgow LGA included:

- lack of connections/linkages between streets and open spaces;
- lack of pathways within parks, open spaces and streets;

- isolated parks and open spaces where people feel unsafe;
- parks and open spaces lacking aesthetic appeal;
- poor quality pathways and roads that are poorly maintained;
- lack of facilities (toilets, seats, shade, drinking water, parking) provided in parks and along pedestrian/cycle paths;
- heavy traffic with limited or no pedestrian and cycle crossings; and
- lack of on-road bicycle lanes and unsafe road conditions.

The Strategy recommends that Council should aim to develop “pathway systems” with paths in urban areas to be “developed [wherever possible] to be all-weather (concrete) and wide enough to cater for a range of users including pedestrians, people in wheelchairs/mobility scooters, bicycles, scooters and those with other general mobility issues”. Supporting infrastructure recommended included “shaded seats at regular intervals, water taps/bubblers and both directional and informative signage”.

#### *Shared Path Networks, Park Settings and Standards*

The Strategy defined a “Recreation Corridor or Recreation Linkage” as “linear parks or recreation corridors are embellished to provide pedestrian linkages that connect recreation facilities, other types of open space, residences, community infrastructure and commercial areas, or form a circuit, or create linkages and access via land beside riversides, creeks and waterways”. Infrastructure is provided to facilitate recreation use, including a formed path, with an “attractive recreation setting”. These linear parks and links provide physical, visual and cognitive linkages of open space areas and community facilities or form a circuit; provide opportunities for cycleways and walkways; or create linkages along and access to riversides, creeks and waterways. The envisaged Farmers Creek Open Space and Recreation Corridor precisely fits this definition of a “recreation corridor or recreation linkage”.

The Strategy identifies four “Park Settings” intended to provide diversity within a recreation and open space network - by varying the physical, social and managerial contexts of a site to offer a range or recreational settings and possible experiences. Three of these are particularly applicable to the envisaged Farmers Creek Open Space and Recreation Corridor (through the Lithgow urban area):



- urban setting - predominantly open, mown grass areas or hardened sites (paved), there may be a few trees providing shade and limited landscaping/garden beds, adjacent built infrastructure dominates view lines;
- semi-urban setting - substantial mature tree canopy over most of the park with predominantly mown grass areas underneath, recreation activity areas may include some paving (but only in small amounts), some parts of the park may have under-storey (particularly on the boundaries screening adjacent land uses), view lines still include adjacent built infrastructure however these no longer dominate; and
- semi-natural setting - substantial mature tree canopy over most of the park with large areas of the park covered by under-storey vegetation, recreation occurs in developed nodes which are likely to be mown, and along highly accessible pedestrian paths (walking and cycling).

Specific to any proposed pedestrian pathway access network the Strategy recommends that path surface material “will reflect the park setting and desired degree of accessibility (e.g. natural settings are enhanced with grass or gravel paths and board-walking)”. Access paths in “local recreation” parks are recommended as having a 1.2 metre minimum width while “district recreation” parks may contain walk/cycle circuits at least 2 metres wide.

## Greater Lithgow City Council Bicycle Plan- 1998

Recommended “an off-road path along Farmers Creek corridor”, from the Methven Estate in the west (in the Fullagars Avenue area) to Oakey Park in the east – initially as an unsealed/gravel route, and subsequently sealed. This “Farmers Creek Route” is identified as “a major off-road path” to be “sealed as pathway for shared bicycle and pedestrian use” and established in conjunction with Council’s efforts in “developing this area for open space to promote tourism and physical activity”.

“Farmers Creek Route” is identified as one of three priority projects, for staged implementation over a four year programme.

Community survey (245 questionnaires, both cyclists and non-cyclists) indicated that “a route along Farmers Creek appears to be very popular as a means of encouraging future cycling”.

Community survey also “identified that the single most important reason people stated for not cycling was ‘the lack of facilities available’ “.

Recommended off-road routes as “shared pedestrian cycle paths of a preferred minimum width of 2.5 metres with a reservation to allow for landscaping where appropriate”.

Stressed the importance of:

- accessing and linking trip generators – such as “open space, schools and shops”;
- route continuity and linkages;
- creating circuits;
- clear route marking and directional signage, shared path and bicycle logos;
- improving intersections and road crossings to enhance cyclist safety
- catering for a range of users – children, novices, family groups, seniors, tourists, and commuters; and
- bicycle parking at destinations and key points.

Path provision to encourage seniors to cycle for exercise and transport, and alternative equipment types (“tricycles with baskets”).

## Lithgow Generic Community Lands Plan of Management 2013

This Plan of Management classifies (in accordance with the *Local Government Act 1993*) and provides management directions or guidelines for all lands that are owned and/or managed by Lithgow City Council and categorised as “community lands” (excluding Blast Furnace Park and other sites of cultural heritage significance). It includes Crown lands under Council’s management.

Community land categorised as either Sportsground, Park, Natural Area or General Community Use – as well as Crown lands – occur along the Farmers Creek corridor though the Lithgow urban area.

Enhancing the Farmers Creek corridor to deliver improved recreational, amenity, environmental and water quality outcomes is consistent with the objectives of these community land categorises.

## **Lithgow Land Use Strategy 2010 – 2030**

The Strategy identifies (in relation to identifying and meeting changing community needs when planning for open space and recreation) the need for planning “to keep pace with and respond to the changing needs of the community as a result of aging and other demographic indicators such as household size and income”. The Strategy recognises the LGA’s rapidly ageing population and significantly increasing percentage of people over 55 years old, with the need to “provide for increased focus on planning and design to promote active ageing/walkability and range of open space and recreational facilities” to meet these changing needs. It specifically acknowledged that an older population is more likely to seek unstructured pursuits such as walking, with resulting continued pressure on Council to extend the footpath and trails network. Overall recreational activity trends away from structured sporting activity in favour of pursuits such as walking were also noted. Managing accessibility and equity in open space planning, considering accessibility and ensuring a reasonable spatial distribution of open space and recreation opportunities within urban centres, as also seen as an issue. This included the availability of low cost and easily accessed opportunities for older populations and low income earners.

Of particular relevance for the envisaged Farmers Creek Open Space and Recreation Corridor:

- the Lithgow Strategic Analysis (SWOT Analysis) included in the Strategy identified the provision of “linkages between open space areas for walking and cycling” as an opportunity; and
- the Strategy included a specific reference to “improving and expanding the pedestrian and bicycle network” (as item T5 under G6. Providing infrastructure for growth”).

The Strategy also:

- notes that flooding “particularly along Farmers Creek in Lithgow” will impact upon the planning of future land use in this area;
- acknowledges that the Lithgow urban area “has the basis for a substantial stormwater management system”, of both concrete pipes and open channels, which empty into Farmers Creek but without “any stormwater management structures or controls”; and
- recognises the need to provide for greater focus to Crime Prevention through Environmental Design (CPTED).

## **Lithgow Flood Study Review Report 2015**

This report was primarily on a hydrological investigation of flooding in the Farmers Creek catchment (and Marrangaroo Creek catchments) drawing data from a number of sources – ranging from LiDAR (Light Detection and Ranging) survey data to anecdotal reports and private photographs. Its objective was to “define flood behaviour in terms of flows, water levels and flooding patterns for floods ranging between 5 and 200 year ARI, as well as for the PMF” (Probable Maximum Flood). The study applied rainfall runoff hydrologic modelling of the Farmers Creek catchment and associated urban drainage system to determine flows – including overland flows – and used this information in a hydraulic model to assess peak water levels and flow patterns. The study determined and mapped flood levels/areas for differing return intervals for the land along Farmers Creek its major tributaries and drainage system. It also identified an “Interim Flood Planning Area (IFPA) for Lithgow - for areas subject to both main stream flooding and major overland flows.

The study did not identify/recommend any detention basins, off-line wetlands or other flood mitigation/management measure in or along Farmers Creek upstream of the Great Western highway that were pertinent to the masterplan. However the study’s flood mapping was included in the constraints and opportunities assessment and plans.



## Lithgow Community Strategic Plan 2025

The following two “Principle Activity Areas” in the Lithgow Community Strategic Plan 2025 are especially relevant:

- Developing Our Built Environment; and
- Enhancing Our Natural Environment.

The following extracts from the Strategic Plan are relevant in relation to the envisaged Farmers Creek Open Space and Recreation Corridor.

The Developing Our Built Environment theme identifies “providing additional open space and recreational areas across the LGA” as an issue with relevant challenges to:

- “Establish a system of cycleways and pedestrian paths to provide links between major cultural and recreational facilities, residential areas and town centres”;
- “Ensure developments within our parks, open spaces and community facilities take into account the needs of a range of groups – including families, youth, older people and people from culturally and linguistically diverse backgrounds”; and
- “Improve the recreation, natural and urban areas for the benefit of residents and visitors”.

Another identified issue is “to provide a variety of community facilities suitable for all ages, and connect points of destination within towns and villages” with the associated challenge of providing “a variety of cultural and recreational facilities suitable for all ages”.

Objective 3.2 in relation to the Developing Our Built Environment priority area is to ensure “sustainable and planned growth through the provision of effective public and private transport options and suitable entertainment and recreational facilities to enhance the lifestyle choices of the community”, and the applicable desired outcomes are:

- at 3.2.4 Cycleways and Walkways - To establish a system of cycleways and pedestrian paths to provide links between major cultural and recreational facilities and town centres (3.2.4.1);
- at 3.2.10 Recreational Facilities - To develop recreational facilities that will meet the needs of the community now and into the future (3.2.10.1); and

- at 3.2.6 Heritage - To Identify, preserve, improve and promote the LGA’s indigenous and non-indigenous built and natural heritage (3.2.6.1).

The Enhancing Our Natural Environment theme identifies minimising the effects of climate change as an issue, with the associated challenge to “develop infrastructure for walking and cycling”. Objective 4.1 for this priority area is to “conserve and preserve the natural environment whilst balancing the impact of development to ensure a sustainable and healthy community”, and the applicable desired outcomes are:

- at 4.1.3 Biodiversity - To responsibly manage natural resources through the control of environmental and noxious weeds (4.1.3.2);
- at 4.1.5 Natural Heritage - To identify, preserve, improve and promote the LGA’s indigenous and non-indigenous built and natural heritage (4.1.5.1); and
- at 4.1.6 Water - To protect our waterways and provide safe drinking water (4.1.6.1).

## Council Combined Delivery Program 2013-2017 and Operational Plan 2015-2016

Council’s Operational Plan 2015-2016 identifies the following actions and performance targets relevant to the envisaged Farmers Creek Open Space and Recreation Corridor:

- at 3.2.06 Heritage (3.2.6.1 - To identify, preserve, improve and promote the LGA’s indigenous built and natural heritage) - Implement works at Blast Furnace Park and nearby precinct in relation to safety and interpretive signage (action), with the construction of raised walkways, viewing platforms, fenced pathways and interpretive signage (performance target); and
- at 4.1.3 Biodiversity (4.1.3.2 - To responsibly manage natural resources through the control of environmental and noxious weeds) - Weed control of natural water courses (action), with weed control undertaken at Farmers Creek (performance target).

The following relevant 2015-2016 budget allocations are identified for the Enhancing Our Natural Environment Priority Area:

- \$10,000 (capital expenditure) – for Farmers Creek Vegetation;

- \$35,000 (recurrent expenditure) – for Farmers Creek Environmental Improvement; and
- \$20,000 (recurrent expenditure) – for noxious weed control and removal (whole LGA).

The following relevant 2015-2016 budget allocations are identified for the Developing Our Built Environment Priority Area (all are capital expenditure allocations):

- \$5,000 – for the Lithgow Heritage and Interpretive Trail;
- \$55,000 – for Lithgow parks and gardens;
- \$100,000 (plus expenditure of \$300,000 income) – for Blast Furnace Park Cultural Heritage Precinct development;
- \$60,000 – for footpath construction (whole LGA);
- \$70,000 – for recreational facilities (whole LGA); and
- \$100,000 – for urban drainage improvements (whole LGA).

## Lithgow Strategic Asset Management Plan 2012-2022

Footpaths and recreation facilities are two of twelve classes of assets for which the Lithgow Strategic Asset Management Plan set outs management and maintenance directions and expenditures over a ten year timeframe.

In relation to footpaths the Plan acknowledges the “community desire to extend footpath/cycleway along Farmers Creek linking recreation areas” and restates the strategic objective “to establish a system of cycle ways and pedestrian paths to provide links between major cultural and recreational facilities and town centres”. One of the Plan’s stated aims is “extension of footpaths and cycle ways to comply with increased use by community”. It proposes a budget allocation of a rolling annual amount of \$80,000 for cycleways/footpaths from 2013-14 onwards.

The Asset Management Plan is linked to and operationalises elements of the Lithgow Community Strategic Plan 2025. In regard to “Our Built Environment Programs” it identifies the following actions relevant to the envisaged Farmers Creek Open Space and Recreation Corridor.

At 3.2.4 Cycleways and Walkways, to achieve the desired outcome “to establish a system of cycleways and pedestrian paths to provide links between major cultural and recreational facilities and town centres” (3.2.4.1), the Asset Management Plan identifies implementing elements of the Lithgow Open Space and Recreation Needs Study, including the following actions:

- developing and progressively implement sections to the Corridor concept linking residential areas and key points of interests;
- providing interpretive signage, seating and interactive experiences along cycleways and pedestrian paths;
- incorporating fitness/obstacle courses in the design of shared cycleway and pedestrian paths;
- identifying and developing cycleways and trails to link towns and villages; and
- developing and maintaining accessible footpaths in the Lithgow urban area.

At 3.2.10 Recreational Facilities, to achieve the desired outcome “to develop recreational facilities that will meet the needs of the community now and into the future” (3.2.10.1), implementing elements of the Lithgow Open Space and Recreation Needs Study, implement the Open Space and Recreation Needs Study (and others) in relation to the following actions:

- developing and upgrading ... recreational facilities to meet the needs of the community; and
- identifying community and environmental assets that can be maximised and exploited for the benefit of the local community and which also add to the attractiveness of the region for present and future residents and investors.

In regard to “Our Natural Environment Programs”, at 4.2.3 Climate Change, it identifies the action of increasing “sustainable transport use e.g. walking, cycling for work and recreation” as one way to help realise the desired outcome of significantly reducing carbon emissions within the LGA. (4.2.3.1).



## APPENDIX 3

# Site Assessments and Constraints/Opportunity Analysis (Detailed Table and Plan), by Planning Unit

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This appendix details the outcomes of the on-site constraints and opportunities analysis of:

- Farmers Creek (Planning Units FC1 to FC10);
- Vale of Clywdd Creek (Planning Unit VoCC3 only – Planning Unit VoCC2 was not assessed in detail due to being non-contiguous with the other public lands in the project area); and
- State Mine Creek (Planning Unit SMC2).

A range of attributes were assessed during the on-site investigations for each planning unit, including:

- the width of the public land corridor along the creek, and the on-ground location of the physical creek channel;
- other public lands, such as Council open space or Crown lands, as well as road reserves;
- other tenures – notably Rail Corp lands;
- existing access infrastructure – shared paths, bitumen pathways, footpaths (including footpaths and road verges in surrounding streets – as possible alternative or interim routes), laneways and on-road cycleways – these were assessed as either shared path standard or “not to standard”;
- open space, parklands and existing recreation facilities, including toilets and drinking water;
- potential leisure, recreation or education facility sites;
- possible access points to the creek corridor – both point access and areas of “open” or “unconfined” access;
- potential conflict points, especially between walkers or cyclists and vehicles (or trains), and potential road crossings;
- “trample track” and informal paths – indicating current use patterns;
- possible creek crossing points;
- “pinch points – such as narrow bridges, limited public land, intruding fences, power poles, and other obstructions or impediments to a shared path;
- physical barriers to a shared path, and locations not suitable for shared path construction due to significant physical constraints (scarps and steep banks, narrow benches, undercut or eroding sections, etc.);
- locations likely to require additional construction or design measures, and expense, to accommodate a shared path – such as sloped banks/benches, dips, stormwater outlets, etc.;
- an evaluation of landscape amenity or the scenic qualities of a creek segment or alignment – rated high, medium or low as influenced by factors such as vegetation condition, views, enclosure, proximity of fencelines and buildings, adjacent land uses, shade/exposure, etc.;
- views along and from the creek, including intrusive elements in a viewshed, and vantage points;
- assets and features of interest or possible attractions – ranging from short attractive sections of creek bed to major built heritage features;
- areas of natural or semi-natural vegetation;
- weed infestations and densities – including the occurrence of high risk, problem or noxious weeds;
- past, and on-going, weed control and replanting/revegetation measures by Council (or others);
- sections of eroded or unstable creek bank;
- contaminated lands or subsidence issues (where obvious or apparent on the surface only);
- encroachments into the public creek corridor and locations requiring tenure and property boundary clarifications; and

- potential safety, privacy and security concerns – for path users and adjoining resident of land users.

The flood liability assessments (less than, or more than, 300mm depth in a 10 year ARI flood event) included in the constraints and opportunities plans were taken from Council's 2015 Lithgow Flood Study Review (these were not identified or verified on-site).

The constraints/opportunities analysis also included results from the rapid waterway condition assessments where relevant.

A constraints and opportunities plan was prepared, accompanied by a summary constraints and opportunities table, for each of the above twelve planning units. These are provided in the following pages.

Figure 4A.1 shows the legend which explain the symbols used in the following constraints and opportunities plans.

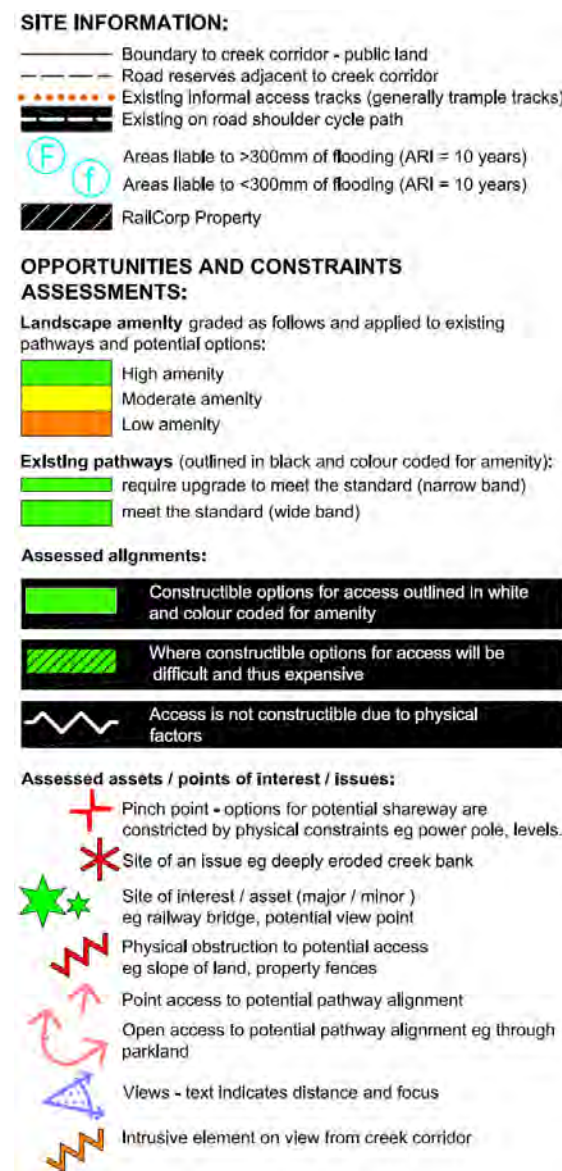


Figure 4A.1 Constraints and opportunities legend



## A4.1 Planning Unit FC1 – Lower/historic Farmers Creek Dam (*north-east*) to end of Bells Road (north of Water Treatment Plant) (*west*)

**Table A4.1 Constraints and Opportunities - Planning Unit FC1**

Opportunities / Assets:	Constraints / Issues:
<b>Overall</b>	
An access route for walkers and cyclists could utilise the existing unsealed road (in reality an unsealed and infrequently maintained vehicle access track) from the end of Bells Rd to its terminus below the disused dam	Uncontrolled vehicle access - the existing vehicle access track gives unfettered access by 4WDs and trail bikes (and mountain bikes) and to fragile environments. A number of eroded tracks, some deeply guttered directly up/down slopes, branch from the existing access road.
The creek corridor and existing vehicle access track wind through a narrow well vegetated valley contained by scenic forested rocky escarpments and stone pagodas	The vehicle access track does not run continuously adjacent to the creek
The land north of the Oakey Park Water Treatment Plant (located just south of Bells Rd) is undeveloped and is the most natural section of the project site	The five creek crossings are all wet crossings (and several repair to protect their heritage/visual appeal and to ensure passability)
The existing vehicle access track travels through a mostly natural (or regenerating) landscape with generally high amenity	Poor drainage in the mid-section of the existing vehicle access track causes ponding on the track
This unit is an entirely bushland setting – appearing as “natural” bushland despite being managed, regenerating or previously disturbed in many places	Areas of coal waste occur beside the creek in places.
Only scattered low density patches of weeds, mainly along the vehicle access track and at usage sites	Only a small ill-defined parking area is available below the disused dam wall
The rapid waterway assessment site in this unit (site 1), located at the lower/southern entry to the sandstone escarpment/pagoda terrain, identified this section of Farmers Creek as being in “Excellent” condition.	Uncontrolled access at the obsolete dam wall presents safety issues (falls)
Views from the creek corridor to the adjacent bushy rocky escarpment and outcrops are of high value in particular from the section of vehicle access track travelling directly N/S to the west of the dam (highly scenic)	The grassy floor of the disused dam presents safety issues (flash flooding)
A section of the creek at the southern end has remains of sandstone revetment, offering visual and heritage interest	The faint trample track from the lower dam to the upper dam is not signposted and in sections is difficult to access on foot

**Opportunities / Assets:**

At various locations, the vehicle access track is in close proximity to the creek (high amenity), the creek sections are either stony and fern lined or pools with riffles

Where the vehicle access track crosses the creek sandstone flagged causeways remain, except for the most northern crossing which is eroded and requires attention (the most southern crossing also requires some repair), these are of heritage and visitor interest

The dam wall and infrastructure at the disused dam have heritage value and visitor interest

Sandstone steps at the disused dam wall give access to a viewing point above the dam

The disused dam presents a level open grassed base – a potential site for facilities

**Constraints / Issues:**



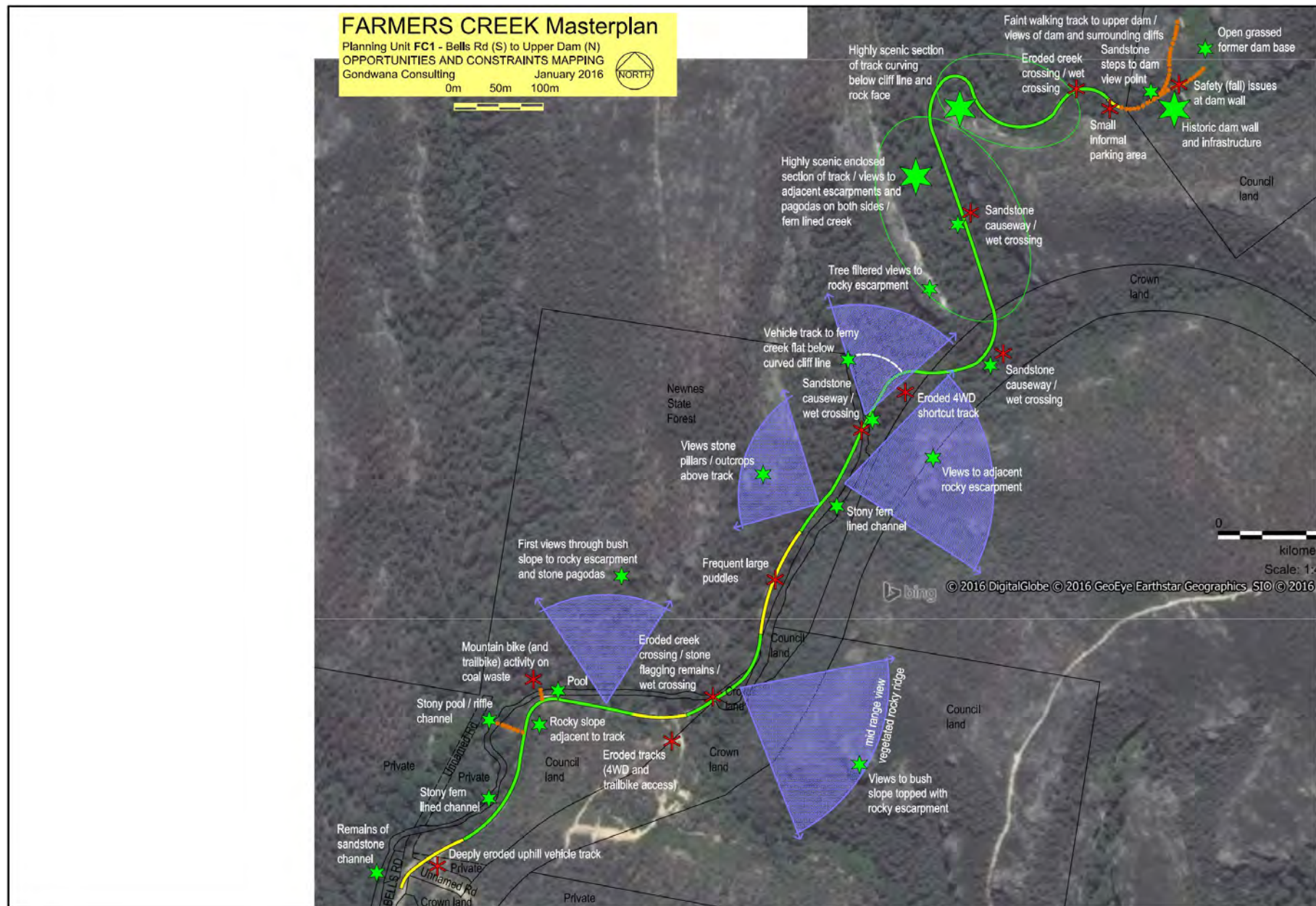


Figure A4.2 Constraints and opportunities – Planning Unit FC1

## A4.2 Planning Unit FC2 – End of Bells Road (east) to Ida Falls Creek (west)

**Table A4.2 Constraints and Opportunities - Planning Unit FC2**

Opportunities / Assets:	Constraints / Issues:
<b>Overall</b>	
A shared path could be aligned within the road reserve (north and west sides) of Bells Rd, with a loop through the Crown land mid-section of the unit.	Narrow public land corridor, with very limited access provision
The Crown land mid-section provides opportunity to align a shared path closer to the creek	Substantial sections of the creek channel are located on private land
The rapid waterway assessment site in this unit (site 2, located 180m upstream of the junction with Ida Falls Creek), identified this section of Famers Creek as being in "Good" condition.	Low and medium weed density area, including a dense stand on Poplar Trees with a mixed weed understory between the creek and Bells Road in the middle of this unit
Views from the creek corridor to the north are generally of high value	Parts of the creek corridor are flood prone
	Views from the creek corridor to the south are generally not as amenable as to the north
<b>North end of Unit to narrow culvert near water treatment plant</b>	
No public land abuts the creek itself except a small portion at the north-east end of this unit.	
The road reserve abutting the creek at the north-east end gives access to a grassy creek side bench and views to the remains of the stone lined creek channel	Generally the Bells Rd reserve is the only public land available for access
Additional remains of stone revetment are sited just north of the farming property (located on private land)	The Bells Rd reserve is narrow with limited shoulder available for a shared path, the road can be used for dual access
Proximity of vegetated hillslope to north and west	The narrow culvert on Bells Rd (over a tributary from the Zig Zag Valley) presents safe access issues for path users and vehicles
Long range views are gained of the Zig Zag Railway (arched sandstone bridge on a bush slope) from the informal parking area at the north-east end	The narrow culvert is situated in a flood prone area
	The road reserve adjacent to the creek at the northern end is used for informal parking and is strewn with litter



**Opportunities / Assets:****Constraints / Issues:*****Narrow culvert to Ida Falls Creek***

A shared path could be located on the northern road shoulder of Bells Rd

A loop shared path could be aligned through the Crown land adjacent to the creek

An array of heritage items are located on private property on the north side of the creek

Proximity of vegetated hillslope to north

The cadastral creek corridor is narrow

The creek proper is contained within the cadastral corridor in the eastern half but flows to the north in the western half

Several pinch points or issues occur within the road shoulder – a power pole, dips in the land (flood prone) and a 2m high eroded creek bank only 1-2m from the road (and 35m in length)

The narrow road bridge over Ida Creek Falls presents safe access issues for path users and vehicles

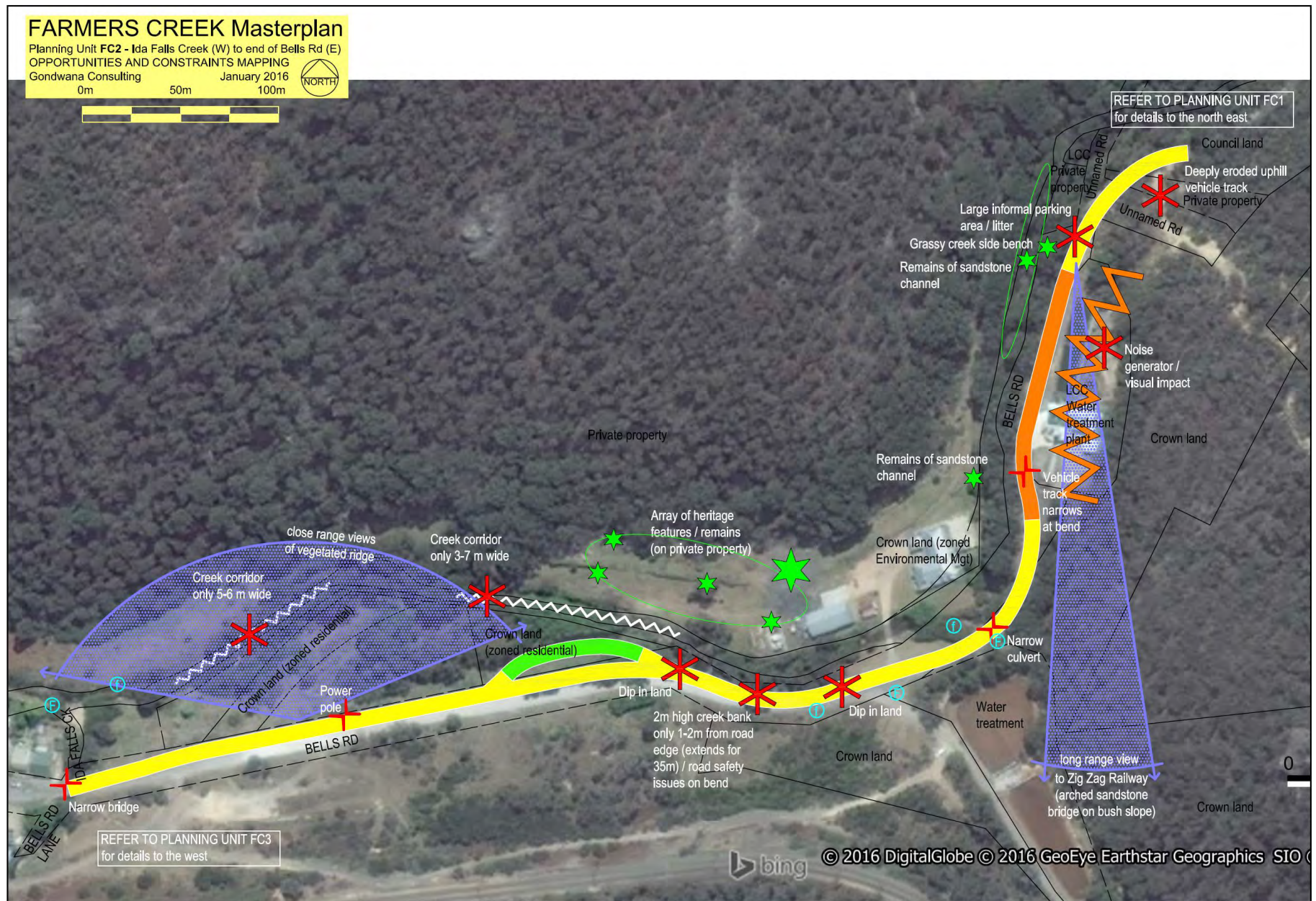


Figure A4.3 Constraints and opportunities – Planning Unit FC2



## A4.3 Planning Unit FC3 – Ida Falls Creek (east) to Victoria Avenue (west)

**Table A4.3 Constraints and Opportunities - Planning Unit FC3**

Opportunities / Assets:	Constraints / Issues:
<b>Overall</b>	
A path could initially be aligned along existing footpaths (not to shared path standard) in Bells Rd between Victoria Ave and Hay St, and Oakey Park and Ida Falls Creek to maintain connectivity – with links to the creek corridor via Victoria Ave , a footbridge at Hay St, and at Oakey Park	Very narrow public land corridor, with very limited access provision (other than Oakey Park)
Oakey Park as a central access point (and “break point” for possible staged development)	Heavily weed infested unit, assessed as having either high or medium weed densities
Views from the creek corridor at the eastern end to the north are generally of high value	Parts of the creek corridor are flood prone
	Generally views are contained within the creek corridor by rear boundary fences (except for Oakey Park reserve and Island Pde to Mill St causeway)
<b>Ida Falls Creek to east of footbridge off Bragg St</b>	
A path could be aligned along an existing footpath in Bells Rd (north side) (not to shared path standard) from Ida Falls Creek to Oakey Park with connection to the creek via the lane on the east side of the park	At the junction with Ida Falls Creek private property and a sandy tributary form a barrier to access, as does bank erosion undercutting the private driveway on the west bank of Ida Falls Creek
Proximity of vegetated hillslope to north	Path alignment is possible for a limited distance west from Ida Falls Creek along the southern bank of the cadastral corridor but it is not adjacent to the creek proper and is compromised in places by sloping land, narrow land width and fenceline intrusion/encroachment
Close views of the vegetated rocky ridge to the north can be gained from Bells Rd Lane (off Bells Rd)	Continuous access cannot be gained downstream from Ida Falls Creek to Oakey Park, access is obstructed by steep creek banks at the Oakey Park end and narrow cadastral boundaries (5-7m wide)
	Where access can be gained the area is flood prone
	There are numerous encroachments ,and unauthorised uses, from adjacent private properties, into the public creek corridor
	This incomplete alignment provides only a low amenity route

**Opportunities / Assets:****Constraints / Issues:*****Footbridge off Bragg St to the Mill St causeway***

A shared path could be aligned south side along the creek bank edge of Oakey Park reserve with connection to Bells Rd to the east via a lane and can continue along the shoulder of Brewery Lane to the footbridge at the Mills St causeway

A path can be aligned along the road shoulder of Island Pde adjacent to the creek bank and continue along the creek corridor (north side) to the footbridge at the Mills St causeway

A loop walk can be created between Bragg St and Mills St with connections at the Mills St footbridge, the road bridge at Brewery Lane and the Bragg St footbridge

Open access is available to the creek corridor on the south side from Oakey Park reserve to Brewery Lane (the full length of this section)

Open access is available to the creek from Island Pde (north side) between Bragg St and Brewery Lane with point access from Mills St

A natural character to the creek as it passes through Oakey Park reserve – though weed tree species present

Existing toilet facilities in Oakey Park (though evidence of inappropriate use during site visit)

Views of creek from the existing footbridge at Bragg St

Mature trees along the creek bank in Island Pde

Views from Oakey Park to vegetated ridge to the NW

Mature trees at the rear of the Zig Zag School

The existing footbridge across the creek at the eastern end of Oakey Park reserve is not to shared path standard – steep approaches at each end are also not to standard

Large stand of the introduced Honey Locust Trees (*Gleditzia* species) creekside along the northern margin of the Oakey Park reserve (weed species recommended for staged replacement and ongoing control to remove)

The road bridge at Brewery Lane on the western side of Oakey Park presents safe access issues – one lane wide with a timber planked path in poor condition

The footbridge at Mills St is not to standard (for a shared path) and spans from an eroded high creek bank at the south-east end

The road causeway at Mills St is a wet crossing, and shared with vehicle traffic

On the northern side of the creek, pinch points occur in Island Pde at mature trees and a power pole and behind the school (survey and liaison with the school is required regarding the location of the property boundary)

A narrow footbridge (north side) over a drainage swale from Brewery Lane to the Zig Zag School is in poor condition and not to standard – the land has also been signposted as private property although it is located within the public land creek corridor

The only pinch point on the south side is a wire stay to a power pole in Brewery Lane at the Mills St footbridge

The creek banks are infested with weeds at the western end of Oakey Park downstream to Mills St reducing amenity and biodiversity values

No existing perimeter tree plantings to Oakey Park reserve to ameliorate views (except for the Honey Locust trees)



### Opportunities / Assets:

A path at the rear of Zig Zag School will improve access to the school for students and staff

A resident in the local area offered volunteer help to manage plantings in Island Pde

### Constraints / Issues:

#### ***Mill St causeway to Victoria Ave***

Initially access can be gained along Bells Rd from Hay St to Victoria Ave with connections to the creek corridor at Victoria Ave and via the footbridge at Hay St

A continuous shared path could be aligned along the north side of the creek from Hay St if two creek crossing points (footbridges) are installed to allow access to the south side then back to the north side to access Victoria St (north side).

At two locations on the south side of the creek and on one location on the north side of the creek access is not constructible due to land limitations (steep creek banks)

Existing footbridge and its southern approach at Hay St are not to standard (for a shared path)

The rapid waterway assessment site in this unit (site 3, at the south end of Hay St), identified this section of Farmers Creek as being in "Poor" condition

The road bridge at Victoria Ave is narrow and access is not to standard (for a shared path)

There are numerous encroachments, and unauthorised uses, from adjacent private properties, into the public creek corridor

Pinch points occur at the western end at Victoria Ave with the required removal of mature exotic trees and narrow land width on the north side and encroaching fencing on the south side

Stand of large mature introduced Honey Locust Trees (*Gleditzia* species) on the northern creekbank immediately upstream from Victoria Ave

The portion of constructible path along the southern bank is flood prone

Views are contained by rear boundary fences



Figure A4.4 Constraints and opportunities – Planning Unit FC3 (East)



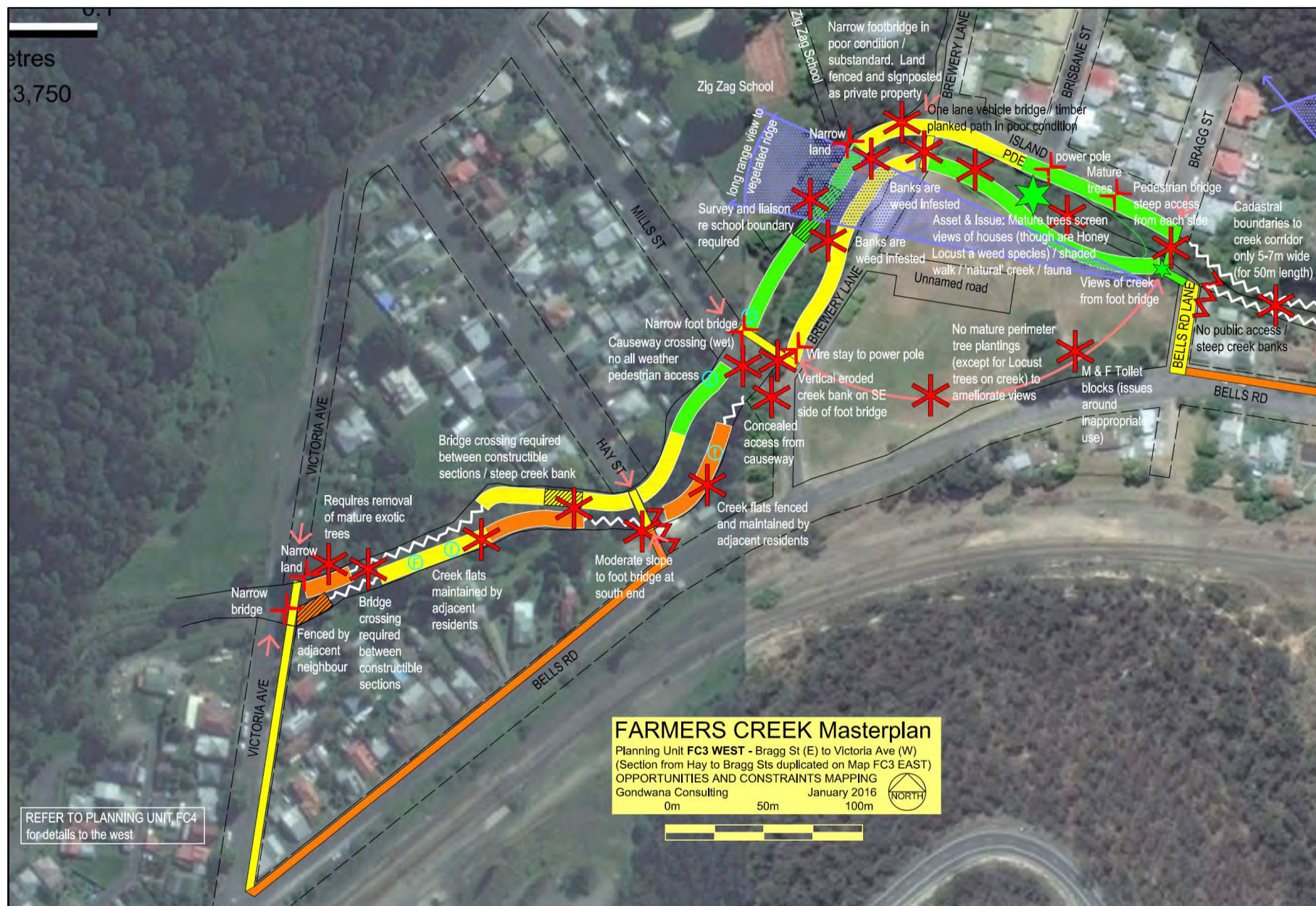


Figure A4.5 Constraints and opportunities – Planning Unit FC3 (West)

## A4.4 Planning Unit FC4 – Victoria Avenue (east) to State Mine Rail Line (at Drurie Street) (west)

**Table A4.4 Constraints and Opportunities - Planning Unit FC4**

Opportunities / Assets:	Constraints / Issues:
<b>Overall</b>	
Access can initially be provided along existing footpaths (not to shared path standard) in Bells Rd (in total or part), between Victoria Ave and the rail line, to maintain connectivity – with connections down Brook St and/or off the old Bells Rd alignment, if needed	Narrow public land corridor, with very limited access provision (other than Brook St Park)
Brook St Park as a central access point (and “break point” for possible staged development)	Substantial sections of the creek channel are located on private land
Views from the creek corridor to the north are generally of high value	Much of the creek corridor is flood prone
	Views from the creek corridor to the south are generally of low value
<b>Victoria Ave to Brook St Park</b>	
Narrow strip of Crown land on southside, between Victoria Ave and Brook St	Steep slope creates barrier to access from Victoria Ave to creekbank, on southside, and creek crossing required (if aligned on northside) due to barrier of steep northside creekbank
Proximity of vegetated hillslope to north	Narrow width sloping public land, and a stormwater outlet, limit access - requirement for elevated boardwalk for a long section from Victoria Ave halfway to Brook St park
Scenic sandstone boulders at toe of hillslope on northside	Large drainage swales, stormwater outlets, eroded creek banks and mature trees located on creek's southside
	Significant encroachment (fencing, sheds and fill) from private property into creek corridor at north-east corner of Brook St park
	Eroding sheer creekbank (>1m high) on southside of channel north-east corner of Brook St park
	Low amenity – medium density weed infestation, proximity to the rear of fenced private properties (including wire mesh fencing), and rubble tipping down southside bank



**Opportunities / Assets:****Constraints / Issues:*****Brook St Park***

A shared path could be located on existing public reserve land and “cadastral creek corridor” through park, with amenity enhanced by adjacent open space

Brook St Park an access point

Attractive natural creek bed with large pebbles (used as a play space) – on private property (but not fenced or identified as such)

Section of deeper still water with views along natural creek – on private property (but not fenced or identified as such)

Proximity of vegetated hillslope to north

A new footpath or shared path can be aligned along Brook St to link Bells Rd and the park

“Cadastral creek corridor” (and any path along this public land) bisects the current open space – and heads away from creek channel

Creek channel and north-west portion of current “park” is located on private property

Sections on north and south side of creek bank are eroding

Shed and materials storage encroaching within the creek corridor (on public land) at the rear of private property on Brook St (south-west corner of park)

Large stand of the introduced Honey Locust Trees (*Gleditzia* species) on northside of creek west of Brook St Park – mostly on private land, but partially within public creek corridor

The rapid waterway assessment site in this unit (site 4, north-western side of Brook Street Park), identified this section of Farmers Creek as being in “Fair” condition.

***Brook St Park to State Mine rail line***

Possible access point via drainage reserve off old Bells Rd alignment

Old brick drainage culvert (feature of interest) off northside of old Bells Rd alignment

Attractive gravel bed and gravel/sand bars on creekside “managed” (by adjacent landholders) section of creek off old Bells Rd alignment

Some more “natural” sections of creek in east with higher amenity value, but mostly located on private land

Views over cleared/disused paddock to vegetated hillslope

Potential to use former pylons (west side) to support an elevated pathway under the State Mine rail bridge – but engineering assessment/design required

Creek channel meanders in and out of “cadastral creek corridor”, with substantial sections located on private property

Narrow width public land constrained by flooding and sections of steep creekbanks, with public land almost limited to the active creek channel in parts (west of old Bells Rd alignment)

Significant encroachment (fencing, outbuildings and gardens) from private property into creek corridor (west of old Bells Rd alignment)

Steep eroded low creekbanks – in west

Large stands of Honey Locust on northern creekbanks (in west), unmanaged paddocks/clearings on northside (in east)

Low amenity in west – high density weed infestation, proximity to the rear of private properties (fenced and unfenced), informal creekbank retaining walls and rubble, with residences overlooking creek channel in places

**Opportunities / Assets:****Constraints / Issues:**

Encroachment (into already narrow public land) by gardens, compost bins, storage and mature tree - around and east of old Bells Rd alignment, lower amenity area due to encroachments and proximity of private property (but management by private landholders has reduced weed density to low in this area)

Areas of medium weed density (in public creek corridor) to west

Intrusive views of old concrete walls and cuttings at base of hillslope to north

Intrusive views of industrial units, and rear storage/dumping areas above creekbank (on RailCorp land)

Large block owned by Rail Corp (southside, adjacent to State Mine rail line), and access to/across this block would require this agency's approval

State Mine rail line embankment and bridge to north - active rail line – major constraint



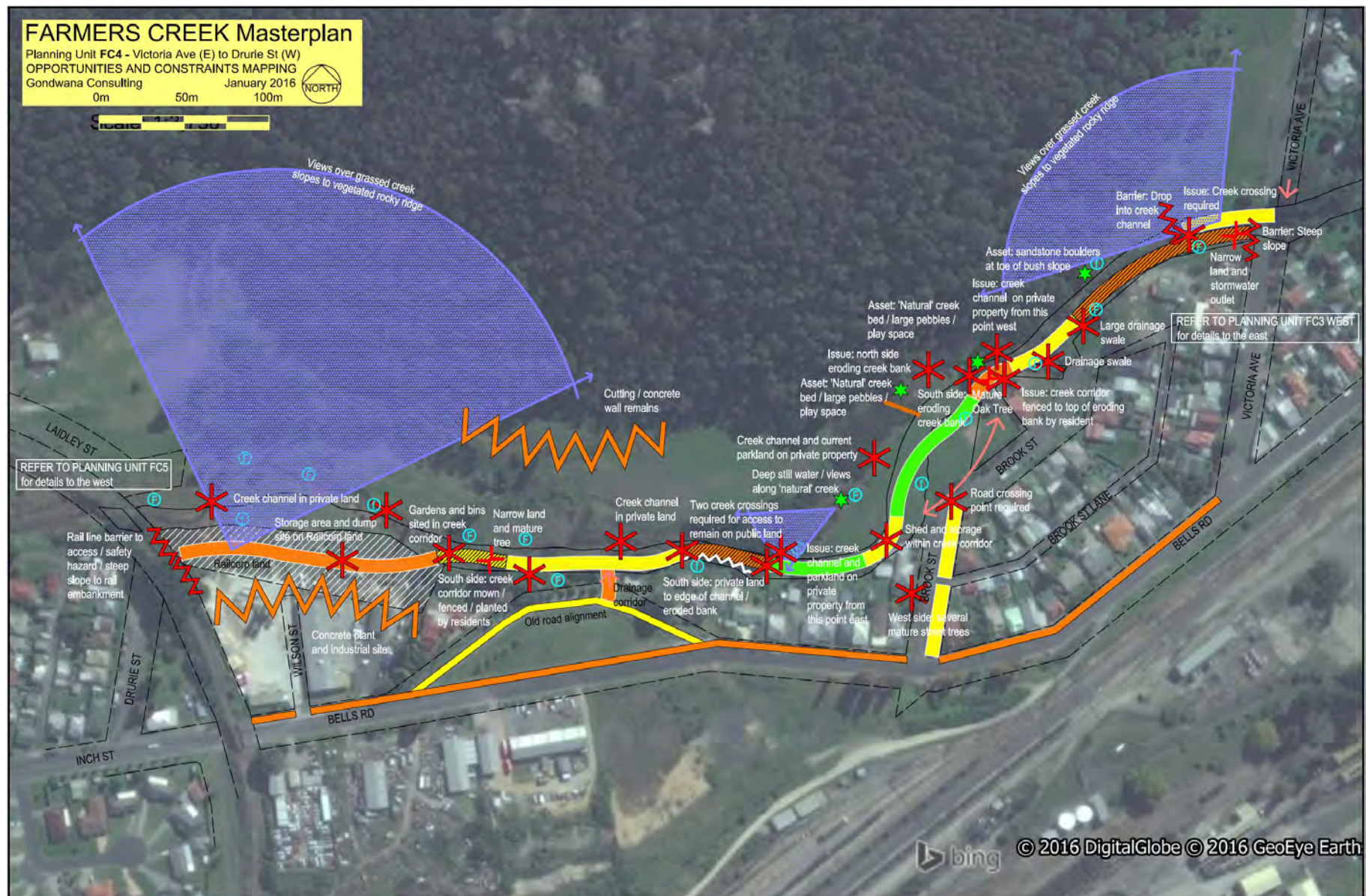


Figure A4.6 Constraints and opportunities – Planning Unit FC4

## A4.5 Planning Unit FC5 – State Mine Rail Line and Drurie Street (east) to Burton Street (west)

**Table A4.5 Constraints and Opportunities - Planning Unit FC5**

Opportunities / Assets:	Constraints / Issues:
<b>Overall</b>	
Access can initially be aligned along existing footpaths (not to shared path standard) in Inch St, from the end of Bells Rd (passing under the State Mine rail line) to Burton St, to maintain connectivity – with possible connections down Drurie St, Saywell St and Atkinson St.	State Mine rail line embankment and bridge at eastern end – an active rail line – is a major connectivity constraint
Saywell St Park and the reserves at Atkinson St provide “open” access to the creek corridor (but with some physical limitations around Atkinson St)	Narrow publicly owned corridor with very limited access provision in western half of unit
Saywell St Park as a central access point (and “break point” for possible staged development)	Sections of the creek corridor are flood prone (Saywell St Park and the paddocks opposite to the north and off Burton St)
Large area of Crown Land, along the creek’s northern side, north-west of the State Mine rail line bridge	Views from the narrow public creek corridor in western half of unit are contained by rear boundary fences and contribute little to amenity
Views (at eastern end) to the north are of high value (vegetated ridge)	
Views of the creek from Saywell St Park and within the park are of relatively high value	
<b>State Mine Rail Line at Drurie St to Saywell St</b>	
A shared path could be aligned through Farmers Creek Reserve (south side) above the creek flats and banks from Drurie St to Saywell St	The rail embankment forms a barrier to access – a tunnel through the embankment, or a deck attached to the pylons to the bridge over the creek (or a path along Drurie St to Inch St) is required
Views to north are high value	Safety issues related to uncontrolled public access to the rail line.
	A pinch point occurs at the Drurie St end to the reserve where available land narrows and at the western end where vehicle access is gained to the rear of properties
	Privacy issues at the rear of the residential properties adjacent to the reserve



**Opportunities / Assets:****Constraints / Issues:*****Saywell St Park***

A shared path could be located along the edge of Saywell St Park at the top of the creek bank (south side) with a loop extending onto the creek flats west of Saywell St. The path can link to the existing footpath (not to shared path standard) in Inch St or link via a new footbridge to the north side of the creek

Saywell St Park an access point

Relatively natural creek corridor providing pleasant views from the park

Mature plantings along creek edge and road frontages to park are high amenity

Proximity of vegetated hillslope to north

Connectivity along the creek at the north-western end of Saywell St Park would require a new footbridge from the park (south side) to the northern creek bank (narrow bank and steep slopes prevent access on south side)

Parts of Saywell St Park and the adjacent creek banks/flats are flood prone

Several (3) trample tracks cross the creek from the park to the north side

Pinch point at semi-permanent mulch stockpile near Saywell St

Section of eroded creekbank (northside) opposite/downstream of Vale of Clywdd Creek junction/outfall (piped from Lake Pillans Wetlands across Saywell St Park and Inch St)

Sections of creek corridor are weed infested – mainly on the northern bank – assessed as medium density

The rapid waterway assessment site in this unit (site 5, north-western corner of Saywell Street Park), identified this section of Famers Creek as only being in “Poor” condition.

***Saywell St Park to Burton St***

Possible to align a path along the north bank (accessed by new footbridge at western end of Saywell St Park) via the open space areas at Atkinson St to the open space at Guy St

Possible to access the north side of the creek via Atkinson St to link into the footpath network in Inch St

Possible to link to the creek corridor via Burton St (new footpath) from Inch St

Southside of the creek is not accessible due to barriers to access/connection at Saywell St Park (north-west end), at Atkinson St, and west to Burton St

The alignment on the north bank is constrained by sections of narrow land width and undulating/mounded bench

Stability issues at an old creekside brick and concrete retaining wall (near Atkinson St)

The road bridge at Atkinson St is narrow with limited capacity to expand the existing pathway (not to shared path standard)

Creek corridor is heavily weed infested – dominated by high weed density areas (upstream and downstream of Atkinson St) and smaller areas assessed as medium density

**Opportunities / Assets:****Constraints / Issues:**

Encroachments (lawns, plantings and fencing) from private property into public creek corridor in several places.

Within the creek corridor, all views are contained by rear boundary fences





Figure A4.7 Constraints and opportunities – Planning Unit FC5

## A4.6 Planning Unit FC6 – Burton Street (east) to Tank Street (west)

**Table A4.6 Constraints and Opportunities - Planning Unit FC6**

Opportunities / Assets:	Constraints / Issues:
Connectivity can be gained along the north side of the creek from the adjacent planning unit FC5 or from Burton St in FC5 along the southern side of the creek in FC6	A creek crossing may be required depending on which sides are developed for access within units FC5 and FC6
Path could be aligned on either side of the creek from Burton St to Tank St	No existing paths occur adjacent to the creek in this section
Path could be aligned along the creek edge of the Guy St open space from the upstream end to Macauley St (downstream)	The south creek bank has low amenity due to views over adjacent industrial buildings and a number of pinch points and issues including eroded creek bank, drainage structures, narrow land width, slope erosion and a steep bank at the Tanks St end
A footbridge could be provided across State Mine Creek to maintain path continuity along Farmers Creek (northern side)	State Mine Creek presents a barrier to access along the northern creek bank of Farmers Creek, requiring the path alignment to be diverted along Banksia Street to Laidley St back to Guy St to provide continuous access. Pinch points and issues along this route include heavy weed infestation of State Mine Creek, a willow tree, narrow pathway at road bridge on Laidley St, privacy issues at rear of properties on west side of creek and conflict with rear lane vehicle access to these properties.
Guy St can be realigned to previous connection to Macauley St (safer junction than the existing) to allow consolidation of open space adjacent to the creek corridor and a wider corridor in which to align the path	The park at Guy St and Macauley St is isolated from the creek corridor by the extension of Guy St (Guy and Macauley Sts intersection is oblique rather than perpendicular). The Guy St alignment along with the location of mature Poplars adjacent to the creek provides a pinch point for path alignment. (Poplars should be removed and regrowth controlled as behave as a weed species)
Open space at Guy St (north side) and adjacent creek plantings and the views available to the vegetated ridges to the north provide high amenity for this section	The location of power poles, lack of kerb and gutter, the fill bank to the creek and a vehicle gravel turning / parking area (near Tank St) will impact on any shared path alignment on north-west side of creek
Path can be aligned along the wide SE shoulder of Macauley St	Remains of old brick retaining walls, and stormwater outlets (without litter or pollution control measures) along south-west creekbank below industrial blocks



**Opportunities / Assets:**

Previous replanting areas/efforts could be reinforced or provide a basis for further revegetation measures.

Road bridge with pathway at Tanks St gives access to both north and south side of creek (though steep bank on SE side of bridge)

**Constraints / Issues:**

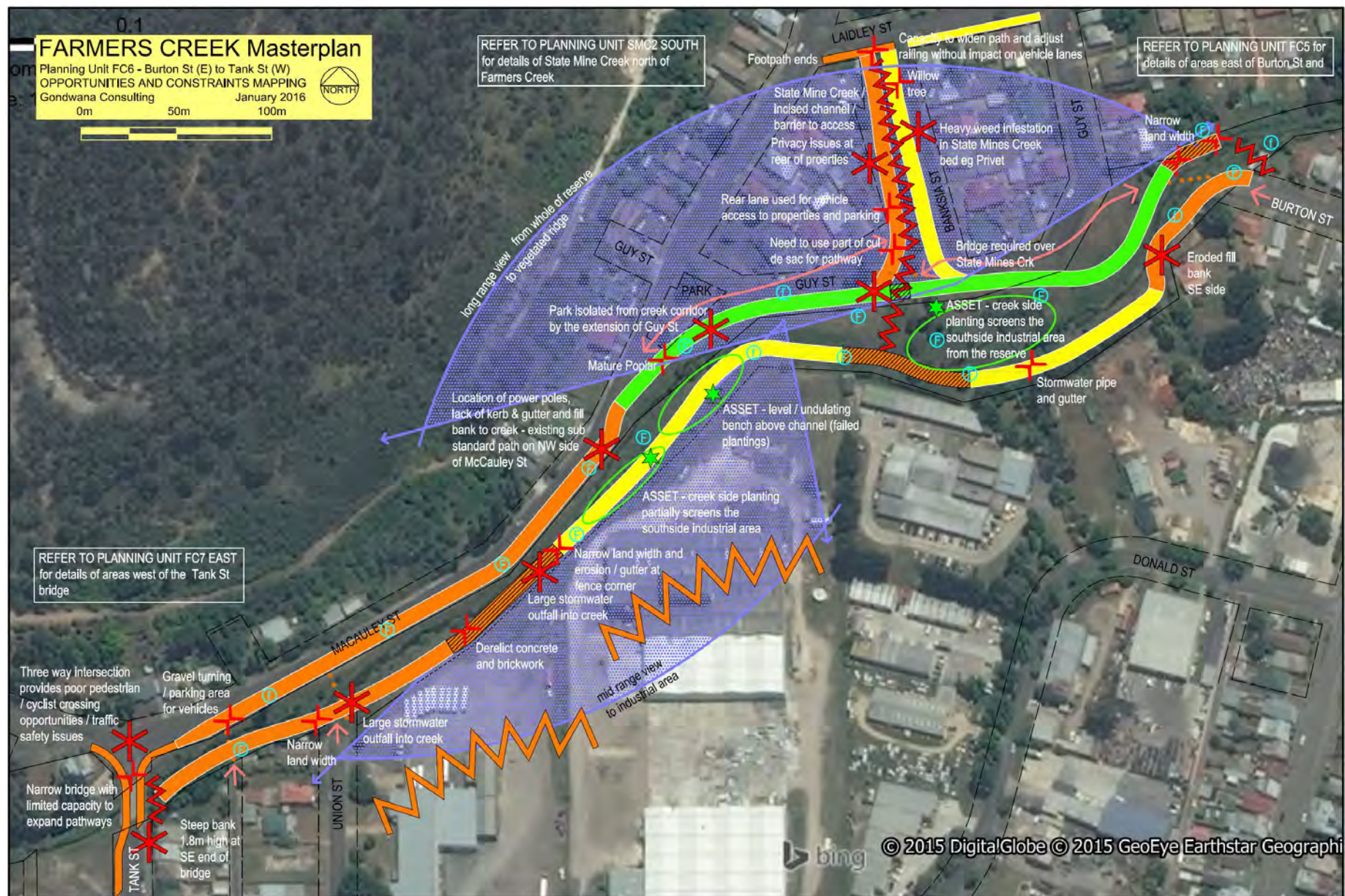
Creek corridor is mostly assessed as a low weed density zone – due to past vegetation management and weed control measures and scattered replanting programmes (but many past plantings have failed or are in poor condition)

Medium density weed areas occur around State Mine Creek junction, at group of suckering Poplar Trees south-west of Guy Street, and upstream from Tank Street.

Despite proximity of vegetated ridge to Macauley St the juxtaposition of a path at the road edge and the views south to the industrial developments reduces the amenity of this section of the route

Three way intersection at Tanks St provides poor pedestrian / cyclist crossing opportunities and the road bridge is narrow with limited opportunities to expand pathways

The rapid waterway condition assessment in this unit (site 6, at Guy Street downstream of the junction with State Mine Creek), identified this section of Farmers Creek as only being in “Poor” condition.





## A4.7 Planning Unit FC7 – Tank Street (east), to Sandford Avenue, and on to Albert Street (west)

**Table A4.7 Constraints and Opportunities - Planning Unit FC7**

Opportunities / Assets:	Constraints / Issues:
<i>Tank St to Sandford Ave</i>	
Connectivity between FC6 and FC7 is possible along the north side	Access from the south side in FC6 is obstructed by a steep high bank
An existing continuous path (not to shared path standard) runs along the north side from Montague St to Sandford Ave and can be used in the first instance	Tank St bridge is narrow with limited capacity to expand pathways to achieve shared path standard
A new path can be aligned from the north side of the Tank St bridge to link to the existing path in Montague St	The existing north side path meets the road pavement of Sandford Ave west of Crane Rd for a short section and then again just north of Coalbrook St requiring users to cross Sandford Ave to continue
Mature tree plantings adjacent to the creek at the dog park end provide high amenity	Much of this section is flood prone
A path could be aligned along the south side of the creek from Tank St to Marjorie Jackson Complex to meet the existing perimeter service track	Improved access over the road bridge at Tank St is required along with an extended boardwalk / bridge from the sewer pumping station site downstream to the rear of properties in Clarice St to provide access along the south side
Mature plantings along the creek adjacent to Heffernan Place Park and again at the Marjorie Jackson Complex enhance the experience on the south side of the creek	Maybe some privacy issues at the rear of houses in Clarice St
The existing service track around the Marjorie Jackson Complex can be used giving access to Sandford Ave (south side of bridge)	Restricted space, sloping land and requirement to upgrade existing canal railings complicate south side access below Beynon St
	Section of creek section from Tank St to start of the large canal was assessed as a medium weed density area
	The rapid waterway condition assessment in the east of this unit (site 7, south of the Montague St dog park), identified this section of Farmers Creek as only being in "Poor" condition.

**Opportunities / Assets:****Constraints / Issues:**

Stands of mature Poplars towards the Sandford Ave bridge should be removed as are weed species and can easily spread along the waterway given their location

***Intersection of Coalbrook St / Sandford Ave, and Sandford Ave bridge***

A footbridge over the creek west of Sandford Ave, from Coalbrook St Reserve to Glanmire Oval to bypass the Sandford Ave road bridge is possible in the first instance to safely connect north and south sides of the creek

High traffic volumes from Sandford Ave into Coalbrook St cause issues for safe road crossing

A link is required around the Hermitage Site (contaminated land) to access a safe crossing point over Coalbrook St (north side) to maintain connectivity

The road bridge is narrow with limited capacity to expand pathways, bridge approaches are steep

Access under the bridge along the north bank is not possible

Access under the bridge is possible along the south bank

Beneath the road bridge on the south side is evidence of anti-social behaviour plus a drainage gutter narrowing opportunities for access

Links can be aligned from up and downstream on the south side to a road crossing point south of the bridge

Dense mature plantings and stockpiled materials obstruct access from the west to the south side of the bridge

***Sandford Ave bridge to Albert St bridge***

This section of canal is subject of re-design for flood mitigation - potential to create a natural style solution to improve biodiversity as well as manage stormwater

Much of this section is flood prone.

The rear yards of properties along the north side have high amenity in the section where private property denies access

Access along north side of creek from the open space at Coalbrook St is blocked by private property boundaries to the canal edge for several blocks. The small public reserve does not give opportunity for access.

A path on the north side from opposite the NW corner of Glanmire Oval (creek crossing is required) to Albert St is possible

Access at Albert St onto the north side is compromised by steep narrow land, a private driveway and sharp bends in a possible alignment

A path can be aligned around the perimeter of Glanmire Oval at the top of the creek bank on the south side

Access around Glanmire Oval is compromised in places by used and disused infrastructure, a mature Gum tree and the players shelter

Existing mature trees on the southern bank are of high amenity (except for Poplars and other weeds)

New flood mitigation works should preserve valuable existing mature trees



**Opportunities / Assets:****Constraints / Issues:**

The rapid waterway condition assessment in the west of this unit (site 8, smaller canal at north-west corner of Glanmire Oval), identified this section of Farmers Creek as being in “Fair” condition.

The major canal at the Albert St end is low in amenity and provides poor environmental values

The Albert St road bridge is narrow with limited capacity to expand walkways



Figure A4.9 Constraints and opportunities – Planning Unit FC7 (East)





Figure A4.10 Constraints and opportunities – Planning Unit FC7

## A4.8 Planning Unit FC8 – Albert Street (east), to/past Showground and along Geordie Street, to Tourist Information Centre (TIC) (west)

**Table A4.8 Constraints and Opportunities - Planning Unit FC8**

Opportunities / Assets:	Constraints / Issues:
<b>Overall</b>	
Links can be made to the existing CBD path network from the TIC	The large concrete canal that carries the creek flows continues under the Albert St road bridge until just downstream of the Geordie St footbridge
Views available from the sports fields and Geordie St to the vegetated ridge to the north	The creek is carried in a narrow concrete canal downstream from the Geordie St footbridge to just above the Geordie St causeway Sections are flood prone The creek canal offers limited views with any amenity
<b>Albert St to the Geordie St footbridge</b>	
Connectivity between FC7 and FC8 is possible along the south side	Access from the north side in FC7 to FC8 is obstructed by a steep high bank up to Albert St and insufficient head height below the road bridge at Albert St
An existing path to shared path standard runs along the southern side of the creek from midway along the sports fields downstream to the footbridge, terminating on the northern side of the footbridge	The Albert St road bridge is narrow with limited capacity to expand the existing pathway (east side)
A path can be aligned to link Albert St with the existing southern side footpath (pinch point at fenced oval may require retaining at oval edge)	Continued access along the southern side from the Geordie St footbridge is blocked by fencing
Tree plantings can occur along the perimeter of the sports fields to improve amenity	Few plantings along the creek canal edge – low amenity
Existing toilets in the showgrounds offer a break point	No existing paths on the north side of the creek between Albert St and the Geordie St footbridge North side is used as de facto vehicle access to rear of properties in Coalbrook St creating potential conflicts with path users Views contained within the corridor on the north side by adjacent fenced properties



**Opportunities / Assets:****Constraints / Issues:*****Geordie St footbridge to upstream of the Geordie St causeway***

A path can be aligned along Geordie St Lane from the footbridge to the Geordie St intersection with Coalbrook St (north side of the creek)

An existing path (not to shared path standard) along the southern side of Geordie St, downstream of Coalbrook St, can be used in the first instance (north side of the creek)

The existing path rejoins the north side of creek downstream of the housing block on the SW corner of the Geordie / Coalbrook Sts intersection.

Safety issues between path users and vehicles where access from the north end of the footbridge crosses rear lane access to upstream properties

Continued access along the north side of the creek canal obstructed by boundary fencing / dwelling and canal revetment.

Section of the existing path (north side) just to the west of the Coalbrook and Geordie Sts intersection requires upgrade to make safe

The downstream end of the existing path (north side) is compromised by a vehicle turnaround and traffic sight distances conflict with the existing road crossing point

The factory to the SE provides a low amenity outlook

The rapid waterway condition assessment in this unit (site 9, small canal at north-west corner of the Showground), identified this section of Farmers Creek as being in "Fair" condition.

***Geordie St causeway to Tourist Information Centre (TIC)***

A separate footbridge across the creek can be provided upstream of the causeway to link the east side of the causeway to the west

A path can be aligned along the southern shoulder of Geordie St from the new footbridge to mid-block and then along the northern shoulder and nature strip crossing the rail line (north side of Geordie St) and into the TIC car park

TIC offers a break point with toilet facilities and tourist information

Access can be gained from the TIC south along the highway to the CBD path network (crossing point required over Geordie St for safety)

No existing paths from the causeway to the TIC

The causeway is an obstruction to safe access and does not provide all weather access

The western lockable causeway gate and signage and the railway infrastructure and the nearby power kiosk provide pinch points to access



Figure A4.11 Constraints and opportunities – Planning Unit FC8



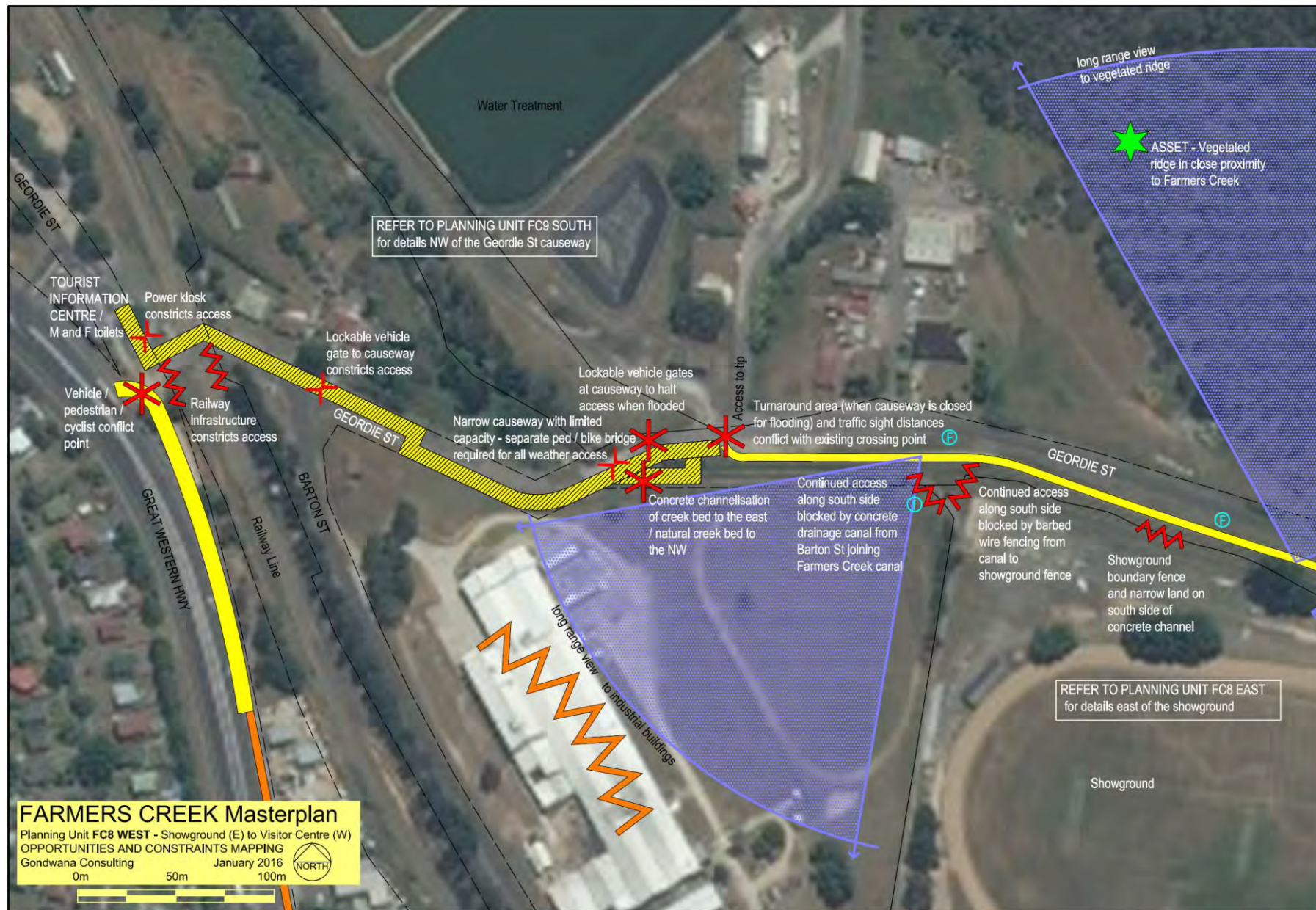


Figure A4.12 Constraints and opportunities – Planning Unit FC8 (West)

## A4.9 Planning Unit FC9 – Geordie St causeway (*south*), via sewage ponds and Council depot to Chivers Close footbridge, and on to Coerwull Rd (*north*)

**Table A4.9 Constraints and Opportunities - Planning Unit FC9**

Opportunities / Assets:	Constraints / Issues:
<b><i>Geordie St (east of causeway) to Council storage depot</i></b>	
Connectivity between FC8 and FC9 is possible from Geordie St (east of the causeway)	The current end of the existing path in Geordie St (south side of street but north side of creek) is compromised by a vehicle turnaround area and poor traffic sight distances
A new crossing point over Geordie St, east of the tip road to the north, and a path on the north side of Geordie St can be aligned to link Geordie St with the existing service road to the storage depot adjacent to Farmers Creek to maintain connectivity	Pinch point at the power pole east of the tip road and safety issues at the driveways entering the tip and the treatment plant
The existing service road accessing the storage depot can be used initially (the road is bordered to the west by a grassed verge then the top of the creek bank in close proximity – the creek is visible from the road in a number of places)	Noise from the adjacent dog pound and kennels and pump station
Mature vegetation along the creek partially screens the rear of properties to the west	Council storage area presents safety conflicts between vehicles and path users
Rock bed and shallow waterfall on creek visible	Access along the western side of the creek is obstructed by private properties
The ponds attract an array of birdlife suggesting possible provision of a simple bird hide	Creek corridor is mostly assessed as a medium weed density zone, plus an area of lower weed density midway and a high weed density zone in vicinity of the Council storage depot (and sewage outfall) in the north-west.
Views onto heritage railway station and residence to the west (Bowenfels)	
<b><i>Council storage depot to western approach to existing footbridge NE of Chivers Close</i></b>	
Access can be gained initially along the mown grassed pathway through the Council reserve (follows the top of the eastern creek bank) to an existing footbridge over the creek approximately 75m from the NW end of the reserve	Pinch points at the mature pine north of the storage area and at the footbridge (narrow bridge – 950mm wide – with moderately sloped approaches)



### Opportunities / Assets:

A loop walk could be aligned (east side of the creek) to the north end of the reserve (though passes twice over the same drainage swale).

### Constraints / Issues:

Access is possible on the western side of the creek though the southern end is obstructed by private properties, the land is narrow in places, a stormwater drain crosses the alignment and the path would be adjacent to the rear boundaries of houses in Chivers Close causing privacy issues

Creek corridor is assessed as a mix of medium weed density areas (mostly) and high weed density zones (in vicinity of the Council storage depot and sewage outfall in the south-east, and between Chivers and Evans Close in the north-west).

The rapid waterway condition assessment in this unit (site 10, north-east of Evans Close), identified this section of Farmers Creek as being in "Poor" condition only.

Access further north from the Council reserve is obstructed by private properties. Access across the creek is required to re-enter the road network in order to link back up with the creek near James Kirkwood Bridge on the Coerwull Rd (refer FC10).

### ***Western approach to existing footbridge NE of Chivers Close to Coerwull Rd***

From the western approach of the footbridge access can be aligned either via an existing easement to Chivers Close or continued along the western bank of the creek to an easement to Evans Close

Paths can be aligned from either easement along the NW side of Chivers Close or along the SE side of Evans Close

Path can be aligned along the NE side of Fullagar Ave to Coerwull Rd

An existing cycle lane on the eastern shoulder of Coerwull Rd but not to standard and is not well sign posted

The access to the north is compromised by stormwater infrastructure, views into rear yards and a steep slope to the easement to Evans Close (currently sealed it services a public utility enclosure adjacent to the creek)

Mature pines x2 on the NW side of Evans Close adjacent to the frontage of a heritage building obstruct access

Pinch point at mature street tree at Evans Close intersection







Figure A4.14 Constraints and opportunities – Planning Unit FC9 (North)

## A4.10 Planning Unit FC10 – Fullagar Avenue (east) and Coerwull Road rail bridge (south) to Great Western Highway (north-west)

**Table A4.10 Constraints and opportunities - Planning Unit FC10**

Opportunities / Assets:	Constraints / Issues:
<b><i>Cooerwull Rd at Fullagar Ave to informal car park west of the James Kirkwood Bridge</i></b>	
A path between FC9 and FC10 can be aligned along the NE road shoulder of Coerwull Rd, north of its intersection with Fullagar Ave, to a midblock road crossing point east of the road bridge and then along the southern verge of Coerwull Rd to the informal car park	No existing footpaths in Coerwull Rd nor over James Kirkwood Bridge
An existing cycle lane on the NE shoulder of Coerwull Rd	The existing cycle lane is not to standard and is not well sign posted so the western extent is unclear
High value viewing points of the Bowenfels viaducts are available from a number of locations along Coerwull Rd	Traffic speeds along Coerwull Rd exceed the speed limit causing safety issues around on road cycle use and road crossing
Mature Oak trees along the southern side of Coerwull Rd screen views of the Council tip to the north when viewed from the Rail Corp service road	Two driveways exit onto Coerwull Rd at the informal car park (western driveway has poor sight lines onto the road)
	The informal car park is eroded and is a scar when viewed from the rail viaducts
<b><i>Informal car park west of the James Kirkwood Bridge to Coerwull Rd via Rail Corp land</i></b>	
Access can be gained initially along the existing service road to the eastern end of the easement to above Coerwull Rd where steps will be required	Proposed works for this section are subject to negotiation with and approval from Rail Corp
Mature Oak trees west of the informal car park	Issues occur at the first bend in the road re oncoming traffic and steep climb
Vantage point to view the viaducts from below available on the western bank of the creek to the NW of the viaducts	Bracken and blackberry infestations on the unfenced steep sloped revetment to the viaduct (NW end) (fall hazard)
The lower viaduct provides a dramatic vantage point for views of the upper viaduct (currently in use), Farmers Creek below both to the north and south (through the arches of the southern viaduct) and the adjacent farming lands back by vegetated ridges to the north	Both viaducts are contained within a heritage conservation zone and any use of these bridges would require consultation regarding heritage issues and requirements



**Opportunities / Assets:**

A vantage point near the upper viaduct (southern bridge) at the eastern end gives views over the lower viaduct

**Constraints / Issues:**

The balustrades to the lower viaduct are at knee height presenting a fall hazard. Treatments to make safe must have regard for impacts on heritage values.

Open access via a staircase from the service road to the upper viaduct and active rail line is a safety hazard

Access is obstructed from the easements eastern end directly to Coerwull Rd by a steep bank

Access to the north along Coerwull Rd from the easement is constrained by a steep bank and mature trees x2

***Coerwull Rd north of the rail line to Fullagar Ave***

Path can be aligned on the existing western side path to a new safe road crossing point then on a new path on the eastern side to Fullagar Ave to another road crossing on Fullagar Ave to the NE side to link with the proposed path along Fullagar Ave

Existing not to standard path along west side

Limited opportunities for a safe road crossing point – constrained by sight distances and existing driveways at the caravan park, the storage units and the motel

Existing on road cycle path on eastern side only (not to standard and poorly signposted)

***Coerwull Rd south of the rail line to the Tourist Information Centre***

Existing cycle path could be upgraded to standard and duplicated on western side to allow loop back to the TIC

Existing on road cycle path on eastern side only (not to standard and poorly signposted)

Paddocks lie adjacent to Coerwull Rd to the west

Pinch points occur at the rail under pass, driveways to depot and a drainage swale running adjacent to Coerwull Rd as it follows the rail line to the TIC

Coerwull Rd is a busy trafficked street

Light industrial development flanks the road to the east to where the road runs adjacent to the rail line to the TIC

Residential housing flanks Coerwull Rd to the west from where the road runs alongside the rail line

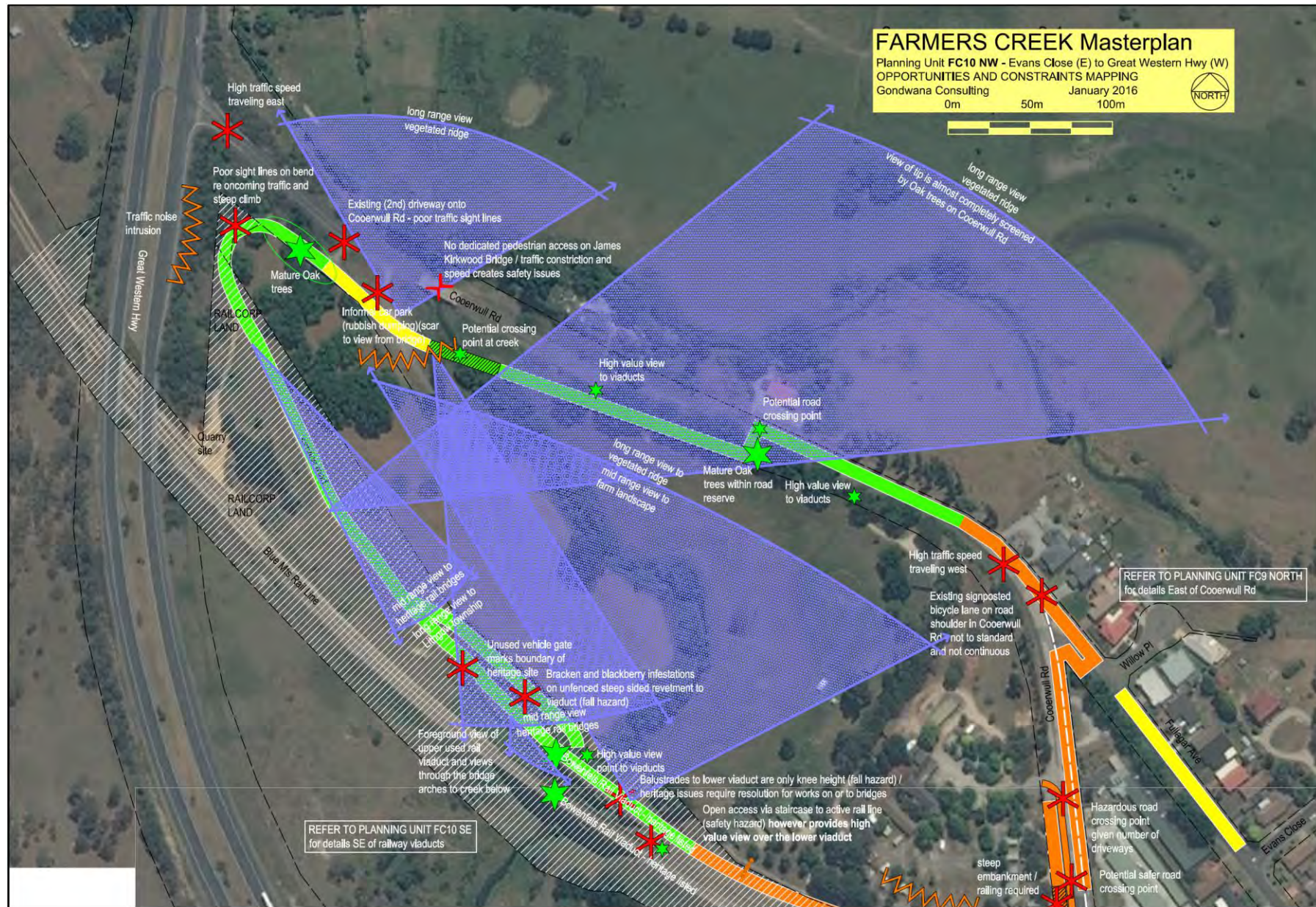


Figure A4.15 Constraints and opportunities – Planning Unit FC10 (North-west)





Figure A4.16 Constraints and opportunities – Planning Unit FC10 (South-east)

## A4.11 Vale of Clwydd Creek, Planning Unit VoCC3 – Inch St (*north*) to Main Western Railway (*south*) and Inch Street (*south-west*) (includes Lake Pillans Wetlands and Blast Furnace Park)

**Table A4.11 Constraints and opportunities - Planning Unit VoCC3**

Opportunities / Assets:	Constraints / Issues:
<b><i>Saywell St Park at Farmers Creek to Lake Pillans Wetlands</i></b>	
Potential to link future shared path along Farmers Creek in Saywell St Park (north) to Lake Pillans (important to not compromise existing or future activities in Saywell St Park by poorly located paths)	No existing paths in Saywell Street Park linking Farmers Creek with Inch St
Saywell St Park (north), open flat grassed area used for informal active recreation	Saywell St Park is flood prone
Saywell St Park (south) open flat grassed area with existing playground facilities, developed as a stormwater detention area, break point on path	Road crossing point required in Inch St to link Saywell St Park, north and south
Path can be aligned through Saywell St Park (south), important to not compromise existing or future activities by poorly located paths, to Lake Pillans Wetlands	Stormwater infrastructure located at the outfall to Lake Pillans (NW corner of the wetlands site) obstructs access though desire lines are evident on the ground
Path can be aligned through the planting area at border of wetlands site	
Lake Pillans wetlands, passive recreation area, with a natural water system, mature amenity plantings, picnic facilities and an existing walking path network around the lake	Existing path network in Lake Pillans Wetlands site is not to shared path standard
Potential to fork the path at Lake Pillans to link walkers to the east to use the existing tree shaded path network (with water views) and cyclists etc. to the west to use the level route	The existing path to the west of Lake Pillans is not shaded and has no water views (not pleasant for a walking route)
Potential to provide a bridge to cross the narrow neck of Lake Pillans (NW corner) to align the path for cyclists to the west of the lake (provide link from the proposed bridge to the existing path at the junction with the existing lake bridge to the east and upgrade the existing path south of this junction to standard to connect with the path network to the south).	



### Opportunities / Assets:

Break points with bike racks can be sited at the existing lake bridge (west end) and the southern end to the western path network

#### *Lakes Pillans to Inch St (via Blast Furnace Park)*

The existing path from Lake Pillans to Blast Furnace Park Rd can initially be used for access (not to shared path standard). Future provision of a shared path – upgrade or realignment – to be within the context of future development proposals for the heritage Blast Furnace site

Blast Furnace heritage site as a break point with heritage artefacts and interpretive signage

A path can be meandered along the Crown land, running parallel to Blast Furnace Park Rd, to Inch St to link existing interpreted artefacts and to link path users into the existing urban path network

Options to link back to the Farmers Creek shared path at Burton St possible along Inch St or Inch St Lane

Inch St is a wide road reserve and could accommodate expansion of the western footpath and narrowing of the road pavement (still maintaining two way access plus two parking lanes).

### Constraints / Issues:

The alignment of the switchback from Lake Pillans to Blast Furnace Park is unsafe for cyclists

Road crossing point over Blast Furnace Rd required

The Crown land falls at a moderate slope from the Park to Inch St and a drainage swale alongside the southern side of Blast Furnace Rd obstructs access

Inch St Lane is used for vehicle access to rear garages, possible safety conflicts with path users. A road crossing point required over Inch St at Burton St.

An existing footpath in Inch St (west side) not to standard. Road crossing points required at Donald and Burton Sts.

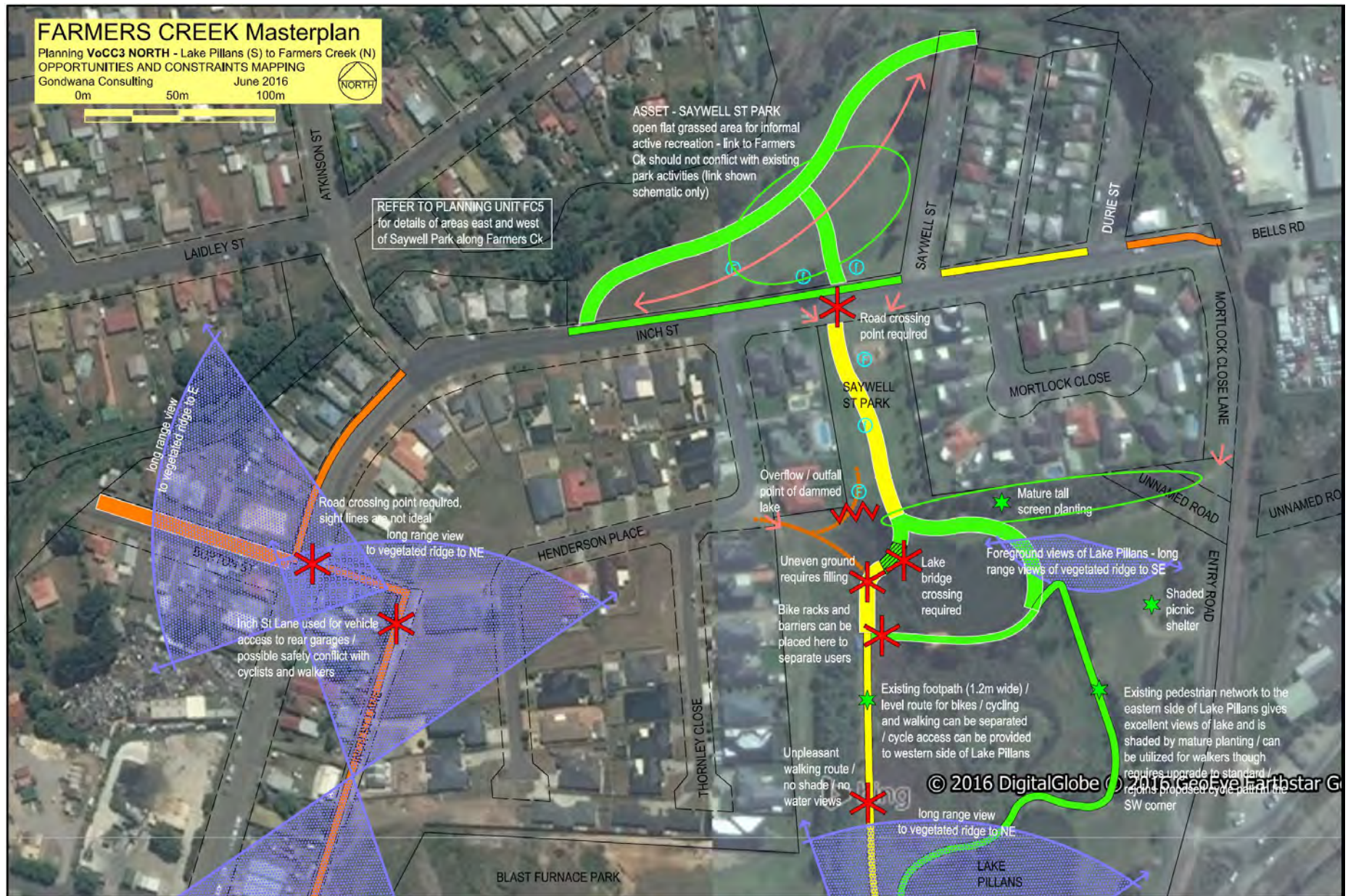


Figure A4.17 Constraints and opportunities – Planning Unit VoCC3 (North)



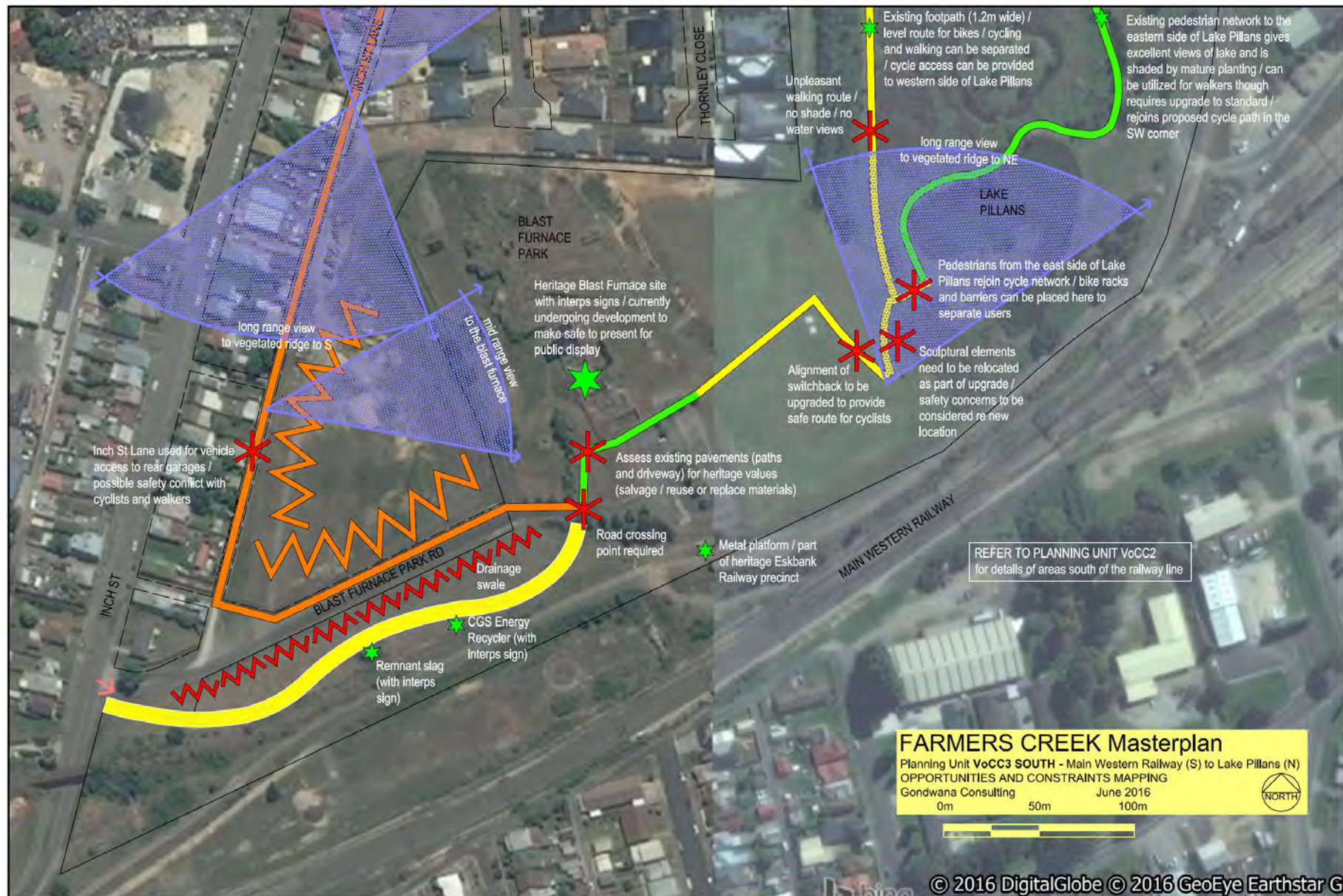


Figure A4.18 Constraints and opportunities – Planning Unit VoCC3 (South)

## A4.12 State Mine Creek Constraints, Planning Unit SMC2 – confluence with Farmers Creek (south) to north-west of end of Pillans Rd (north)

**Table A4.12 Constraints and opportunities - Planning Unit SMC2**

Opportunities / Assets:	Constraints / Issues:
<i>Southern public lands - Guy St open space (at Farmers Creek) to Sutcliffe St open space (and private land)</i>	
Connectivity can be gained from Farmers Creek (in FC6) to State Mine Creek along Banksia St	No existing paths within the public lands through which the creek passes
A path can be aligned from the proposed shared path on the north side of Farmers Creek at Guy St along the eastern bank of State Mine Creek (western nature strip of Banksia St)	The rapid waterway condition assessment (site 13 just upstream of the junction with Farmers Creek), identified this section of State Mine Creek being in "Fair" condition.
Capacity to widen existing paths on the Laidley St road bridge over State Mine Creek without impacting on vehicle lanes	State Mine Creek is infested with weeds (including a mature willow tree obstructing the path alignment), section from Farmers Creek to Laidley Street assessed as a moderate density weed zone
A path can be aligned along the east side of the creek north between Laidley St and Sutcliffe St	Road crossing point required at Laidley St.
	Survey required to confirm boundary locations at Laidley St and pinch points at Selwyn St and Sutcliffe St open space
	Rear garage vehicle access is gained through what appears to be public land to properties on the western side of Sutcliffe St (to be investigated re boundaries)
	Access north beyond Sutcliffe St open space along the creek is blocked by private property. Access can continue into Wiles St Park but once again is blocked to the north by private properties.
	The creek bank is lower on the eastern side and offers more views into the creek though is heavily weed infested.
	State Mine Creek is heavily infested with weeds north from Laidley Street, public lands assessed as a moderate density weed zone



Opportunities / Assets:	Constraints / Issues:
Alternative access can be aligned along Macauley St (east side)	Access along Macauley St is constrained by severe undercutting of the western creek bank just north of Laidley St, stormwater infrastructure, narrow verge / shoulder and busy road traffic (safety hazard between road and path users).
Varied birdlife present in the creek corridor despite the presence of weeds	Views into the creek are limited from the western side due to existing vegetation and the elevation of Macauley St as it rises to the north.  Access beyond Arden St is blocked by private properties – a creek crossing would be required to establish a loop walk (a bridge would be costly given the difference in creek bank elevations).
<b>Northern public lands – private lands (in south) to north-west of northern end of Pillans Road (approximately opposite Mount Street in west)</b>	
Easy/direct access off north end of Pillans Rd, but to only a limited expanse of public land along/beside creek	Isolated from other public lands, with no other entry/exit points (apart from off Pillans Road) and no access from Macauley St to west  Dominated by creekbed and flood terraces, with limited and/or discontinuous benches beside creek for pathway/access or facilities  Frequent encroachments (fencing, gardens and ornamental plantings, stormwater outlets) into public land of the creek corridor, along with garden waste or rubbish dumping and landfill  Rear property boundaries/fencelines constrain views or are in poor repair and unattractive in places  Assessed as a high density weed zone – with an area where Council has recently commenced weed control works (off the north end of Pillans Road) assessed as a moderate weed density area  The rapid waterway condition assessment (site 12 near the northern limit of the public lands), identified this section of State Mine Creek being in “Poor” condition only



Figure A4.19 Constraints and opportunities – Planning Unit SMC2 (southern portion only to start of intervening private lands)



## **APPENDIX 4**

### **Implementation and Cost Estimates Schedules, by Planning Unit**

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Presented in a separate document.





# FARMERS CREEK PRECINCT - Business Case and Cost Benefit Analysis 2016



This Business Case and Cost Benefit Analysis was developed by:

**A.P SHEERE CONSULTING**  
*professional strategic solutions*

A.P. SHEERE CONSULTING would like to acknowledge the support of:



#### Disclaimer

The details provided in this report are based on information available at the time of preparation and terms of reference of the project. All estimates and statements made are given in good faith and in the belief that such statements are not false or misleading. All sources of information are detailed in the report. Readers are recommended to make appropriate enquiries and/or take appropriate advice before acting on information supplied in this report. A.P. SHEERE CONSULTING and Lithgow City Council are not liable to any person for loss or damage incurred or suffered as a result of acting on or accepting any offer contained in this report.



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Aerial photograph of the Lithgow town, NSW



# 1.0 Executive summary

## Part 1

This project - **Farmers Creek Precinct Business Case and Cost Benefit Analysis** - is undertaken by A.P. SHEERE CONSULTING on behalf of Lithgow City Council.

The project involves preparing what is known as the Farmers Creek Precinct to become a recreational and environmental asset for Lithgow, its residents and visitors. Implementation of the Farmers Creek Masterplan from Stage 1-3 will result in a number of attributes including:

- Significant path works securing a continuous, mostly creekside, pathway from Burton Street to the east to the Tourism Information Centre in the west.
- A low speed 'shared zone' - for pedestrians, cyclists and vehicles.
- Significant planting and vegetation works.
- New recreational facilities including pic-nic areas, bubblers and shaded areas.

The total cost of the **Farmers Creek Precinct Stage 1 Development** - is **\$1,996,650.00 (GST exclusive)**.

This development project is considered to be cost effective as it provides many benefits including:

- Addresses safety issues along the creek
- Helps to diversify the economic base and supports the restructure of Lithgow
- Improved environmental standards
- Improved linkages to Lithgow's CBD
- Encourages people to stay in the region longer and therefore spend more locally
- Provides a number of employment opportunities to the socially disadvantaged
- Provides traineeship opportunities
- Increased sense of pride in the region
- Makes the region more attractive to current and future residents
- Provides opportunities for the community to pursue healthy activities which are freely accessible

Using a real discount rate of 7 per cent, the total project generates a net present value of over \$1.6 **million** with a **benefit cost ratio of 1.66**. Calculations are based on dollar values which are GST exclusive.

A benefit-cost ratio of 1.66 means that policymakers can expect \$1.66 in benefits for every \$1 in costs.

This suggests that investment in the Farmers Creek Precinct Project will return greater benefits than a 'without project' scenario.

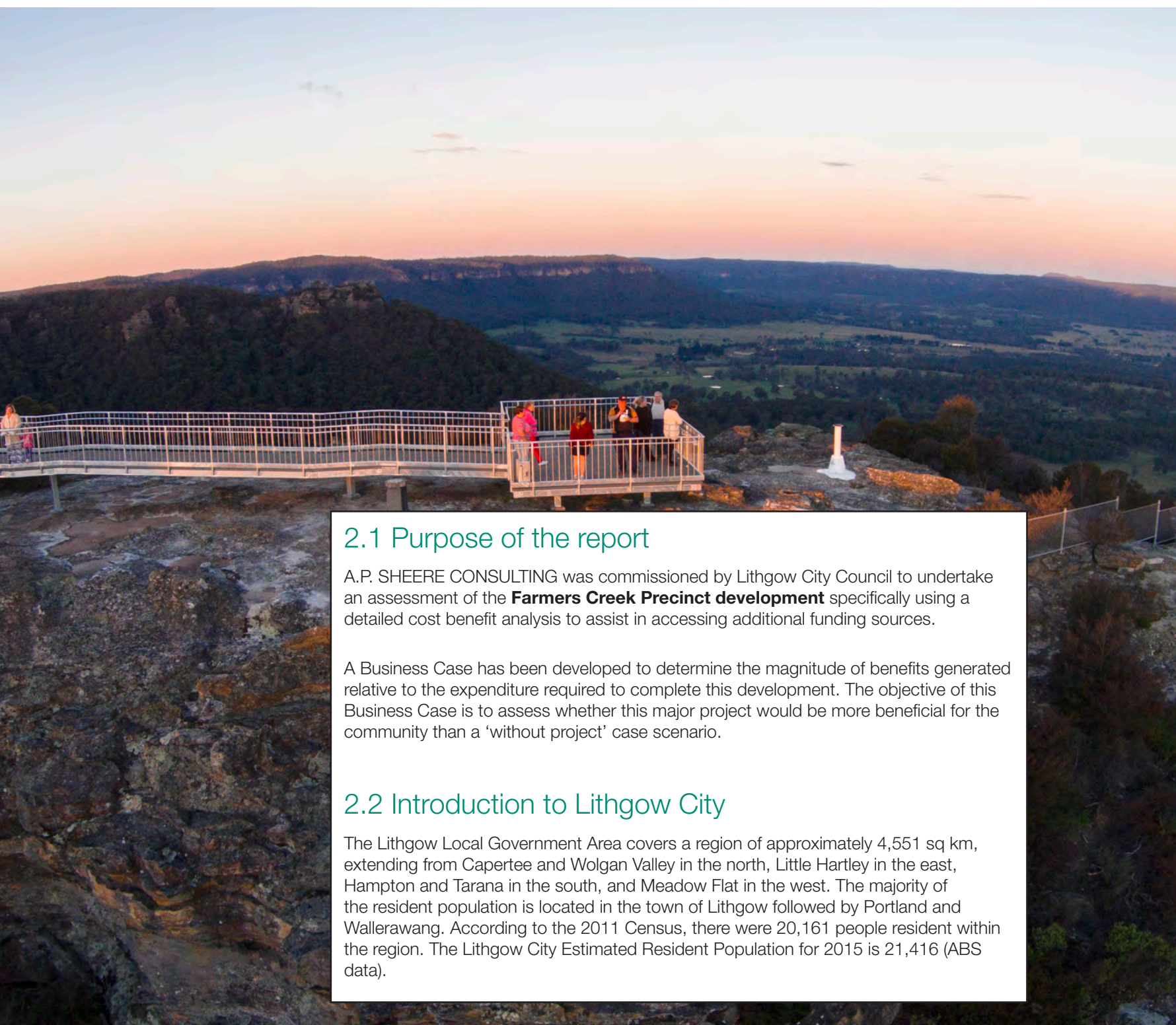




**total** project cost for Stage 1:  
\$1,996,650 (GST exclusive)<sup>1</sup>

<sup>1</sup> Based on 2016 quotes

## 2.0 Introduction



### 2.1 Purpose of the report

A.P. SHEERE CONSULTING was commissioned by Lithgow City Council to undertake an assessment of the **Farmers Creek Precinct development** specifically using a detailed cost benefit analysis to assist in accessing additional funding sources.

A Business Case has been developed to determine the magnitude of benefits generated relative to the expenditure required to complete this development. The objective of this Business Case is to assess whether this major project would be more beneficial for the community than a 'without project' case scenario.

### 2.2 Introduction to Lithgow City

The Lithgow Local Government Area covers a region of approximately 4,551 sq km, extending from Capertee and Wolgan Valley in the north, Little Hartley in the east, Hampton and Tarana in the south, and Meadow Flat in the west. The majority of the resident population is located in the town of Lithgow followed by Portland and Wallerawang. According to the 2011 Census, there were 20,161 people resident within the region. The Lithgow City Estimated Resident Population for 2015 is 21,416 (ABS data).



## 2.3 Lithgow's Strategic location in the Central West of NSW

On the western fringe of the Blue Mountains, Lithgow is at the crossroads of four major highways, is on the western rail line, and is a gateway to both Sydney and Central West NSW.

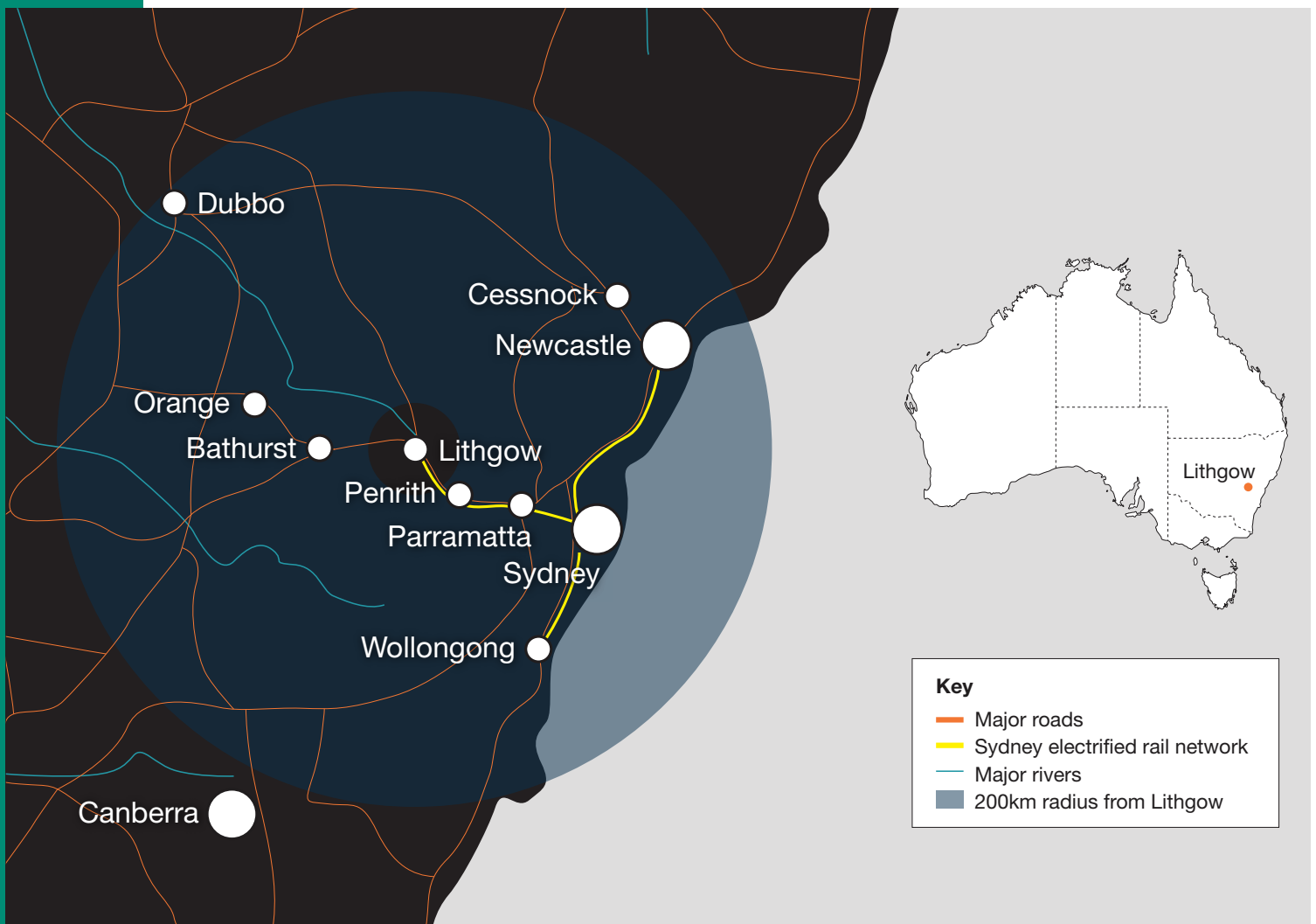
Lithgow is located just two hours drive from Sydney and Goulburn and 40 minutes from Bathurst. Lithgow has become a popular meeting place between the Central West, the Blue Mountains and Sydney. Lithgow is, and always has been, a centre for enterprise and entrepreneurial activities. The mining and energy sectors, along with manufacturing and retail, dominate the economic base today.

Lithgow is also served by the electrified rail service with direct links to Sydney's CBD. Main Street is the principal retail strip and comprises the main commercial area and access to the railway station.

In order to assist Lithgow's ongoing development it is necessary to have appropriate infrastructure in place to meet the current and future needs of the region and its community.

Lithgow is well located to drive population growth to regional areas as it is unrivaled in the Central West with its proximity to Sydney's CBD.

Figure 1.0 Lithgow's' strategic location in Australia



## 2.4 Project background

At the headwaters of Farmers Creek is Lithgow's water supply - Farmers Creek Dam. Water from Farmers Creek Dam is filtered at the Oakey Park Water Treatment Plant and supplied to Lithgow. The original lower dam (Dam #1) which was built in 1896 is no longer used. The upper dam which was built in 1907 has a capacity of 450 ML and a small catchment area of 12 km<sup>2</sup>.

The Farmers Creek Dam system is also provided with a supplementary supply from the Clarence Water Transfer Scheme. When there is insufficient natural water flow into the dam, up to 5 ML/day of water can be transferred from the Clarence Water Transfer Scheme.

The extent of the Farmers Creek Precinct project is roughly 18 km of Farmers Creek and associated tributaries through to Lake Lyell. Most of the project objectives are focused on the 10 km section of Farmers Creek and tributaries within the urban area from the Dam to the Great Western HWY, with the remaining 8 km of creek within a largely agricultural landscape with limited public access.

Several proposals for the Farmers Creek precinct have been made by local residents and community groups, some of which Council has adopted and begun to implement.

The Farmers Creek Masterplan is based upon 3 stages of development. All three stages involve a number of hard and soft infrastructure works, weed control and native vegetation replanting /regeneration.



### 2.4.1 Works already undertaken

A number of works have already been completed at Farmers Creek including the identification of green open spaces, disused rail and transport corridors, road reserves, creek and river corridors and crown and council public lands. In addition to this, Council mapping has been produced incorporating all of these elements, including potential off-road routes for walking track and bike trails through the whole of the Farmers Creek Precinct (and broader Lithgow Valley).

A summary of works already undertaken since 1998 are listed below:

- June 1998 - Greater Lithgow City Council Bicycle Plan
- 2001 – 2009 - Lake Pillans Wetland Reserve Lithgow & Districts Landcare Group contribute nearly \$200,000 of volunteer labour and manage \$70,000 of grant funds to undertake weed control and revegetation works
- 2006, 2007, 2008 and 2009 - Environment Advisory Committee (EAC) Walking Track and Bike Trail network proposal using Ballarat's Yarrowee River Landscape Management and Master Plan as an example (with the Ballarat example DVD)
- 2009 - Lake Pillans Wetland Reserve and Farmers Creek interpretive / educational signage & sculpture trail proposal addressing childhood literacy utilising mythological Bunyip stories as focal point
- 2009 - Environment Advisory Committee (EAC) Walking Track and Bike Trail network proposal using Ballarat's Yarrowee River Landscape Management and Master Plan as an example, was formally presented to Lithgow City Council by Hedley Thomson (details below), who was brought to Lithgow from Ballarat with Council funding
- 2009 - Tidy Towns bike path proposal To create a 3m wide path and planting from Geordie St crossing to Montague St
- 2009/2010 - Lake Pillans Wetland Reserve Refurbishment of the boardwalk and bridges - completed 2012
- 2010 - Lake Pillans Wetland Reserve Interpretive signage design, fabrication and installation- completed 2012
- 2011/12 – Lake Pillans Wetland Reserve & Blast Furnace Park Council-managed RLCIP funding to connect the two reserves via a pathway, install picnic shelters, roadside and entrance signage to Lake Pillans Wetland Reserve
- 2012 - Lake Pillans Wetland Reserve Council funds the replacement of failed timbers on the two bridges
- 2013/14 – Lake Pillans Wetland Reserve (plus five others in Lithgow & Hartley valleys) Local Land Services funding (43K) and LOLA funding (20K) for bush regeneration and revegetation works
- Management plans for reserves adjacent to Farmers Creek, including sporting facilities

## 2.5 Project location

Farmers Creek is the main waterway flowing through the City of Lithgow in NSW. The Farmers Creek Precinct area extends from Farmers Creek No. 2 dam downstream through the Lithgow urban area and associated tributaries, then on to Lake Lyell - a total of 18kms.

## 2.6 Project objectives

This project will drive economic growth principally through increased tourism and business patronage; result in local biodiversity and environmental outcomes and encourage a healthier population by investing in accessible community infrastructure.

The key objectives of the Farmers Creek Precinct which highlight the need for the development are as follows:

- Improve public access and increased recreational use (e.g cycle/walking paths)
- Provide better linkages along the main section of Farmers Creek, State Mine Creek, Vale of Clwyd Creek, Lake Pillans Wetlands and Blast Furnace Park.
- The project will support the ongoing restructure and diversification of the Lithgow LGA.
- The project will ensure the preservation of an environmentally and historically significant area in Australia.
- The project will encourage and enable residents to participate in healthy activities which are freely accessible to all.
- The project will promote the responsible management of natural resources through the control of environmental and noxious weeds.
- The project will conserve and preserve the natural environment whilst balancing the impact of development to ensure its sustainability.

## 2.7 Project description and plans

Farmers Creek and its main tributaries have an incidental open space role where it passes alongside playing fields and parks with scattered recreational uses associated with sections of creekside paths. The Farmer's Creek project area also includes a significant wetland and industrial heritage tourism. The project area already benefits from targeted weed removal and re-vegetation efforts in a number of key places.

The principal actions associated with this project stem from the Farmers Creek Masterplan and include a series of "Hard" Works (Built Infrastructure and Facilities); "Soft" Works (Landscape Works and Amenity Plantings) Weed Control and Native Vegetation Replanting /Regeneration. Hard works and soft works are further detailed below:

Hard works	Path works, cycle ways, boardwalks, bridges, safety railings, bollards, vehical barriers, park furniture and facilities (e.g picnic settings, benches, water bubblers, bike racks, shade shelter), road crossings and infrastructure (e.g zebra crossing, refuge crossing, grad rails, speed humps, kerb and guttering, signs and line-marking, demolition, fill and retaining walls.
Soft works	Filter strip plantings, amenity plantings, screening plantings, tree guards, turf/grass



### 2.7.1 Design elements

The project's design elements and materials used will create an attractive, interesting and consistent visual and thematic experience for visitors in keeping with the site's environmental and heritage values. Council hopes to link the Farmers Creek precinct with the Main Street revitalisation project and utilise similar design elements for consistency and connectivity. Some examples of these design elements are provided below:



Pathway example



Boardwalk example

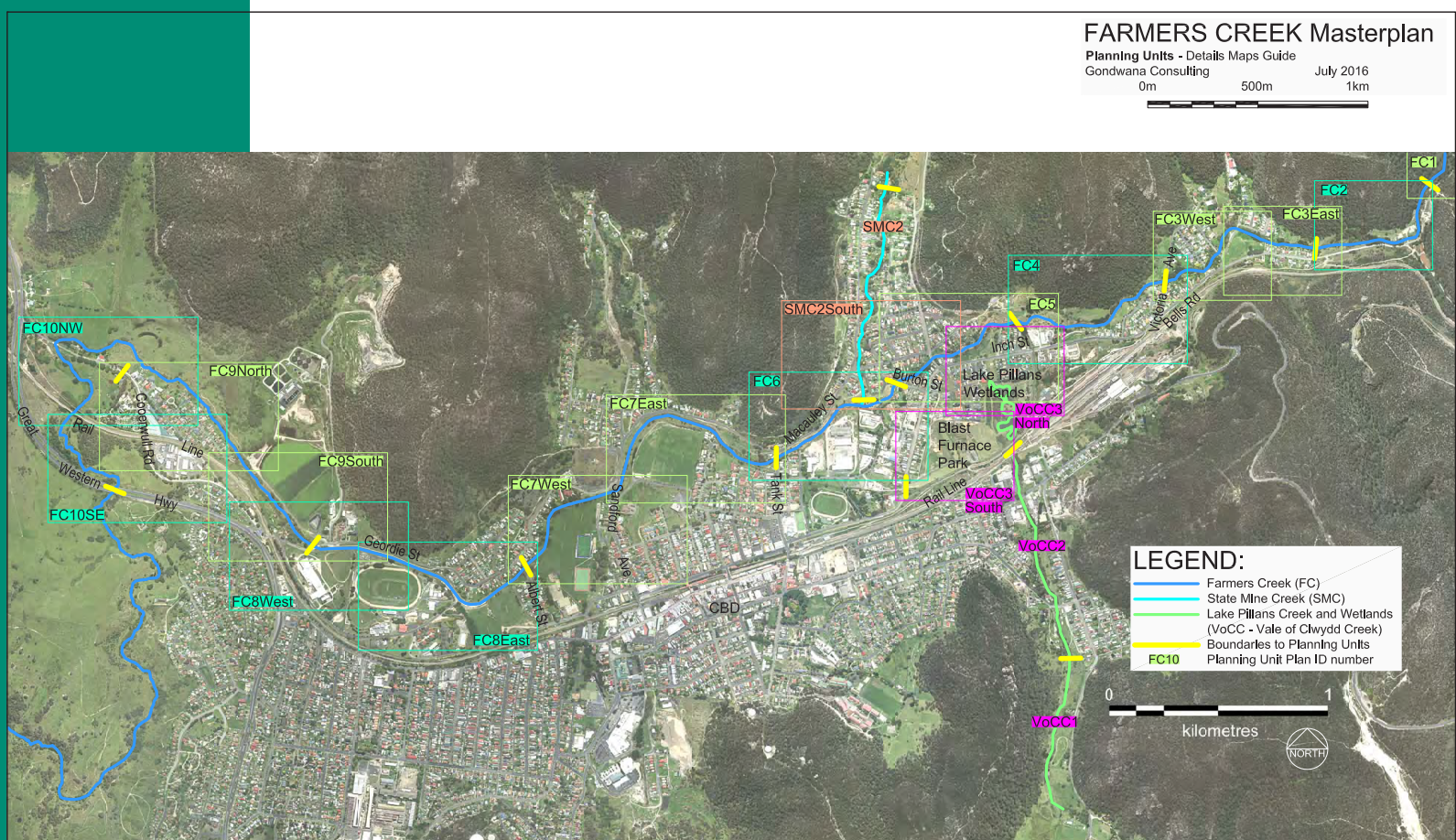


Bollard example

## 2.8 Farmers Creek Masterplan

The Farmers Creek Masterplan is illustrated in Figure 2.0. Note that the Masterplan is broken down into 3 stages of development. The draft Masterplan was completed in December 2016.

Figure 2.0 Farmers Creek Masterplan 2016



### 2.8.1 Masterplan priorities for the Staged development

The Farmers Creek Masterplan identified priorities to be addressed as part of the project's development.

#### 2.8.1.1 Stage 1 Masterplan Priorities

Following are the key “drivers” for the Stage 1 masterplan actions and works:

- To fill in missing links, to shared path standard, in Council's existing path network between the Geordie Street causeway and Sandford Avenue (in the Showground and sportsfields precinct, an area of higher potential use) (Planning Units FC7-West and FC8-East).
- To improve the connection between Marjorie Jackson Oval and the Montague Street area, along Macauley Street and Burton Street (mostly as shared path), to Inch Street (Planning Units FC6 and FC7-East) and allowing improved links to the Lake Pillans Wetlands
- To upgrade existing paths, and establish the start of a shared path loop route, through the Lake Pillans Wetlands and Blast Furnace Park (a major investment in Planning Units VoCC3- North and VoCC3-South).
- To connect the existing path network, via a new shared path west from the Geordie Street causeway, to the Lithgow Tourism Information Centre and existing urban pathway network (Planning Unit FC8-West).
- To commence shared path development (but to varying standards and user suitability) in the “western heritage zone”, along Coerwull Road (in Planning Unit FC9-North
- To support new path construction with WSUD measures (mainly creekside filterstrip plantings), and undertake appropriate stormwater quality improvement measures (mainly retrofittings) in conjunction with open space upgrading efforts along these sections of creek corridor.
- To expand/escalate environmental works (weed control and native species plantings to the creek corridor), and commence the confirmation of public land boundaries, upstream (east) of Burton Street (Planning Units FC2, 3, 4 and 5).
- To undertake environmental works (weed control and native species plantings to the creek corridor), on public lands downstream from the Geordie Street causeway (Planning Units FC9-South, FC9-North, FC10- Northwest and FC10- Southeast).

#### 2.8.1.2 Stage 2 Masterplan Priorities

Following are the key “drivers” for the Stage 2 masterplan actions and works.

- To build on Stage 1 works in the “central urban recreation and open space zone”, with additional sections of shared path to increase the amount of creekside pathway (Planning Units FC7- East and FC7-West).
- To improve the shared path connection towards the Lake Pillans Wetlands, by extending the creekside shared path east from Burton Street (Planning Unit FC5)
- To establish a continuous shared path connection through the Lake Pillans Wetlands and Blast Furnace Park, from north to south-west (Planning Units VoCC3-North and VoCC3-South).
- To commence the limited provision of a shared creekside path in the “eastern upstream environmental zone”, between Oakey Park and Hay Street (Planning Unit FC3).
- To complete a shared path connection through the “western heritage zone”, but to varying standards and user suitability north-west from the Geordie Street causeway to Chivers Close (Planning Units FC9-South and FC9-North).
- To support new path construction with WSUD measures (mainly creekside filterstrip plantings in areas of engineered or seminatural creek channel with less riparian



vegetation), and undertake appropriate stormwater quality improvement measures (mainly retrofittings) in conjunction with open space upgrading efforts.

- To continue, and further expand if necessary, environmental works (weed control and native species plantings to the creek corridor), and commence the confirmation of public land boundaries, upstream (east) of Burton Street (Planning Units FC2, 3, 4 and 5).
- To continue environmental works (weed control and native species plantings to the creek corridor), on public lands downstream from the Geordie Street causeway (Planning Units FC9-South, FC9-North, FC10-Northwest and FC10-Southeast).

#### 2.8.1.3 Stage 3 Masterplan Priorities

Following are the key “drivers” for the Stage 2 masterplan actions and works:

- To build on Stage 1 and 2 works in the “central urban recreation and open space zone”, with the new and upgraded shared path as the final links in a continuous route (to shared path) standard through this zone (Planning Units FC2, FC3, FC4 and FC5).
- To identify alternative route options, mainly in the “eastern upstream environmental zone”, where a creek corridor route may not be feasible (from land tenure, constructability, cost or potential demand and usage levels) in order to still offer some degree of connectivity along the entire, wider, Farmers Creek corridor.
- To focus shared path construction in the more challenging “eastern upstream environmental zone”, to build on the limited Stage 2 works and establish a shared path link - along creek corridor as far as practicable - from a terminal creek side picnic area north-west of the Water Treatment Plant downstream to Atkinson Street (Planning Units FC7-East, FC8-East and FC8- West).
- To capitalise on environmental works (weed control and native species plantings to the creek corridor) and amenity plantings in Stage 1 and 2 Stage 1 in the alignment and development of new/upgraded shared paths.
- To link the Lake Pillans Wetlands, and Blast Furnace Park, completely into the Farmers Creek shared path network - including completing the extended loop route, off the creek corridor through these features, to shared path standard (Planning Units FC5, VoCC3-North and VoCC3-South).
- To develop additional, local, loop routes along main creek corridor shared path “spine”.
- To upgrade sections of lower standard shared path links in the “western heritage zone”, north-west along the Sewage Treatment Plant access road to Chivers Close (Planning Units FC9-South and FC9-North).
- To support new path construction with WSUD measures (mainly creekside filterstrip plantings in areas with less riparian vegetation), and undertake appropriate stormwater quality improvement measures (mainly retrofittings) in conjunction with shared path development and open space upgrading efforts.
- To identify potential sites for off-line wetlands or detention works.

#### 2.8.2 Stage 1 Masterplan detailed description

The proposed Stage 1 path works, in conjunction with the existing path network, would secure a continuous, mostly creekside, pathway from Burton Street in the east to the Tourism Information Centre in the west. Most of this route would be to shared path standard, with the exception of the existing Geordie Street and Sandford Avenue (Marjorie Jackson Oval) path sections which, while not to shared path width at present, are nevertheless signposted for both walker and cyclist use.

Within the “central urban recreation and open space zone” this extended shared path’s eastern end is the crossing of Farmers Creek (off the west end of Burton Street). This is proposed as an interim “stepping stone” crossing, and so would be a “pinch point” in the network unsuitable for cyclists and mobility scooters.

Downstream from here a new shared path would run along the creek’s northern side, through the Guy Street open space (including a short bridge over State Mine Creek), then continue down the south-east side of Macauley Avenue, separated from the adjacent carriageway, to Tank Street. The proposed path network is illustrated in Figure 3.0.

Crossing to the west side of Tank Street, a new shared path would be developed south of the Montague Street dog park to link with the existing bitumen path running west then south between the creek (here as a large, then smaller, canal) and Sandford Avenue. This existing path is signposted for shared use, but not to shared path standard. At the south-western end of this bitumen path a new crossing of Sandford Avenue would lead to a short section of shared path before crossing Coalbrook Street and accessing Glanmire Oval via a new short bridge. A new shared path would run around the edge of Glanmire Oval to cross Albert Street, and then continue along the southern edge of the large stormwater canal to join the recently constructed shared path leading to the Geordie Street footbridge (built to shared path standards).

A low-speed “shared zone” – for pedestrians, cyclists and vehicles – would be demarcated in the laneway at the northern end of the existing Geordie Street footbridge, and a short section of shared path developed northwards to connect with the existing Geordie Street path (signposted for shared use, but not to shared path width). At the western end of this existing path, near the Geordie Street causeway, a new section of shared path would access a new bridge, aligned north-south, over the stream channel (canal). A new shared path would continue along the south side of the creek, west past the causeway, and along the southern then the northern side of Geordie Street westwards to the Main Western Rail Line crossing. The design requirements for the shared paths’ crossing of the rail line (north of the existing vehicle crossing) would require negotiation with Rail Corp. From here a new shared path would run a short distance north then west, through the existing information centre parking area (with appropriate signage and/or line-marking) to the existing zebra crossing accessing the Lithgow Tourist Information Centre to link into the wider urban pathway network.

Elsewhere in the “central urban recreation and open space zone” a new shared path leads south, from a new crossing on Inch Street, through the existing park (and floodway) to a new entry node at the north-west corner of the Lake Pillans Wetlands. From here a new footpath connects south-east to the existing walks around the wetlands, and new bridge (to shared path standard) would allow walkers and cyclists to cross the narrow outlet to the wetlands and link with the recently constructed path down the wetland’s western edge. This path would be widened to shared path standards. Steps are also developed at the south end of this is widened path to safely separate walkers and cyclists on the slope between the the Lake Pillans Wetlands and Blast Furnace Park, as well as new supporting amenity plantings. West from Blast Furnace Park a shared path would meander down the open grassy slope south of Blast Furnace Road to a new crossing point on Inch Street. At Stage 1 the Lake Pillans Wetlands and Blast Furnace Park are not fully integrated into the creek’s shared path network, and a shared path loop route through these attractions remains only partially realised (relying on the existing north-south footpath on Inch Street).

East from Burton Street in Stage 1 walkers would be reliant on existing footpaths, often well away from the Farmers Creek corridor and not to shared path standard, and cyclists would be required to use the existing roadways. This encompasses all of the “eastern upstream environmental zone”.



In the “western heritage zone”, north-west from the Geordie Street causeway, a road crossing and short section of unsealed compacted shared path will link the existing Geordie Street path to the Council depot and Sewage Treatment Plant access road. An existing informal route, alongside Farmers Creek, beside the access road and continuing north-west through an unmanaged reserve already provides a connection Chivers Close. While navigable by walkers and possibly by cyclists (in dry conditions), this link is not to shared path standard and is not suitable for mobility scooters. A section of new shared path (partly sealed and partly compacted only) would link along Coerwull Road leading to a viewing point to the heritage railway viaducts, just east of the James Kirkwood Bridge. However there is no constructed link between Chivers Close and Coerwull Road at Stage 1, requiring walkers to use the grassed road verges and cyclists to use the adjacent roadways.

At Stage 1, and also in subsequent stages, there is the potential to significantly enhance the recreational appeal - as well as the potential tourism interest – of the western end of the proposed shared path network. The twin rail viaducts over Farmers Creek are significant heritage assets and visitor attractions. These features can be viewed from Coerwull Road – as realised under the proposed Stage 1 works.

However there is also the potential to develop a loop route using the Rail Corp owned corridor – from Coerwull Road in the north just west of the James Kirkwood Bridge, north-west then south east along the rail corridor (including passing across the older heritage rail viaduct), to Coerwull Road at the existing rail overpass in the southeast.

Figure 3.0 Path network overview Stage 1

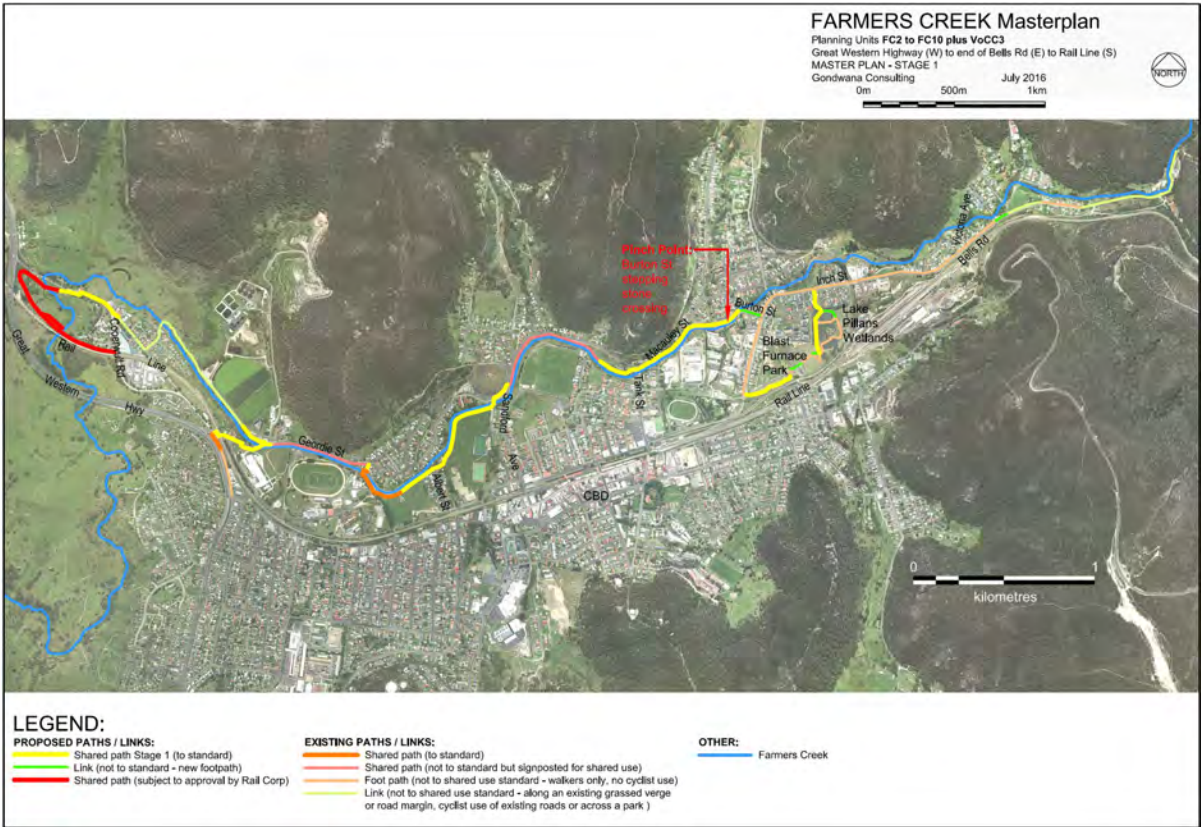


Figure 27 Stage 1 path network overview

Farmers Creek Masterplan - Draft V2 (June 2016)

Source: Farmers Creek Masterplan June 2016

## 3.0 Estimated costs

### 3.1 Project costs and program of works

There are a number of estimated Capital Costs for this project. It is estimated that completion of Stage 1 only will require a **\$1,996,650** (GST exclusive) investment.

A Program of works for Stage 1 is detailed in Table 2.0.

#### 3.1.1 Ongoing costs

Current Council budgets for Farmers Creek are as follows:

- Vegetation Control \$20,000
- Maintenance/Dredging \$20,000

It is anticipated that savings will be made in reduced dredging and waste removal from Farmers Creek post development. Maintenance costs are expected to increase however as a result of the additional pathways and plantings.

For the purposes of the Cost Benefit Analysis an annual figure of \$40,000 in ongoing costs post development per annum has been used.

#### In-kind contribution

Community planting days contribute significantly to the ongoing work required to maintain the Farmers Creek project area. On average, these occur three times a year and attract approximately 30 people each time. This results in an estimated \$25,200 per annum in labour savings (at a \$40/hr rate).

#### 3.1.2 Stage 1 project costs

A summary of the project costs associated with Stage 1 are provided in Table 1.0. A detailed breakdown is provided in Appendix A.

Table 1.0 Summary cost breakdown for Stage 1 only - Farmers Creek, Lithgow

Entire project	\$ (2016 prices)
All "Hard" Works (Built Infrastructure and Facilities)	1,394,480 <sup>1 2</sup>
All "Soft" Works (Landscape Works and Amenity Plantings)	322,910
All Weed Control and Native Vegetation Replanting / Regeneration	279,260
<b>TOTAL</b>	<b>1,996,650 <sup>1 2</sup></b>

Source: Farmers Creek Masterplan 2016

<sup>1</sup> Excludes cost of proposed rail crossing to Rail Corp specifications (cost to be determined).

<sup>2</sup> Excludes safety railings and other upgrades to the Chivers Close bridge, subsequent to an engineering and safety inspection (cost to be determined).



Table 2.0 Program of works for Stage 1 - Farmers Creek, Lithgow

### Estimated program of works timeline for Stage 1

Planning Unit	start date	end date
	2019	2022
FC1 – Lower (Historic) Dam (north-east) to End of Bells Rd (north of Water Treatment Plant) (south/south-west)	2021	2022
FC2 – End of Bells Rd (north of Water Treatment Plant) (east) to Ida Falls Creek (west)	2021	2022
FC3 – Ida Falls Creek (east) to Victoria Ave (west)	2021	2022
	2019	2022
FC4 – Victoria Ave (east) to State Mine Rail Line (at Drurie St) (west)	2021	2022
FC5 – State Mine Rail Line and Drurie St (east) to Burton St (west)	2019	2021
VoCC3 North & South – Inch St (north) to Main Western Railway (south) and Inch Street (south-west)	2021	2022
VoCC2 – opposite, west of, Berry St (south) to opposite, east of, Boundary St (north)	2021	2022
FC6 – Burton St (east) to Tank St (west)	2019	2022
SMC2 – confluence with Farmers Creek (south) to NW of end of Pillans Rd (north)	2021	2022
FC7 East – Tank St (east) to Sandford Ave (west)	2019	2022
FC7 West – Sandford Ave (east) to Albert St (west)	2019	2021
	2019	2020
FC8 East – Albert St (east) to Showground (west)	2020	2021
	2020	2021
FC8 West – Showground (east) to Tourist Information Centre (TIC) (west)	2020	2021
	2020	2021
FC9 South – Geordie St Causeway (south) to Council Depot Area (north)	2020	2021
	2020	2021
FC9 North – Council Depot Area (south) to Coerwull Rd (north)	2021	2022
	2021	2022
FC10 (SE and NW) – Fullagar Ave (east) and Coerwull Rd rail bridge (south) to Great Western Hwy (north-west)	2021	2022
	2021	2022

Source: Farmers Creek Masterplan 2016

# 4.0 Context and need for the project

## 4.1 Project benefits

The benefits from the Farmers Creek Precinct development will be seen across National, State, Regional and Local stakeholders and are listed below:

NATIONAL	<ul style="list-style-type: none"> <li>Will help safeguard an environmentally significant site</li> <li>Will help safeguard a number of historically significant sites</li> <li>Addresses a number of National objectives</li> </ul>
STATE	<ul style="list-style-type: none"> <li>Supports and promotes economic growth and diversification</li> <li>Promoting growth in regional towns i.e. redirecting population growth</li> </ul>
REGIONAL	<ul style="list-style-type: none"> <li>Supports and promotes economic growth and diversification in Central West NSW</li> <li>Project construction jobs and ongoing job opportunities</li> <li>Induced development</li> <li>Encourages private investment</li> <li>Develops tourism sector</li> </ul>
LOCAL	<ul style="list-style-type: none"> <li>Addresses significant safety and environmental issues at the site</li> <li>Helps to diversify the economic base and supports the restructure of Lithgow</li> <li>Encourages people to stay in the region longer and therefore spend more locally</li> <li>Helps to educate people about the environmental and historic importance of the site and Lithgow itself</li> <li>Allows Farmers Creek to be accessible and safeguards its future</li> <li>Provides a number of employment opportunities to the socially disadvantaged</li> <li>Provides traineeship opportunities</li> <li>Increase a sense of pride in the region</li> <li>Helps to develop community cohesion and local identity</li> <li>Encourages private investment i.e. retail expansion and commercial developments</li> <li>Makes the region more attractive to current and future residents</li> <li>Provides opportunities for the community to pursue healthy activities which are freely accessible</li> </ul>

## 4.2 Why is the project being undertaken?

There are a number of key reasons as to why this project is being undertaken:

- 1. Provide direct opportunities for the most unskilled and disadvantaged workers:** by re-engagement through volunteering, community and potentially employment, this project will provide those disadvantaged workers in the region with a number of opportunities.
- 2. Support the continued economic restructure of Lithgow** – the diversification of the local industry base is important to Lithgow to ensure its growth and ongoing sustainability resulting in greater job opportunities both for locals and the greater regional area. Farmers presents opportunities for tourism in particular with recreational activities and historic sites of interest within the precinct.
- 3. Support local business growth** – the proximity of Farmers Creek to Lithgow's CBD provides a realistic opportunity for businesses to harness the tourist/visitor trade which is being stimulated by a number of projects including the Restructuring of Lithgow initiative.
- 4. Allow greater access to and support the sustainable management of** an environmentally significant area.
- 5. Provide additional opportunities for residents to participate in healthy activities** which are easily accessible and incur no charges/financial commitment.



## 4.3 Provide direct opportunities for the most unskilled and disadvantaged workers

By re-engagement through volunteering, community and potential employment, this project will provide those disadvantaged workers in the region with a number of opportunities.

### 4.3.1 Low SEIFA ranking

The Socio-Economic Indices for Areas (SEIFA) Index of Advantage/Disadvantage is published by the ABS. The SEIFA index takes into account and summarises high values (advantages) and low values (disadvantages) taken from Census variables such as households with low income (disadvantage) and people with a tertiary education (advantage). All areas are ordered from the lowest to highest rank - the lowest rank being 1 - and placed in deciles ranging from 1 to 10 with 1 being the lowest decile of advantage/disadvantage. The area with the highest rank of 152 (having the highest level of advantage) would be placed in the 10th decile of advantage/disadvantage.

In 2011, the SEIFA index placed the Lithgow Local Government Area in the 2nd decile of advantage and disadvantage, that is, amongst the most relative disadvantaged Local Government Areas in NSW. This means that the number of households possessing 'disadvantage' variables is significantly greater than the number of households benefiting from 'advantage' variables.

Lithgow in fact had the 22nd ranking of all Local Government Areas in NSW meaning that there were 130 other Local Government Areas that had a higher advantage index than Lithgow. Table 3.0 details the respective rankings of all 11 LGAs which make up the NSW Central West. Lithgow's SEIFA ranking has in fact fallen (worsened) since 2006 when it was ranked 28th.

Table 3.0 Index of Relative Socio-Economic Advantage and Disadvantage, by LGA, 2011

LGA	Rank within NSW (out of 152 LGAs)	Percentile
Cabonne	111	8
Bathurst	104	7
Blayney	92	6
Orange	90	6
Oberon	79	6
Weddin	52	4
Forbes	44	3
Lachlan	39	3
Parkes	36	3
Cowra	24	2
Lithgow	22	2

Source: ABS 2011, A.P. SHEERE CONSULTING

Bathurst and Cabonne have the highest SEIFA rankings amongst the LGAs listed followed by Blayney, Oberon and Orange which share the same percentile ranking. These are socio-economically more advantaged than the other LGAs listed. These results are attributable to some extent to a relatively higher proportion of their respective resident population being tertiary qualified and other economic and social factors.

Access to higher education is also an important factor. 2011 ABS Census Data indicates that University or other Tertiary Institution attendance was significantly lower in Lithgow at 4.2% than in the Central West (7.6%) and NSW (11.4%). This is also reflected by the occupational status of many Lithgow residents. Limited educational attainment also limits the ability of the community to meet the needs of a more diversified industry base and can potentially hinder investment.

In addition to the newly established University of Notre Dame medical campus and the more recent opening of the new UWSCollege within walking distance of the main shopping strip in the Lithgow CBD, should both help to address issues relating to access to higher education within the Lithgow LGA. Lithgow City Council was instrumental in the success of UWSCollege establishing within the Council owned heritage building known as the Hoskins Building. Over \$10 million dollars has been invested in this building to make it a state-of-the-art educational facility. Courses are specifically tailored to the community and the needs of local businesses.

Median income data indicates a disproportionate number of Lithgow residents employed in lower earning brackets (considered to be less than \$500 a week). There are a number that earn significantly more (predominantly employed in the energy sector) but these numbers are not enough to counter the greater number of poorly paid residents or residents on Centrelink benefit. Those Lithgow residents renting directly from a Housing Authority between 1996 and 2006 remained relatively constant at 23.3% of dwellings in 2006. This also reflects the significantly lower socioeconomic standing of the Lithgow resident population.

#### *4.3.2 High unemployment rate*

The unemployment rate is derived from the ABS labour force survey and Centrelink data and compiled by the Department of Employment. According to the Department of Employment, in June 2016, the Lithgow LGA had an unemployment rate of 8.4%, above the NSW Central West and NSW State averages. In addition the share of the unemployed who have been out of work for more than six months—remains at unprecedented levels.

There is considerable research documenting the association between long term unemployment and poor socio economic outcomes. “They tend to be in poorer health and have children with worse academic performance. Communities with a higher share of long term unemployed workers also tend to higher rates of crime and violence” Nichols et al, 2012.

The project will provide a number of job opportunities for local residents including those who are currently not within the workforce or soon to be unemployed. Job opportunities to help address the high unemployment rate include construction jobs, landcare, maintenance and specific artisan work.

#### *4.3.3 Occupation data - Number of unskilled workers*

Table 4.0 below shows that at the 2011 Census, people living in the Lithgow Local Government Area were more likely than people in NSW as a whole to be employed in technical and trades, machinery operating and driving and labouring. In 2011 Mining was listed as the highest employer and it is feasible that many of these positions would have been held in this industry sector.



Table 4.0 Lithgow residents' occupations, 2011

Occupation	Lithgow	Lithgow %	NSW CW %	NSW %
Managers	760	9.4	15.5	13.3
Professionals	983	12.2	16.0	22.7
Technicians and Trades Workers	1,423	17.7	14.9	13.2
Community and Personal Service Workers	955	11.8	10.1	9.5
Clerical and Administrative Workers	1,065	13.2	12.4	15.1
Sales Workers	672	8.3	8.8	9.3
Machinery Operators And Drivers	1,147	14.2	9.1	6.4
Labourers	923	11.5	11.7	8.7
Inadequately described	133	1.6	1.6	1.8
Total employed persons aged 15+	8,061	100.0	100.0	100.0

Note: Based on residents 15 years and over

Source: ABS Census 2011, Profile id, A.P. SHEERE CONSULTING

Unskilled workers are usually categorised by the ABS as Labourers. A high proportion of Lithgow's resident workforce are therefore categorised as 'unskilled' at 11.5% according to ABS Census data, 2011.

#### 4.3.4 Occupational analysis over time

Table 5.0 illustrates that between 2006 and 2011 most occupations experienced growth with Machinery Operators and Drivers gaining 126 positions. Labourers declined slightly (by 27 positions) however, between 2001 and 2011, the number of labourers increased by 62 persons or 7.2%.

#### 4.3.5 Income Levels

##### 4.3.5.1 Weekly gross individual income levels for Lithgow resident workforce 2011

Table 6.0 illustrates that in 2011, the largest percentage of Lithgow's working population (14%) either earn between \$200-\$299 per week or \$300-\$399, followed by \$400 - \$599 per week (12.8%). Most people in NSW earn \$400-\$599 per week. The Department

Table 5.0 Occupational analysis over time, 1996 - 2011

Occupation	1996	2001	2006	2011	Change 2011-2006
Managers	747	815	817	760	-57
Professionals	740	792	889	983	+94
Technicians and Trades Workers	1530	1384	1362	1,423	+61
Community and Personal Service Workers	630	735	855	955	+100
Clerical and Administrative Workers	782	834	1004	1,065	+61
Sales Workers	555	693	690	672	-18
Machinery Operators And Drivers	1471	1116	1021	1,147	+126
Labourers	882	861	950	923	-27
Inadequately described	198	155	130	133	+3
Total employed persons aged 15+	7535	7385	7718	8,061	+343

Note: Based on residents 15 years and over

Source: ABS Census 2011, Profile id, A.P. SHEERE CONSULTING

of Human Services defines 'low income earners' as those individuals earning gross weekly income which is less than \$527.00. Therefore, approximately 50% of the resident workforce are low income earners.

5.2 % earn over \$2,000 per week which can be partly attributed to the high numbers of resident workforce working in the Mining industry which is historically a well paid industry sector in Lithgow. This is however, less than the 6.6% earning \$2,000 or more in NSW.

#### 4.3.5.2 Income levels by occupation, 2011

By far the greatest number of individuals earning over \$2,000 in 2011 were Technicians and Trades Workers (274) followed by Machinery Operators and Drivers (249). These figures have increased significantly since 2006 where the number of Technicians and Trades Workers earning over \$2000, for example, was 108 persons. This is possibly attributable to the increase in residents working in the Mining sector which occurred after the 2006 Census and illustrates the impact of fluctuations within the Mining sector.

Those earning \$599 or less per week, were mainly working as Labourers, Community and Personal Service Workers and Sales Workers. See Table 7.0.

#### 4.3.5.3 Department of Social Services data, 2013-14

Department of Social Services data indicates that during December 2014, at least 14,679 benefit payments were made to Lithgow residents. This represented an increase of 549 payments since September 2013 or 3.9%. The majority of payments were for Pensioner Concession Cards at 39.2% followed by Age Pension at 22.6%. These two payment types consistently increased between September 2013 and December 2014. Payments which increased the most during the same period were 'Low income card' (16.2%) and Newstart Allowance (11.4%). According to Lithgow Centrelink, in December 2014, 6,861 low income payments were made.

Table 6.0 Gross weekly income levels for Lithgow residents, 2011

Weekly gross income	2011		
	Number	%	NSW %
Negative Income/ Nil income	1,087	6.6	8.6
\$1-\$199	1,194	7.3	7.3
\$200-\$299	2,302	14.0	10.7
\$300-\$399	2,286	14.0	10.2
\$400-\$599	2,091	12.8	11.5
\$600-\$799	1,531	9.3	10.1
\$800-\$999	949	5.8	7.9
\$1000-\$1249	965	5.9	7.5
\$1250-\$1499	624	3.8	5.3
\$1500-\$1999	901	5.5	6.5
\$2000 or more	858	5.2	6.6
Not stated	1,599	9.8	8.0
Total persons aged 15+	16,387	100.0	100.0

Source: ABS Census 2011, Profile id, A.P. SHEERE CONSULTING



Table 7.0 Income level by occupation, 2011

Weekly income	Managers	Professionals	Technicians and Trades Workers	Community and Personal Service Workers	Clerical and Administrative Workers	Sales Workers	Machinery Operators and Drivers	Labourers	Inadequately described	Not stated	Total
\$1-\$199 (\$1-\$10,399)	28	31	18	59	35	130	14	117	5	6	443
\$200-\$299 (\$10,400-\$15,599)	30	30	34	76	39	74	17	99	0	6	405
\$300-\$399 (\$15,600-\$20,799)	26	35	86	109	80	91	27	96	4	7	561
\$400-\$599 (\$20,800-\$31,199)	95	94	161	211	174	142	54	179	8	8	1126
\$600-\$799 (\$31,200-\$41,599)	97	104	209	173	222	102	121	186	7	6	1227
\$800-\$999 (\$41,600-\$51,999)	84	101	164	79	157	44	112	83	5	8	837
\$1,000-\$1,249 (\$52,000-\$64,999)	79	130	168	68	186	35	156	58	12	4	896
\$1,250-\$1,499 (\$65,000-\$77,999)	54	115	113	61	77	13	127	29	13	0	602
\$1,500-\$1,999 (\$78,000-\$103,999)	104	216	151	87	44	6	230	33	3	0	874
\$2,000 or more (\$104,000 or more)	126	112	274	17	29	7	249	9	6	3	832
Not stated	9	10	31	11	14	19	29	26	3	15	167
Total	759	984	1424	957	1064	669	1147	923	66	69	8062

Source: ABS Census 2011, Profile id, A.P. SHEERE CONSULTING

#### 4.3.6 Job opportunities

Following completion of Stage 1 Masterplan Works, additional staff will be required to maintain the pathways and planted areas, general site clean-up, repair and maintenance.

Council already has the support of local volunteer groups to help maintain Farmers Creek. In addition to this Council will partner with local employment and disability organisations to offer traineeships in Landcare and Environmental Care.

The traineeships will be supervised by Council operation staff who currently maintain Farmers Creek. This will provide trainees with skill based, worthwhile and interesting work and give them a sense of responsibility for a significant place.

### 4.4 Support the continued economic restructure of Lithgow

Lithgow has a unique combination of attractive natural attributes associated with its location between the Blue Mountains and the Western Region. The city's natural setting is characterised by varied topography and complemented by an existing built form. It's built form is rich in character and defined by a distinctive mix of historic and character buildings lining pedestrian streets.

In addition to this, Lithgow's strategic location in terms of proximity to Sydney and direct links via road and rail infrastructure, is unrivalled in the Central West of NSW. This provides the region with a number of opportunities for economic diversity.

Lithgow has already seen the beginnings of an increase in popularity by new residents moving to the LGA from Sydney and the Blue Mountains who find the significantly lower costs of living and stunning environment, attractive as a form of 'tree change'. The success of a number of retirement villages highlights the opportunities afforded to the aging population as well. These demographic changes and the additional opportunities of comparatively lower business start-up costs for small business owners in particular, provides the Lithgow region with an opportunity for structural change. This coupled with the need to make the region attractive to families, highlights the importance of this infrastructure investment.

The Farmers Creek upgrades will directly support the Lithgow Revitalisation Project by developing an environmental and historic site which is within walking distance of the Lithgow CBD.

#### 4.4.1 Historic cultural heritage

Farmers Creek has a number of Aboriginal heritage sites with the precinct area. In addition to this there are a number of sites of historic interest also scattered throughout the precinct including, State significant and locally significant sites.

Twenty-two listed heritage sites (including four sites of State significance), one heritage conservation area, and five archaeological sites (including one site of State significance) occur on or in most cases adjacent or in proximity to the Farmers Creek corridor – according to the NSW State Heritage Register and "Schedule 5 Environmental Heritage" of the Lithgow Local Environmental Plan 2014.

Of the five sites of State level significance:

- Farmers Creek passes under the Bowenfels Rail Viaducts (in Planning Unit FC10-North-west) – comprising the 1870 viaduct over Farmers Creek which is one of the oldest stone arch railway viaducts in New South Wales, and the 1921 viaduct



Oakey Park colliery remains



dominated by brick arch construction;

- Bowenfels Railway Station and Bowenfels Station Masters Residence are proximate to, and clearly visible from, the creek (in Planning Unit FC9-South)
- the Lithgow Coal Stage Signal Box (and associated locally significant Eskbank Railway Station Group) are proximate to, and visible from, Lake Pillans Wetlands and Blast Furnace Park (in Planning Unit VoCC3-South); and
- the Blast furnace site and coke ovens (Blast Furnace Park) is an archaeological site of State significance (in Planning Unit VoCC3-South).

Heritage sites can provide attractions or features of interest, and potential interpretive or educational components, to a walking track or shared path. The linkage has been identified in a number of strategic plans (see Section 4.9) as a means of maximising the economic opportunities presented by the unique identity of Lithgow.

## 4.5 Support local business growth

Farmers Creek's proximity to the Lithgow CBD will enable the project to actively support the growth of these local businesses in particular. The ongoing Lithgow Revitalisation Project will see a generous amount of investment targeting the CBD and region as a whole to meet it's changing role and demographic base.

Within the urban area of Farmers Creek, recreation facilities are only currently provided along limited sections of the creek corridor, and these facilities consist solely of access and movement infrastructure - paths and bridges. However their location adjacent to parks and playing fields often allows for access to the facilities provided for these areas – such as toilets, drinking water or shade.

The infrastructure improvements to Farmers Creek will encourage recreational activities and usage by residents and visitors. A knock-on-effect of this is the likelihood of these people also patronising the CBD. The Farmers Creek redevelopment is expected to attract both locals and visitors who will in turn support the local businesses through their spending activities.

As part of the redevelopment it is likely that some specialist trades will be required which will again provide locals with an opportunity to acquire work and showcase their skills.

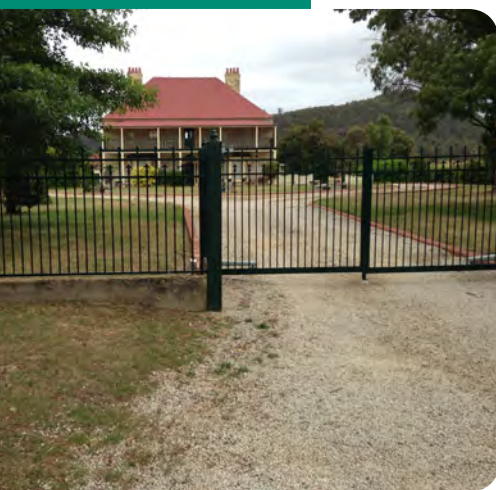
## 4.6 Improved access and sustainable management of an environmentally significant area

The project will increase the community's "ownership" of the creek and lead to a better understanding and appreciation of the unique history of the LGA and greater region.

The improved access resulting from this development will broaden the reach of the site in terms of visitation and ongoing usage. This will ultimately ensure the project area's sustainability and help Council manage this area of environmental/historic significance.

By the methods outlined in the Farmers Creek Masterplan, visitors will be able to access the project area and take ownership of the site which will assist with its ongoing sustainability.

The Atlas of NSW Wildlife (which draws together flora and fauna records from the NSW National Parks and Wildlife, Office of Environment and Heritage, Royal Botanic Gardens, Department of Primary Industries, Forests NSW and the Australian Museum) records seven threatened species from the vicinity of Farmers Creek.



Metven House



Engineered channel example



Limited unusable area for pathway

These comprise one flora species and six fauna species. All are listed under the NSW Threatened Species Conservation Act 1995. Three are also considered of national significance, being listed under the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999). (Source: Farmers Creek Masterplan).

The Farmers Creek Precinct project will enable Council to effectively increase native vegetation throughout the area and improve the habitat values of engineered channels.

## 4.7 Provide additional opportunities for residents to participate in healthy activities

The Farmers Creek Precinct – in providing greatly enhanced opportunities for exercise and enjoyable physical activity – will play an important role in combating significant current health problems (including the ‘obesity epidemic’ and childhood diabetes). This development will contribute significantly to community-based health promotion - thereby enhancing the vitality and productivity of Lithgow’s population and reducing potential costs associated with primary and acute care in the public health care system.

### 4.7.1 Health outcomes

In December 2009 Sydney West Area Health released a report detailing the ‘Social and Health Profile of the Lithgow Local Government Area’. This report highlighted that the Lithgow Local Government Area continued to face many health and social challenges including:

- residents of Lithgow experienced a higher prevalence of asthma, overweight and obesity compared to residents of SWAHS and NSW. The proportion of Lithgow residents who were overweight and obese (60.6%) was significantly higher than that for NSW (51.7%).
- Sydney West Area Health Services’ Centre (SWAHS) identified significantly higher rates (2005 data) for residents of the Lithgow Local Government Area for all cancers, cerebrovascular disease, ischemic heart disease, acute myocardial infarction, all injury, asthma, and diabetes.

These serious health issues directly impact the community through pressure placed on health services, a less active community and fewer able to participate in the workforce.

The proposed upgrades to Farmers Creek will encourage all generations to develop healthy lifestyles and provide the community with a means of participating in healthy activities (at no charge) thus reducing the burden on community health services in particular.





## 4.8 The project's strategic alignment

The Farmers Creek Precinct development also specifically aligns with a series of related strategic plans currently being implemented aimed at reinforcing the role of NSW as an economic powerhouse.

The Farmers Creek project is consistent with the statutory purpose and objectives of the Restart NSW Fund Act, in this instance, 'infrastructure projects that will improve local infrastructure in regional areas that are affected by mining operations'. In combining the statutory purpose of the Restart NSW Fund, which is to improve economic growth and productivity in NSW, with the priorities of 'Making it Happen' it is possible to illustrate how this project will achieve both.

### 4.8.1 State strategic alignment

NSW 2021

#### **LITHGOW TACKLING CHILDHOOD OBESITY**

Reduce overweight and obesity rates of children by 5% over 10 years.

The Farmers Creek Precinct will enable the community to have access to a facility that promotes healthy recreational activities and in turn will help address obesity in particular with children and other health issues associated with limited activity. This will result in children growing into adults who are significantly more productive in terms of their contribution to the community through engagement and workplace productivity. This will further reduce the financial burden placed on the healthcare system which is under significant stress by reducing the number of hospitalisations, for example, of obese related illnesses.

The Farmers Creek Precinct development also complements the recently completed indoor heated swimming pool which is located in the project area.

#### **LITHGOW BUILDING INFRASTRUCTURE**

Key infrastructure projects to be delivered on time and on budget across the state.

The Farmers Creek Precinct will provide a safe environment for the community to interact and participate in healthy and fun activities which is currently limited. A change in demographics is being witnessed in the Lithgow LGA and in neighbouring regions in the Central West with people seeking a 'tree-change' in this locality. The ability to harness families in particular is paramount and this development will help to support this objective.

#### **LITHGOW CREATING JOBS**

150,000 new jobs by 2019

The Farmers Creek Precinct development will provide a number of employment opportunities for local and regional workers. It is further expected that the development itself will provide an economic multiplier effect in terms of helping with the general regeneration of the region and the economic benefits including job opportunities, which result from this. The development of a well designed and unique recreational area will support the need to provide residents and visitors with accessible attractions. These help encourage visitors to stay in the region longer and will result in the region being more attractive to new (and current) residents.

#### 4.8.2 Regional strategic alignment

##### **RDA Central West (RDACW) Strategic Plan 2013-16**

The Regional Plan underpins the key activities and issues that the RDACW believe require priority for regional economic development.

Regional Development Australia Central West priorities: Economic Development

- Facilitate partnerships and support initiatives that aim to improve the overall quality and standard of living across the Central West region.
- Support the development of hard and soft targeted infrastructure projects to meet the needs and opportunities of the Central West region.

This Project will assist in meeting the Economic Development, environmental and social objectives identified in the Regional Plan.

#### 4.8.3 Local Strategic alignment

##### **Our Place...Our Future Community Strategic Plan 2013-2025.**

This Plan sets out the community's vision for the strategic direction of the Lithgow local government area.

- 3.2.4.1 Cycleways and Walkways - To establish a system of cycleways and pedestrian paths to provide links between major cultural and recreational facilities and town centres
- 3.2.10.1 Recreational Facilities - To develop recreational facilities that will meet the needs of the community now and into the future

Developing Our Built Environment

- 3.1.1.1 Provide infrastructure to ensure the sustainable growth and development of the area including the provision of quality recreational and community facilities.
- 3.2.2.1 Develop cultural and recreational infrastructure that will meet the needs of the community now and into the future.
- 3.2.6.1 To Identify, preserve, improve and promote the LGA's indigenous and non-indigenous built and natural heritage.

##### **Open Space and Recreational Needs Study 2011**

- Recommendation 22 - Complete the first stage of the walkway along Farmers Creek and commence detailed designed for stage two. High priority.
- Recommendation 28 - Continue to develop the recreation corridor along Farmers Creek. High priority.
- Councillors - "development of additional walking and cycling opportunities is important, particularly for our aging community".
- Sect. 355 Sports Advisory Committee - "walking and cycling will continue to be popular activities", "a foot/bike path along Farmers Creek .. would be beneficial".
- Sect. 355 Environmental Advisory Committee - "the most important priority ... access to a quality walking system" including "a series of urban walks and cycling circuits".
- Parks Management & Engineering Services – providing "a good pedestrian (walk and cycle) path system in the urban areas" as one of two highest priority, and "the first stage is to complete a link along Farmers Creek in Lithgow".
- Community Development – "A better quality walk/cycle network", one of three "top priority infrastructure needs".
- Lithgow Community Workshop – the "need to further promote and develop walking and cycling opportunities", one of two key community priorities.
- Survey of +200 households across the LGA – identified "more walk and cycling tracks" as the second highest recreational need.



#### **Lithgow Land Use Strategy 2010 – 2030**

- Rapidly ageing population and increasing percentage of people +55 years = need to “promote active ageing/walkability and range of open space and recreational facilities” .
- An older population is more likely to seek unstructured pursuits such as walking, with continued pressure to extend the footpath and trails network.

#### **Greater Lithgow City Council Bicycle Plan 1998**

- Recommended “an off-road path along Farmers Creek corridor”, from the Fullagars Avenue area in the west to Oakey Park in the east – initially as an unsealed/gravel route, and subsequently sealed, for “shared bicycle and pedestrian use” .
- Community survey (245 questionnaires, cyclists and non-cyclists) “identified that the single most important reason people stated for not cycling was ‘the lack of facilities available’”.

#### **Lithgow Tidy Towns Committee**

- 2009 proposal for a cycle/pedestrian path, and “greening”, that “generally follows route of Farmers Creek” from Geordie Street causeway to Montague/Tank Street, developed in three stages(west to east).

#### **Lithgow Heritage Development Control Plan**

This identified opportunities for the introduction of significant conservation areas across the LGA. Each of the areas nominated has the potential to attract visitors and provide product for heritage based tourism.

*“By protecting, preserving and maintaining our heritage assets, we provide future generations with the opportunity to learn from, enjoy and value the important aspects of our social and cultural heritage.”*

#### **Lithgow Cultural Precinct Study**

This was undertaken to explore the potential for a number of Council owned facilities to support the development of cultural industries in the town of Lithgow. The recommendations that emerged from the study identified ways to capitalise on the strengths within the Lithgow community in order to establish a Cultural Precinct as an identifiable and thriving cultural cluster.

Core to the recommendations delivered in the study is the concept that visible and supported cultural industries can contribute flow-on benefits across the LGA by attracting tourists, skilled workers and business investment; diversifying the economy; and improving the quality of life of residents. Investing in the cultural industries could have a multiplier effect for Lithgow.

#### **Lithgow Business and Retail Strategy**

This was prepared to provide input into the development of the Economic Development Strategy. The Farmers Creek Precinct meets the objectives of Strategy by enhancing the tourism product offering and coupled with the redevelopment of the CBD, encouraging residents and visitors to spend more time in the area.

## **4.9 Other supporting evidence**

The following selection of images also support the need for this project. They were taken as part of the development of the Farmers Creek Masterplan 2016.

Unmanaged rail crossing for pedestrians and cyclists



Opportunities to increase tourism



Weed control requirements





Access issues



Hazardous road crossings



Improve amenities



## 4.10 Actions to ensure that project objectives are realised

There are a number of initiatives that will be used to ensure the best outcomes for this project. Some of the key initiatives include:

### *4.10.1 Farmers Creek Master Plan, 2016*

The Farmers Creek Master Plan was developed to provide Council and the community with a strategic framework for the enhancement and development of the Farmers Creek Precinct conserving the project area and exploring opportunities for redevelopment for the benefit of the City.

### *4.10.2 Print media*

A strong media presence can be created by having articles published in industry specific and local/regional publications. Paid advertising campaigns published in newspapers can be used to increase print media presence. This can be a successful strategy to communicate the upgraded project area encouraging recreational activities.

### *4.10.3 Marketing collateral*

Promotional leaflets, brochures, etc could be developed with an appropriate distribution plan implemented.

### *4.10.4 Social media*

With over 1.80 billion people currently active on social media around the world, Farmers Creek can leverage this growing audience to connect with prospective visitors and site users.

### *4.10.5 Further initiatives*

Some key actions that will influence the success of the project are detailed below:

- Marketing and Communications Plan - a detailed plan can be created and implemented which not only ensures that the local community is aware of the developments and outcomes but also the greater region and beyond. This will be accomplished by specific advertising using various websites and social media.
- Marketing Distribution Plan that specifically targets a range of markets.



# 5.0 Cost Benefit Analysis

## Part 2

An economic appraisal has been undertaken to determine the magnitude of benefits generated relative to the expenditure required to develop the **'Farmers Creek Precinct'** project

### 5.1 Objectives, options and scope

The objective of this economic appraisal is to assess whether undertaking the **Farmers Creek Precinct** project would be more beneficial for the community as a whole than a 'without project' case scenario.

This economic appraisal uses a cost benefit framework (CBA) to assess the desirability of each option. The appraisal focuses on the benefits and costs accrued by users (Lithgow City LGA, businesses and the community as a whole), which include environmental improvements, healthier population and encouraging further investment. Benefits arising from each option are based on net decreases in user costs relative to the 'without project' case.

There are a number of social and other environmental impacts that cannot be valued due to limited information about the valuations of social and environmental benefits and costs associated with certain elements of the project.

To compensate for this, this study separately identifies, in a qualitative way, the full range of program outcomes, including economic, social and environmental costs and benefits. This approach is outlined in the Qualitative Assessment.

#### 5.1.1 Scope Assessment

Scenario 1: status quo - no change where it is assumed that development at Farmers Creek would remain largely unchanged resulting in:

- worsening issues with safety and access
- damaged to image and reputation of the LGA in terms not maintaining the creek for future generations
- unable to maximise the opportunities presented by Farmers Creek
- greater pressure placed on maintenance services
- inability of the community to learn about and respect the importance of the Creek
- no additional jobs being created within the local community
- less community infrastructure
- less attractive to current and future residents

Scenario 2: initially complete Stage 1 Development of the Farmers Creek Precinct

This scenario is likely to result in significant benefits for residents and visitors including:

- significantly improved access and safety for users
- significantly improve the biodiversity and environmental management of the project area
- increased usage of Farmers Creek by both residents and visitors
- opportunities for local people to gain work experience and address employment disadvantage

- positively impacts upon local businesses
- provides greater opportunities for additional users/visitors to spend locally
- construction will incur limited inconvenience to residents
- Makes the region more attractive to current and future residents

The quantifiable benefits of the **Farmers Creek Precinct project - Stage 1** are discussed in more detail below.

## 5.2 Quantitative assessment of benefits

Modeling for the economic appraisal has been carried out according to NSW Government Guidelines. These guidelines are provided by the NSW Treasury Guidelines for Economic Appraisals (TPP 07-5).

Costs and benefits that can be directly expressed in economic terms are referred to as 'quantitative'. Costs or benefits that cannot be quantified in economic terms are referred to as 'qualitative costs' and 'qualitative benefits'. It is important here to understand that 'quantitative' in this sense means quantified in monetary terms. Even though something can be expressed numerically, it may not necessarily be able to be quantified in the economic sense by the assignment of a monetary value.

### 5.2.1 General parameter values

The following general parameter values have been used for the **Farmers Creek Precinct** user cost benefit analysis.

- Base Year - The base year considered for discounting purposes is 2016.
- Discount Rates - A discount rate of 7% has been used to discount future capital costs and user costs to the base year. Discount rates of 4% and 10% have also been used for the purpose of sensitivity analysis.
- Evaluation Period - An evaluation period of 20 years has been used for the economic analysis.
- Dollar values - All dollar values are based on the Australian dollar using estimated 2016 figures.

### 5.2.2 Monetised benefits

The benefits of the **Farmers Creek Precinct** are further detailed below.

#### 5.2.2.1 Increase in expenditure from increased number of visitors

Farmers Creek has a number of historical sites and opportunities for recreational activities.

According to figures taken from Tourism Research Australia (TRA) in 2013, 127,000 domestic overnight tourists and 291,000 domestic day tourists travel to Lithgow Local Government Area annually (based on a three to four year average to June 2013). These figures increased to 135,000 domestic overnight tourists (or 6.3%) and 312,000 domestic day tourists (or 7.2%) according to figures taken from Tourism Research Australia (TRA) in 2014. In addition to this there were some 300,000 international visitors to Lithgow spending an average of \$483 per person in 2014.

Domestic overnight visitors spent on average \$158 per night. Of these visitors we estimated that 40% will, at some point in their trip, visit the town centre as this is the only town within the LGA with significant retail, recreation and accommodation facilities. According to 2014 TRA figures, 44% of overnight visitors eat out at restaurants during their stay.

Domestic day trippers (staying up to 4 hours in Lithgow) spend on average, \$87 per head (or \$21.75 per hour). Of these visitors we estimated that 40% will, at some point in their trip, visit the town.



Heritage rail bridges



A conservative estimate has been used allowing for an additional 2% of domestic visitors (both day trippers and overnight visitors) being attracted to the region and town centre per year and an additional 2% of current visitors spending at least 1 hr at Farmers Creek and an extra hour within the town centre. This equates to an extra 3,596 persons after Year 1. Here, a conservative figure of \$22 additional spend (for 1 hour) per extra day tripper and overnight visitor has been used. This does not take into account extra revenue from extended overnight accommodation.

This results in an **additional \$78,672 after Year 1** on increased overnight visitation and spend (staying an extra 1 hour) and increased day trippers and spend (staying an extra 1 hour) over the assessment period.

#### 5.2.2.2 Reduce the current safety risks for residents/visitors using the creek area

There are a number of safety risks along the Farmers Creek project area. If it is found that the Council is responsible for injury suffered as a result of a bad fall for example due to damaged pathways, then the claimant may be entitled to claim compensation for the injury including past and future loss of wages, past and future loss of superannuation, past and future medical expenses, damages for pain and suffering and payment for any gratuitous assistance they have received around their home because of the injuries in the slip, trip or fall.

For the purposes of this assessment a conservative figure of **\$40,000** has been used to represent a potential one-off compensation claim during the 20 year period being analysed.

#### 5.2.2.3 Savings in dredging, waste removal and bushland damage

The site has experienced some significant waste dumping issues and damage to surrounding bushland areas. Council estimates that on average these costs amount to \$30,000 per annum. It is conservatively estimated that these costs will reduce by approximately 30% post Stage 1 development (i.e savings of **\$9,000 pa**).



Damage to bushland



Waste issues

#### 5.2.2.4 Property appreciation

Within the vicinity of Farmers Creek lie approximately 3,678 properties. It is fair to presume that once Stage 1 is completed those properties in particular adjoining the creek may benefit from an appreciation in value as this is a common consequence of investment activities.

The median residential property value in Lithgow as at November 2016 according to CoreLogic RP Data, was \$262,000 (an increase of 3.48% since November 2015). For the purposes of this CBA, a very conservative figure of 150 (4% of the listed residential homes) has been used for calculations.

If we also assume a conservative appreciation of 0.5% per annum, this gives a total projected residential property value appreciation of **\$196,500 in the first year**. This results from the surrounding residential area becoming a more attractive and popular place to live.

#### 5.2.2.5 Healthier population

In 2005, overweight and obese Australian adults cost the Australian economy \$21 billion in direct health care and direct non-health care costs, plus an additional \$35.6 billion in government subsidies, according to a study published in the Medical Journal of Australia.

Using weight categories defined only by Body Mass Index, the mean annual total direct health care and nonhealth care cost per person was \$1,710 for those of normal weight (\$2,240.84 RBA estimate in 2016), \$2,110 for the overweight and \$2,540 for the obese (\$3,328.50 RBA estimate in 2016). The average annual cost of government subsidies per person was \$3,737 for the overweight and \$4,153 for the obese (\$5,442.24 2016 RBA estimate), compared with \$2,948 for people of normal weight (\$3,863.16 RBA estimate for 2016).

#### Obesity in Lithgow

According to recent data released in 2013 by Adelaide University's Public Health Information Development Unit, Lithgow ranked 5th in a table showing those regions with the highest obesity rates in Australia. The figure of 24.20 out of 100 persons being obese in Lithgow represents close to 1 in 4 persons. Based on ABS Census data (2011), this equates to approximately 5,000 Lithgow residents being obese.

If only 0.5% of these people (25 of them) changed from being 'obese' to 'normal' weight this would save both the healthcare system \$27,192 pa and government subsidies of \$39,477 per annum. For the purposes of this CBA a **combined figure of \$66,669 per annum in savings** has been used, increased by 1% per annum.



## 5.3 Economic activity effected by the project

### 5.3.1 Construction

Council Operations advised a rough estimate of 3-4 construction workers 5 days to complete 100 m of 2.4 m of the new footpath. This equates to:

- Stage 1 – 2440 metres
- Stage 2 – 1638 metres
- Stage 3 - 4863 metres

In addition to this, to complete the various stages would require the services of a Project Manager, landscapers and administrative support.

### 5.3.2 Operational - post construction

Following completion of Stage 1 Masterplan Works, additional staff will be required to maintain the new soft/hard infrastructure and vegetation. Council will partner with local employment and disability organisations to offer traineeships in Landcare and ground and facility maintenance. The traineeships will be supervised by Council recreation staff who currently maintain the project area.

Through the partnership with local employment and disability organisations, Council will also offer opportunities for young unemployed people and people with disabilities to develop skills related to tour guiding and event services. It is estimated that 1 FTE position post construction will be created with the balance of hours to be worked on Landcare type roles elsewhere in Council.

### 5.3.3 Multiplier impacts during and post construction

This project will have a significant economic impact on a number of business sectors and the local community in general. ABS National Accounts: Inputs-Outputs data show that for every \$1 million spent on construction output gives rise to 9 jobs in the construction industry (the initial employment effect). The construction of this project is a \$1,996,650 investment. Based on this approach this would lead to potentially 18 FTE construction jobs during the construction period.

The 1996-1997 ANA Input-Output Tables identified Employment Multipliers for first round industrial support and consumption induced effect of 0.33, 0.45 and 2.33 respectively for every job year in direct construction. Therefore, for the \$1,996,650 in construction costs, a total of 74 full time FTE jobs could be generated in the economy including the 18 FTE jobs generated during construction (Table 8.0).

Table 8.0 Employment multipliers

	Initial effects (1)	Firstround effects (2)	Industrial support effects (3)	Production induced effects (4=2+3)	Consumption induced effects (5)	Total multiplier (6=1+4+5) FTE
Construction-total job years generated	<b>18</b>	5.9 (18 x 0.33)	8.1 (18 x 0.45)	<b>14</b>	<b>41.9</b> (18 x 2.33)	<b>74</b>

Direct allocation of imports method, ABS ANA Input-Output Tables

The jobs created by the project arise as a result of increased demand for construction materials and derived demand for associated goods and services. Construction workers, consultants, contractors and engineers will spend a portion of their salaries on food, accommodation and recreation in the vicinity of the construction area. There are a number of social and environmental impacts that cannot be valued due to limited information about the valuations of social and environmental benefits and costs associated with certain elements of the project.

Note that the multiplier effects are national, and not necessarily local. The ABS states that:

*“Care is needed in interpreting multiplier effects; their theoretical basis produces estimates which somewhat overstate the actual impacts in terms of output and employment. Nevertheless, the estimates illustrate the high flowon effects of construction activity to the rest of the economy. Clearly, through its multipliers, construction activity has a high impact on the economy.”*

### 5.4 Cost Benefit Analysis Summary

To provide the total present value of benefits for undertaking the **Farmers Creek Project**, the resultant time-stream of cost savings (or increases) were discounted and summed over the 20 year evaluation period from opening the new, upgraded project area.

A similar process of discounting and addition was carried out for the capital and maintenance costs previously identified, to provide the equivalent present value of costs for each option. A summary of the results for the economic analysis in terms of Net Present Value (NPV) and Benefit Cost Ratio (BCR) are provided in Tables 9.0 and 10. These were calculated from the estimates of Present Value Benefits and Present Value Costs assessed in accordance with the method outlined above.

A Benefit Cost Ratio greater than 1 means that the benefits outweigh the costs and the investment should be considered. If the ratio is less than 1, the costs outweigh the benefits. If the BCR is equal to 1, the benefits equal the costs.

Table 9.0 Economic analysis summary	
	Infrastructure upgrades
Discount rate	7%
Present value of costs	\$ 2,420,410.57
Present value of benefits	\$ 4,022,664.67
Net present value	\$ 1,602,254.10
Benefit cost ratio	1.66
Internal rate of return	16%

### 5.5 Sensitivity Analysis

The sensitivity analysis was carried out using a Discount Rate of 4% and 10%. The results of the sensitivity analysis are summarised in Table 10.0.

Table 10.0 Sensitivity analysis	
	Infrastructure upgrades
NPV with 4% discount rate	\$ 2,654,448.42
Benefit cost ratio	2.04
NPV with 10% discount rate	\$ 877,106.84
Benefit cost ratio	1.38



# BCR calculations with 7% discount rate

year	benefits (b)	costs (c) including recurrent costs	Discount factor at 7% $DF_t = 1/(1+0.07)^t$	discounted benefits $b_t * df_t$	discounted costs $c_t * df_t$	discounted net benefits $(b_t - c_t) * DF_t$	net benefits $(b_t - c_t)$
0	0.00	1,996,650.00	1.00	na	1,996,650.00	-1,996,650.00	-1,996,650.00
1	390,841.00	40,000.00	0.93	365,271.96	37,383.18	327,888.79	350,841.00
2	354,063.63	40,000.00	0.87	309,252.89	34,937.55	274,315.34	314,063.63
3	357,329.31	40,000.00	0.82	291,687.16	32,651.92	259,035.24	317,329.31
4	360,638.76	40,000.00	0.76	275,129.58	30,515.81	244,613.77	320,638.76
5	363,992.71	40,000.00	0.71	259,521.77	28,519.45	231,002.32	323,992.71
6	367,391.91	40,000.00	0.67	244,808.74	26,653.69	218,155.05	327,391.91
7	370,837.12	40,000.00	0.62	230,938.72	24,909.99	206,028.73	330,837.12
8	374,329.12	40,000.00	0.58	217,862.95	23,280.36	194,582.59	334,329.12
9	377,868.69	40,000.00	0.54	205,535.53	21,757.35	183,778.18	337,868.69
10	381,456.65	40,000.00	0.51	193,913.22	20,333.97	173,579.25	341,456.65
11	385,093.82	40,000.00	0.48	182,955.30	19,003.71	163,951.59	345,093.82
12	388,781.02	40,000.00	0.44	172,623.42	17,760.48	154,862.94	348,781.02
13	392,519.11	40,000.00	0.41	162,881.47	16,598.58	146,282.90	352,519.11
14	396,308.95	40,000.00	0.39	153,695.44	15,512.69	138,182.75	356,308.95
15	400,151.43	40,000.00	0.36	145,033.29	14,497.84	130,535.45	360,151.43
16	404,047.45	40,000.00	0.34	136,864.85	13,549.38	123,315.47	364,047.45
17	407,997.92	40,000.00	0.32	129,161.69	12,662.98	116,498.72	367,997.92
18	412,003.78	40,000.00	0.30	121,897.05	11,834.56	110,062.50	372,003.78
19	416,065.98	40,000.00	0.28	115,045.71	11,060.33	103,985.38	376,065.98
20	420,185.49	40,000.00	0.26	108,583.91	10,336.76	98,247.15	380,185.49
present value benefits				4,022,664.67			
Present value costs					2,420,410.57		
Net present value						1,602,254.10	
internal rate of return							16%
				benefit cost ratio	present value of benefits/present value of costs		1.66

The BCR calculations with a 4% and 10% discount rate are provided in Appendix B.

## 5.6 Qualitative Assessment

A qualitative assessment has been undertaken to support the Cost Benefit Analysis to highlight a range of potential costs and benefits associated with the project that cannot be assigned a value or easily costed.

### *5.6.1 Supports Industry*

Improving access to Farmers Creek will result in greater patronage of local businesses from visitors who come and visit the area. The proximity of Farmers Creek to Lithgow's CBD is critical to the ease in which people can move between the project area and the local CBD shops.

### *5.6.2 Employment opportunities*

There are number of employment opportunities associated with this project. Following completion of Stage 1 Masterplan Works, additional staff will be required to maintain the pathways, grassed areas, general site clean-up, repair and maintenance.

Council will partner with local employment and disability organisations to offer traineeships in Landcare and ground and facility maintenance. This will provide trainees with skill based, worthwhile and interesting work and give them a sense of responsibility for a significant place.

Through the partnership with local employment and disability organisations, Council will also offer opportunities for young unemployed people and people with disabilities to develop skills related to tour guiding and event services.

### *5.6.3 Increased community pride*

Farmers Creek is a tangible link to the past and Lithgow's unique identity. It is valued by the community as a symbol of a shared past. The transformation of the Lithgow town centre public domain space, upgrades to Blast Furnace Park and Farmers Creek, will reinforce the sense of identity, build civic pride and help define the character of the Lithgow Region.

### *5.6.4 Building a stronger community*

Farmers Creek highlights the sense of shared history and reinforces feelings of connectedness among community members. Greater social cohesion increases a community's "social capital" and its ability to solve problems and achieve common goals. (Putnam 2000; Policy Research Institute 2005)

Revitalizing the Farmers Creek project area will help preserve long-established social ties and community networks. These developments will also facilitate the mixing of people of different backgrounds and the formation of more diverse and inclusive social networks.

The Farmers Creek Precinct will provide a high quality well connected public domain that is convenient, safe, unique and attractive which encourages social and economic interaction and exchange. The Project will stimulate social interaction as well as providing health benefits for residents. International research shows that social inclusion can lead to greater social cohesiveness and as well as economic outcomes can lead to social benefits such as better standards of health. "Designing facilities to encourage meeting and social interaction in communities can improve mental health." (Mean et al., 2005)

### *5.6.5 Improving access and linkages*

This project will help to improve linkages between Farmers Creek, Blast Furnace Park, Eskbank House and Lithgow's CBD in particular. Completion of Stage 1 will open the site up to a number of target markets and help to highlight the environmental and historic links between other local sites in the region and beyond.



It is also expected that in the near future, Eskbank Station will become operational once again, for tourist trains. The station's proximity to Farmers Creek and Blast Furnace Park, provides a clear and easy link to the site from passengers alighting there and a further opportunity for increased access and patronage.

Cycling is being encouraged within the town centre through Council's improved cycleways and once stage 1 is completed, cyclists will be directed to other places of interest such as Blast Furnace Park and the CBD. This has both positive environmental and health effects on the community as a whole.

Establishing a system of cycleways and pedestrian paths to provide links between major cultural and recreational facilities and town centres is part of Lithgow City Council's Developing our Built Environment strategies in the Community Strategic Plan 2026.

#### *5.6.6 Environmental benefits*

Natural environmental benefits will occur from the removal and management of noxious weeds; reduction in waste and water pollution plus the re-introduction of local flora to the site.

The upgrades proposed will enable Council to better manage the environment at Farmers Creek and also encourage the community to take ownership of the precinct helping to ensure its sustainability.

# 6.0 Appendix A

Break down of costs for Stage 1 of the Farmers Creek Precinct development

**Cost Estimate Summary Table – by Planning Unit and Cost Categories**

Planning Unit	Order of Cost (\$) *
	Stage 1
FC1 – Lower (Historic) Dam (north-east) to End of Bells Rd (north of Water Treatment Plant) (south/south-west)	3,200
	0
	0
	3,200
FC2 – End of Bells Rd (north of Water Treatment Plant) (east) to Ida Falls Creek (west)	1,080
	0
	0
	1,080
FC3 – Ida Falls Creek (east) to Victoria Ave (west)	5,300
	13,650
	0
	18,950
FC4 – Victoria Ave (east) to State Mine Rail Line (at Drurie St) (west)	8,400
	0
	0
	8,400
FC5 – State Mine Rail Line and Drurie St (east) to Burton St (west)	25,920
	3,690
	0
	29,610
Planning Unit	Order of Cost (\$) *
	Stage 1
VoCC3 North & South – Inch St (north) to Main Western Railway (south) and Inch Street (south-west)	467,850
	23,940
	0
	491,790
VoCC2 – opposite, west of, Berry St (south) to opposite, east of, Boundary St (north)	0
	0
	0
	0
FC6 – Burton St (east) to Tank St (west)	215,860
	49,950
	89,050
	354,860
	0



	0
	154,060
SMC2 – confluence with Farmers Creek (south) to NW of end of Pillans Rd (north)	<b>154,060</b>
	87,960
	53,420
	36,150
FC7 East – Tank St (east) to Sandford Ave (west)	<b>177,530</b>
<b>Planning Unit</b>	<b>Order of Cost (\$) *</b>
	<b>Stage 1</b>
	232,160
	78,990
	0
FC7 West – Sandford Ave (east) to Albert St (west)	<b>311,150</b>
	43,090
	49,240
	0
FC8 East – Albert St (east) to Showground (west)	<b>92,330</b>
	239,040 <sup>2</sup>
	40,500
	0
FC8 West – Showground (east) to Tourist Information Centre (TIC) (west)	<b>279,540 <sup>2</sup></b>
	28,980
	5,000
	0
FC9 South – Georgie St Causeway (south) to Council Depot Area (north)	<b>33,980</b>
	11,400 <sup>3</sup>
	530
	0
FC9 North – Council Depot Area (south) to Coerwull Rd (north)	<b>11,930 <sup>3</sup></b>
<b>Planning Unit</b>	<b>Order of Cost (\$) *</b>
	<b>Stage 1</b>
	24,240
	4,000
	0
FC10 (SE and NW) – Fullagar Ave (east) and Coerwull Rd rail bridge (south) to Great Western Hwy (north-west)	28,240

<b>ENTIRE PROJECT</b>	
All "Hard" Works (Built Infrastructure and Facilities)	<b>1,394,480<sup>2 3</sup></b>
All "Soft" Works (Landscape Works and Amenity Plantings)	<b>322,910</b>
All Weed Control and Native Vegetation Replanting /	<b>279,260</b>
<b>TOTAL</b>	<b>1,996,650<sup>2 3</sup></b>

**Key:**

"Hard" Works (Built Infrastructure and Facilities)
"Soft" Works (Landscape Works and Amenity Plantings)
Weed Control and Native Vegetation Replanting / Regeneration
Total – By Stage
<b>Total – All Stages and All Cost Categories</b>

**Notes:**

\* Refer to Implementation and Cost Estimates Tables for detailed breakdown of cost estimates

<sup>1</sup> Excludes upgrades to Brewery Lane bridge/path subsequent to engineering input and detailed design (cost to be determined)

<sup>2</sup> Excludes cost of proposed rail crossing to Rail Corp specifications (cost to be determined)

<sup>3</sup> Excludes safety railings and other upgrades to the Chivers Close bridge, subsequent to an engineering and safety inspection (cost to be determined)

<sup>4</sup> Works proposed on Coerwull Rd that require (or are consequent to) negotiation and agreement with Rail Corp have not been costed.

<sup>5</sup> Proposed works on Rail Corp land that require negotiation with (and approval from) Rail Corp to proceed, and associated proposals reliant on these Rail Corp endorsed works, have not been costed



# 6.0 Appendix B

BCR calculations with a 4% discount rate

year	benefits (b)	costs (c) including recurrent costs	Discount factor at 4% $DF_t = 1/(1+0.04)^t$	discounted benefits $b_t * df_t$	discounted costs $c_t$ $* df_t$	discounted net benefits (b- c)*DFt	net benefits (b-c)
0	0.00	1,996,650.00	1.00	na	1,996,650.00	-1,996,650.00	-1,996,650.00
1	390,841.00	40,000.00	0.96	375,808.65	38,461.54	337,347.12	350,841.00
2	354,063.63	40,000.00	0.92	327,351.73	36,982.25	290,369.48	314,063.63
3	357,329.31	40,000.00	0.89	317,664.45	35,559.85	282,104.60	317,329.31
4	360,638.76	40,000.00	0.85	308,275.52	34,192.17	274,083.35	320,638.76
5	363,992.71	40,000.00	0.82	299,175.47	32,877.08	266,298.39	323,992.71
6	367,391.91	40,000.00	0.79	290,355.16	31,612.58	258,742.58	327,391.91
7	370,837.12	40,000.00	0.76	281,805.73	30,396.71	251,409.02	330,837.12
8	374,329.12	40,000.00	0.73	273,518.62	29,227.61	244,291.01	334,329.12
9	377,868.69	40,000.00	0.70	265,485.53	28,103.47	237,382.06	337,868.69
10	381,456.65	40,000.00	0.68	257,698.45	27,022.57	230,675.88	341,456.65
11	385,093.82	40,000.00	0.65	250,149.60	25,983.24	224,166.36	345,093.82
12	388,781.02	40,000.00	0.62	242,831.48	24,983.88	217,847.59	348,781.02
13	392,519.11	40,000.00	0.60	235,736.80	24,022.96	211,713.84	352,519.11
14	396,308.95	40,000.00	0.58	228,858.54	23,099.00	205,759.54	356,308.95
15	400,151.43	40,000.00	0.56	222,189.89	22,210.58	199,979.31	360,151.43
16	404,047.45	40,000.00	0.53	215,724.24	21,356.33	194,367.91	364,047.45
17	407,997.92	40,000.00	0.51	209,455.22	20,534.93	188,920.29	367,997.92
18	412,003.78	40,000.00	0.49	203,376.65	19,745.12	183,631.53	372,003.78
19	416,065.98	40,000.00	0.47	197,482.57	18,985.70	178,496.87	376,065.98
20	420,185.49	40,000.00	0.46	191,767.17	18,255.48	173,511.69	380,185.49
present value benefits				5,194,711.47			
Present value costs					2,540,263.05		
Net present value						2,654,448.42	
internal rate of return							16%
				benefit cost ratio	present value of benefits/present value of costs		2.04

BCR calculations with a 10% discount rate

year	benefits (b)	costs (c) including recurrent costs	Discount factor at 10% $DF_{t+1}$ $1/(1+0.10)^t$	discounted benefits $b_t$ * $df_t$	discounted costs $c_t$ * $df_t$	discounted net benefits (bt- ct)* $DF_t$	net benefits ( $b_t - c_t$ )
0	0.00	1,996,650.00	1.00	na	1,996,650.00	-1,996,650.00	-1,996,650.00
1	390,841.00	40,000.00	0.91	355,310.00	36,363.64	318,946.36	350,841.00
2	354,063.63	40,000.00	0.83	292,614.57	33,057.85	259,556.72	314,063.63
3	357,329.31	40,000.00	0.75	268,466.80	30,052.59	238,414.21	317,329.31
4	360,638.76	40,000.00	0.68	246,321.12	27,320.54	219,000.58	320,638.76
5	363,992.71	40,000.00	0.62	226,010.83	24,836.85	201,173.98	323,992.71
6	367,391.91	40,000.00	0.56	207,383.15	22,578.96	184,804.20	327,391.91
7	370,837.12	40,000.00	0.51	190,298.08	20,526.32	169,771.75	330,837.12
8	374,329.12	40,000.00	0.47	174,627.30	18,660.30	155,967.00	334,329.12
9	377,868.69	40,000.00	0.42	160,253.21	16,963.90	143,289.31	337,868.69
10	381,456.65	40,000.00	0.39	147,068.05	15,421.73	131,646.32	341,456.65
11	385,093.82	40,000.00	0.35	134,973.03	14,019.76	120,953.28	345,093.82
12	388,781.02	40,000.00	0.32	123,877.61	12,745.23	111,132.38	348,781.02
13	392,519.11	40,000.00	0.29	113,698.80	11,586.58	102,112.23	352,519.11
14	396,308.95	40,000.00	0.26	104,360.53	10,533.25	93,827.28	356,308.95
15	400,151.43	40,000.00	0.24	95,793.07	9,575.68	86,217.39	360,151.43
16	404,047.45	40,000.00	0.22	87,932.50	8,705.17	79,227.33	364,047.45
17	407,997.92	40,000.00	0.20	80,720.21	7,913.79	72,806.43	367,997.92
18	412,003.78	40,000.00	0.18	74,102.50	7,194.35	66,908.15	372,003.78
19	416,065.98	40,000.00	0.16	68,030.11	6,540.32	61,489.79	376,065.98
20	420,185.49	40,000.00	0.15	62,457.90	5,945.75	56,512.15	380,185.49
present value benefits				3,214,299.39			
Present value costs					2,337,192.55		
Net present value						877,106.84	
internal rate of return							16%
				benefit cost ratio	present value of benefits/present value of costs		1.38



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