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Scale: 1:4,500 at A3

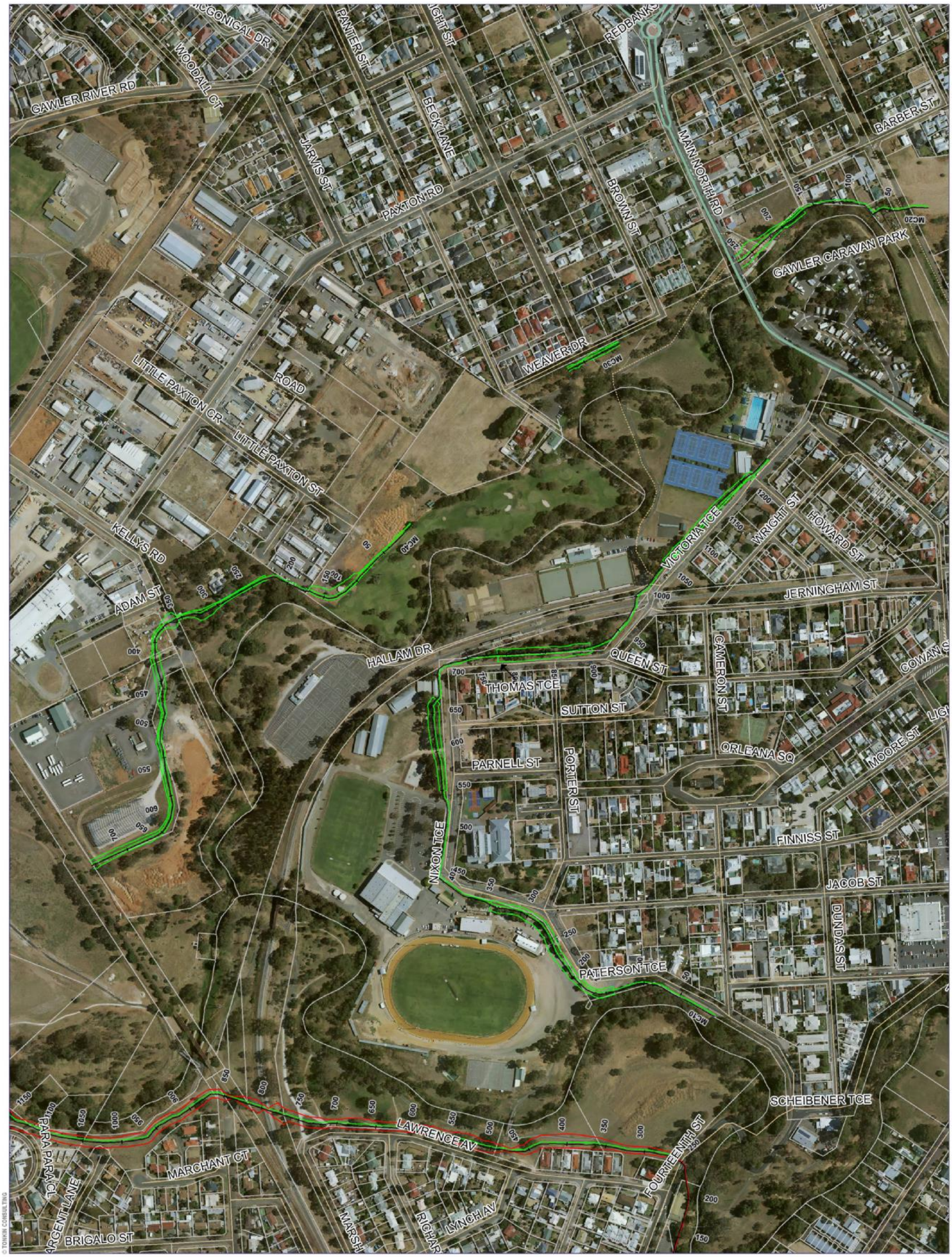
Job Number: 2014.1387
Filename: levee south.wor
Revision: A
Date: 04/09/2017
Drawn: TAK

Data Acknowledgement:

Town of Gawler

LEVEE MC00

Figure 1



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Data Acknowledgement:
Cadastre supplied by PBBI Australia Pty Ltd
?? data supplied by ??
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Town of Gawler

MC10-MC40

Figure 2

Appendix B

Levee Bank Assessment Report

Gawler Stormwater Management Study

Proposed Levee bank route, Vegetation

1 Introduction

As part of the development of strategies for the management of stormwater runoff from the City of Gawler, S.A., it is proposed to construct levee banks to control flooding. At the request of Tonkin consulting, a survey has been undertaken of the proposed route of the levee to examine vegetation and identify any issues, i.e. the location of any regulated or significant trees.

Maps showing the location of the levee are included in Appendix 1 and longitudinal profiles in Appendix 2. This information was supplied by Tonkin Consulting.

2 Field Assessment of Levee Route

As required an inspection was undertaken of the levee route to examine vegetation. Noting whether it is;

- Natural, native
- Planted, non-native, landcaping
- Regulated trees, circumference 2.0 m or more, at 1.0 nm above ground
- Significant trees, circumference 3.0 m or more, at 1.0 m above ground
- Whether in tree protection zones(TPZ) around regulated or significant trees

Also of importance is the degree to which any regulated or significant trees have the base of their trunks buried by the levee.

With regard to the location of the levee banks shown on the maps in Appendix 1, some sections already exist and will be modified, while other sections are new and the shown positions are approximate due to map scaling and would require more accurate positioning in detailed design. In some instances, small variations in the levee position could avoid trees if required.

The levee is on both public and private land. Council contacted all property owners seeking permission for access. All but two agreed. These are identified in the summary table below.

3 Field Assessment Results

The surveys were undertaken in October 2017 on public land and February 2018 on private land, after Council had obtained written consent from property owners for access. The results are summarised in Table 1 below, and various photo point locations (way points) shown on Figure 1. The Eastings and Nothings for these locations is included in Attachment 1.

Table 1 Field Assessment, Summary of Assessment

MC20

Chainage	Photos	Comments / Vegetation Issues	Potential Impact on Important Vegetation
0-200	2,3	Mostly through private properties with planted vegetation	Low
210	1	**significant tree**	High
220 - 270		No vegetation issues	Low

MC30

Chainage	Photos	Comments / Vegetation Issues	Potential Impact on Important Vegetation
0-70		Proposed fill up to 0.7 m. No vegetation issues.	Low

MC40

Chainage	Photos	Comments / Vegetation Issues	Potential Impact on Important Vegetation
0-220		No vegetation issues	Low
220-350		Through private property with planted vegetation. Minor reroute to avoid TPZ of some large trees.	Low
350 - 410	5	No vegetation issues	Low
420	4	Through private property with planted vegetation. Minor reroute to avoid TPZ of one non-regulated non-native tree.	Low
430 - 750	6	Through private property with planted landscaped vegetation. Minor reroute to avoid TPZ of one large tree.	Low

MC10

Chainage	Photos	Comments / Vegetation Issues	Potential Impact on Important Vegetation
0 - 80	28	No vegetation issues.	Low
80	27	Align wall as far from base of **significant tree** as possible	High
80 - 140	25,26	Walled section within TPZ of pepper trees (exotic). No native or regulated tree issues.	Low
140 - 350	22,23,24	Embankment up to 1.7 m high and up to ~10 m wide will bury bases of most trees, all planted non-	High

Chainage	Photos	Comments / Vegetation Issues	Potential Impact on Important Vegetation
		indigenous.	
350 - 550	19	Walled section along footpath up t 1.5 m high in places may need to be moved further east for footings to avoid root damage to trees.	**Moderate**
550 - 750	18,20,21	Bank and walled sections with numerous large **regulated and significant trees** between fence and paved area. Move alignment west to avoid TPZ of trees	**High**
750 - 1000	14,15,16,17	Bank and walled sections need to **negotiate between large significant trees** to avoid their TPZs. Move alignment closer to Thomas Tce where the Railway Station car parking area is, because it is too close to the front **row of significant trees** and well within their TPZs	**High**
1000 - 1100	7,8,9	Along existing embankment with **three significant trees** which will be affected. Move alignment to avoid TPZ of these trees	**High**
1100 - 1180	10,11	Along existing embankment with low planted landscaping shrubs. No tree impacts	**Low**
1180 - 1210	13	Continue walled section or move alignment closer to footpath to avoid burying base of **regulated tree** at ch. 1200	**Moderate**
1210 - 1240	12	Along existing embankment with low planted landscaping shrubs. No tree impacts	**Low**

MC00

Chainage	Photos	Comments / Vegetation Issues	Potential Impact on Important Vegetation
0 - 100	29	No access available through private property. Buildings and trees potentially affected.	**Unknown**
100	31	**Significant tree**. Alignment would be better away from tree outside TPZ	**High**
100 - 260	30,32	Walled section very close to buildings and wall footings may affect large trees on top of embankment around footbridge. Keep outside TPZ of tree at ch. 250	**Moderate**
260 - 480	33,34	One removal of exotic pepper tree at ch. 440 may be necessary. No vegetation issues.	**Low**
480 - 750	35, 36	Embankment up to 15 m wide and 2.5 m high. Two tree bases (one **regulated tree**) at ch. 490 will be buried. Proposed alignment will pass through one large *Schinus molle* (exotic, pepper tree), one *E.*	**High**

Chainage	Photos	Comments / Vegetation Issues	Potential Impact on Important Vegetation
		camaldulensis, and will bury the bases of at least eight other large semi-mature *E. camaldulensis*., some of which are of **regulated** size, and all provide high amenity value. Realignment / use of low wall rather than bank, along footpath at road level will have much less impact	
750 - 870	37, 38, 39	Group of juvenile *E. camaldulensis* could be buried. Alignment passes through TPZ of one **significant** *E. camaldulensis* by rail line	**High**
870	40	**Regulated tree**. Ensure base is not buried by fill for embankment.	**Moderate**
870 - 1100	41,42	Roughly follows existing path along high ground and minor realignments can avoid damage to any trees. No vegetation issues.	**Low**
1100 - 1200	43	Embankment fill will bury bases of some **immature** ***E. camaldulensis***. One or two may require removal.	**Moderate**
1200 - 1250	44	Goat paddock. No vegetation issues	**Low**
1250 - 1350		No entry permission granted. Private property with walled section very close to building and 3-4 large *E. camaldulensis*. **Potential vegetation issues**.	**Unknown**
1350	45	**Significant tree** in very poor condition	**High**
1350 - 1470	46,47	Group of immature *E. camaldulensis* along proposed centreline on top of existing embankment. Possibly use wall not bank	**Moderate**
1470 - 1620	48,49	Alignment should be relocated to follow this embankment. No vegetation issues	**Low**
1620 - 1870	50	Alignment should be relocated to follow this embankment. No vegetation issues	**Low**
1870 - 2000	51	No entry permission granted. Private property. potential impact on 3-4 *Schinus molle* (environmental weed) and one planted *Ficus macrophylla*, probably **significant** size. **Potential vegetation issues**.	**Unknown**
2000 - 2200	52	No entry permission granted. Private property. No apparent vegetation issues.	**Low**
2200 - 2550	53,54	Alignment should be relocated to follow this embankment. No vegetation issues.	**Low**

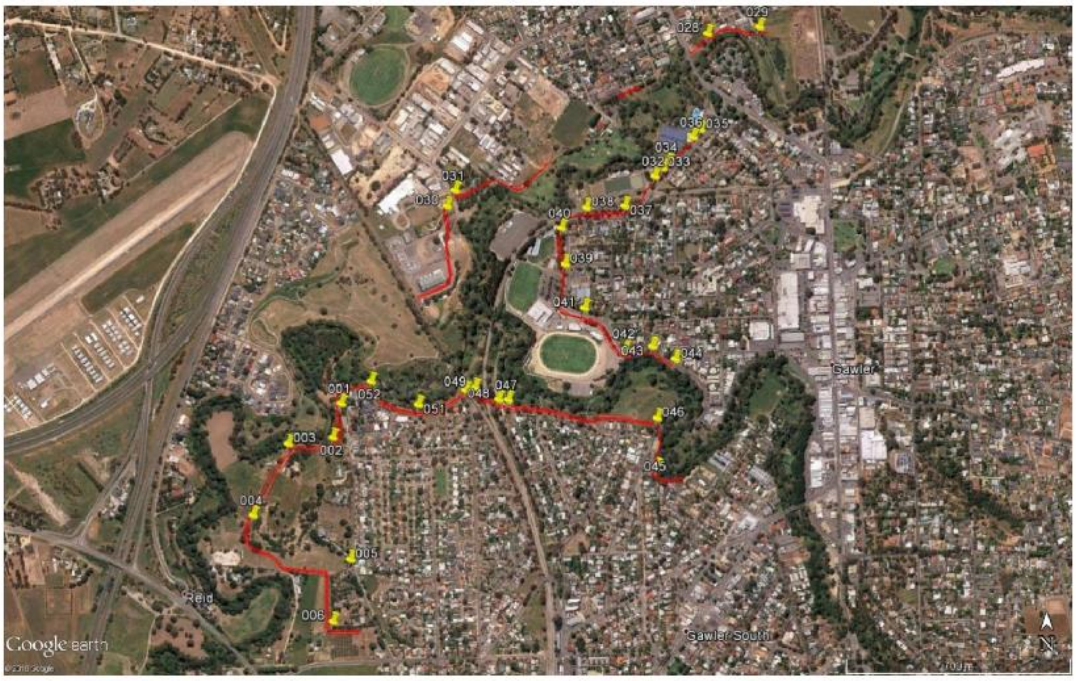

Figure 1 **Locations of waypoints in photo captions**

MC 20

Photo 1 wpt 28 ch 210 E. cam., 1.2m diam., 20 X 13m, Significant, right on top of bank. Move centreline of bank at least far enough so that trunk is not buried. TPZ 14m radius

Photo 2 looking east from ch 160 along walled section – no vegetation issues

Photo 3 looking west from wpt 29 ch 30 – walled section crosses private property. Garden vegetation, no native vegetation issues

MC 40

Photo 4 looking southwest to E. leucoxylon. at wpt 30 ch 420 on centreline of bank. Planted non-native, not Regulated size, 0.5m diam. 12m X 12m healthy. TPZ 6m radius

Photo 5 looking west from wpt 31 ch 360 – no vegetation issues

Photo 6 looking west from gate at end of Kelly Road – alignment passes through a private landscaped area with palms and lower shrubs. Garden plantings, no native vegetation issues

MC 10

Photo 7 looking west to tree at wpt 32 ch 1160, walled section. Right on bank centreline. E camaldulensis. 1.5m diam. Significant tree 23m X 20m. TPZ 15m radius. Move wall alignment

Photo 8 looking north to tree at wpt 33 ch 1120. Close to bank centreline. E cladocalyx. 0.95m diam. Significant tree 20m X 24m. TPZ 11.5m radius. Move bank alignment and/or use wall instead.

Photo 9 looking north to tree at wpt 34 ch 1105. Close to bank centreline. E cladocalyx. 1.05m diam. Significant tree 20m X 22m. TPZ 12.56 radius. Move bank alignment and/or use wall instead.

Photo 10 looking southwest along bank centreline – scope for moving to open area a few metres west to avoid trees

Photo 11 looking northeast along bank centreline – landscaping with shrubs

Photo 12 looking southwest along alignment from wpt 35 ch 1230, start of walled section – landscaping with shrubs

Photo 13 looking west to tree at wpt 36 ch 1200 – E. camaldulensis 1-2m west of bank centreline. Minor burying (0.5m deep) at base. Poor health, Regulated size 0.8m diam. 18m X 12m. Continue walled section or realign closer to footpath

Photo 14 looking northeast from wpt 37 ch 900, end of walled section – negotiate between trees

Photo 15 looking west from wpt 37 ch 900, end of walled section – bank centreline very close to front line of planted row of E. leucox. along parking area. All Significant trees. Will bury bases, and be well within TPZ of all these trees. Move south to edge of car park and/or use wall instead of bank

Photo 16 looking east from wpt 38 ch 780, end of walled section – bank centreline very close to front line of planted row of E. leucoxylon. along parking area. Will bury bases, and be well within TPZ of all these trees (approx.. 12m radius). Move south to edge of car park and/or use wall instead of bank

Photo 17 Looking west from start of walled section – deviate south to be outside TPZ of E. leucoxylon. Significant tree. TPZ 13m.

Photo 18 looking north along bank centreline from wpt 39 ch 550 (start of walled section) – move alignment 15m west to avoid all trees

Photo 19 looking south along wall centreline from wpt 39 ch 550 (start of walled section) – move alignment 10m east along footpath to avoid all trees

Photo 20 looking south from wpt 40 ch 660 (start of bank section) – move alignment 15m west to avoid all trees

Photo 21 looking northeast from wpt 40 ch 660 (end of walled section) – move slightly west to avoid larger trees

Photo 22 looking west from wpt 41 ch 350 (end of walled section) – no vegetation issues

Photo 23 looking east from wpt 41 ch 350 (start of bank section) – bank may bury base of one Lophostemon conferta (planted, not regulated tree) – scope for minor realignment to avoid all trees and other infrastructure

Photo 24 looking northwest from wpt 42 ch 160 (20m from end of bank section) – bank buries bases and passes through row of Bracychiton gregorii (planted, not Regulated size trees) – scope for realignment to avoid all trees and other infrastructure

Photo 25 looking east from wpt 42 ch 160 (20m from end of bank section) to tree at wpt 43 ch 80 along walled section – no native vegetation issues

Photo 26 looking east from end of bank section to tree at wpt 43 ch 80 along walled section – inside TPZ of all Schinus molle trees, but area already very compacted. These trees are non-native, non Regulated

Photo 27 looking west to tree at wpt 43 ch 80 E. cladocalyx 1.8m diam. 30m X 25m, Significant tree. Root zone already heavily impacted by paving and compaction, but tree health apparently good. Align walled section as far from base of this tree as possible.

Photo 28 looking northwest from end of walled section wpt 44 ch 0 (end MC10) – no vegetation issues

MC00

Photo 29 looking east from wpt 45 ch 100 – private property, numerous large trees. Proposed embankment appears to be sited on top of dwelling and outbuildings – unknown vegetation issues, not surveyed due to lack of access permission.

Photo 30 looking north from wpt 45 ch 100 (start of walled section) – planted landscaped shrubs around car park and public buildings

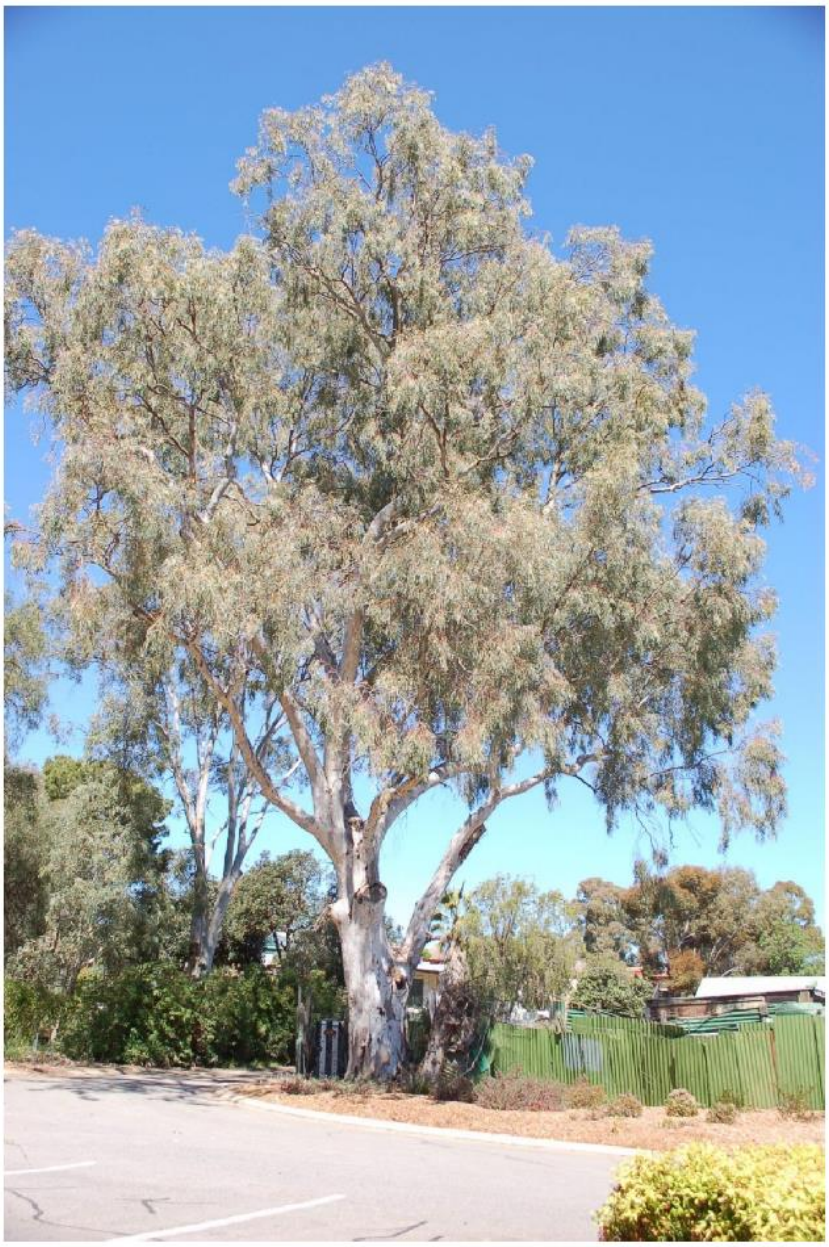

Photo 31 looking south to tree at wpt 45 ch 100 approx. 2m from centreline, at end of bank section. E. camaldulensis. 1.1m diam. Significant tree, 20m X 20m. Already paved to 1.5m from base (inside SRZ of tree), excavation and wall footings may affect tree further. Would be better to be further away from tree.

Photo 32 looking south from wpt 46 ch 260 along wall section (start of bank section) – no vegetation issues

Photo 33 looking west along alignment from wpt 46 ch 260 along bank section – no vegetation issues

Photo 34 looking east from path to footbridge – bank passes 3m south of large old Schinus molle tree at ch. 440. Base will be buried. Non-native, non Regulated tree

Photo 35 looking west from path to footbridge – proposed alignment follows lower level footpath, requiring fill and embankment which will bury bases of two trees. Realignment / use of low wall rather than bank, along footpath at road level will have much less impact.

Photo 36 looking east along alignment from wpt 47 ch 730 – proposed alignment will pass through one large Schinus molle one E. cam. and will bury the bases of at least eight other large semi-mature E. camaldulensis., some of which are of Regulated size, and all provide high amenity value

Photo 37 looking east along alignment from wpt 47 ch 730 toward railway line – group of juvenile E. camaldulensis may be affected by burying. Alignment passes through TPZ of one large E. camaldulensis by rail line, 23m X 23m, Significant tree.

Photo 38 looking north to tree at wpt 48 ch 770 on centreline of embankment. Planted E. cladocalyx, spreading, poor form 0.4m diam.,11m X 15m.

Photo 39 looking east to railway line from wpt 49 ch 840 (on centreline, on other railway line) – no vegetation issues

Photo 40 looking west along alignment from wpt 49 ch 840. One E. camaldulensis. Wpt 50 ch 870, on centreline, 0.8m diam. 13m X 18m, Regulated size. Deviate alignment to avoid.

Photo 41 looking east along alignment from wpt 51 ch 1040 – no vegetation issues

Photo 42 looking west along alignment from wpt 51 ch 1040 – occasional small tree in batter zone

Photo 43 Looking east along alignment from wpt 52 ch 1200. One immature 0.3m diam. on centreline may require removal

Photo 44 Looking west along alignment from wpt 52 ch 1200 – private goat paddock. No vegetation issues

Photo 45 E. camaldulensis on alignment at wpt 1 ch 1350 – Significant Tree in very poor condition. 16m X 15m. Central trunk burnt out, numerous major limb failures

Photo 46 Looking south along alignment from wpt 1 ch 1350 – Start of bank section. Group of immature E. camaldulensis along proposed centreline on top of existing embankment. None Regulated size. Possibly use wall not bank.

Photo 47 Looking north along alignment from wpt 2 ch 1470 – Group of immature E. camaldulensis along proposed centreline on top of existing embankment. None Regulated size.

Photo 48 Looking west along alignment (and existing driveway) from wpt 2 ch 1470 –No vegetation issues

Photo 49 Looking northeast along existing bank from wpt 3 ch 1620. Alignment should be relocated to follow this embankment. Planted mixed Eucalypt varieties, all immature, none Regulated size. No vegetation issues.

Photo 50 Looking south along existing bank from wpt 3 ch 1620. Alignment should be relocated to follow this embankment. No vegetation issues

Photo 51 Looking south along existing bank from wpt 4 ch 1870. Alignment should be relocated to follow this embankment. Chainage 1870 to 2200 not surveyed due to lack of access permission. Ch 1870 to ch 1970 – potential impact on 3-4 Schinus molle (environmental weed) and one Ficus macrophylla. F. macrophylla planted, probably Significant size, requires assessment.

Photo 52 Looking west towards alignment at ch 2200 from wpt 5 on Penrith Ave– Alignment should be relocated to follow this embankment. Chainage 1870 to 2200 not surveyed due to lack of access permission. No vegetation issues expected.

Photo 53 Looking north along existing bank from wpt 6 ch 2370. Alignment should be relocated to follow this embankment. Minor patch of Acacia spp. regrowth on embankment at chainage 2310. No vegetation issues.

Photo 54 Looking east along existing bank from wpt 6 ch 2370. Alignment should be relocated to follow this embankment. No vegetation issues

Attachment 1 **Way point Eastings and Northings**

WPT	Easting	Northing
1	292066	6168883
2	292042	6168778
3	291904	6168755
4	291800	6168532
5	292104	6168404
6	292055	6168211
28	293176	6170048
29	293334	6170073
30	292381	6169499
31	292404	6169548
32	293021	6169606
33	293045	6169632
34	293061	6169649
35	293160	6169752
36	293137	6169728
37	292930	6169511
38	292812	6169503
39	292750	6169328
40	292736	6169439
41	292813	6169194
42	292942	6169072
43	293025	6169081
44	293098	6169043
45	293048	6168708
46	293046	6168860
47	292582	6168906
48	292553	6168907
49	292479	6168942
50	292449	6168933
51	292305	6168885
52	292157	6168953

Appendix D – Development potential discussion paper

GAWLER + SURROUNDS STORMWATER MANAGEMENT PLAN

DISCUSSION PAPER

Prepared by:

Jensen PLANNING + DESIGN

October 2016

Document Quality Control

Project Name	Gawler and Surrounds Stormwater Management Plan
Project Number	P1715
Client	Tonkin Consulting
Document	Discussion Paper
Document File Name	P1715 -V2 Final Discussion Paper 20Oct16
Author of Document	PJ

Version	Date of Document Release	Name of Person/s document was released to	Method of Release	Authorised By	Authorisation Date
1	20 October 2016	Tim Kerby	Email	PJ	20 October 2016

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1 BACKGROUND

1.1 Purpose of this Discussion Paper

The Town of Gawler, with the support of Light Regional Council, The Barossa Council and the City of Playford, is undertaking a Stormwater Management Plan for Gawler and its surrounds. The Stormwater Management Plan involves the preparation of stormwater modelling for the region, and the analysis of current and future land use, zoning and demographic trends.

Gawler and the surrounding areas are identified to experience significant growth in the future. As identified in the State's 30 Year Plan for Greater Adelaide, there are both existing and planned urban lands around Gawler including Evanston, Gawler East, Concordia, Hewett, Gawler Belt and Roseworthy which will support an increased population. With this residential growth there is anticipated to also be an expansion of employment opportunities within the Kingsford Regional Industrial Estate and at Roseworthy.

The Study Area includes most of the Town of Gawler, and some but not all of the growth areas identified within the 30 Year Plan.

Currently there is no stormwater management plan that documents how stormwater will be managed to accommodate future growth in the Study Area catchment, improve the levels of service of the existing stormwater drainage infrastructure to reduce the risk of flooding, improve the quality of stormwater runoff, maximise harvesting and reuse of stormwater runoff and maintain or improve the health of existing natural and engineered watercourses.

There are several significant rural and urban watercourses within the existing urban area of Gawler that have not been assessed with respect to the risk of flooding or the establishment of the water quality impacts on receiving waterways. Likewise there has been no detailed assessment of the risk of flooding within areas outside of Gawler likely to experience residential and employment land growth.

This report has been prepared by Jensen Planning + Design, in collaboration with Tonkin Consulting, to identify the full development potential of the Study Area in order to inform stormwater modelling and future Development Plan policy. This is necessary to consider the relationship between stormwater management and levels of imperviousness in the urban and rural living areas across the Study Area.

This report has had regard to key strategic policy directions for future growth of Adelaide and particularly the Barossa region of the 30-Year Plan for Greater Adelaide, as well as existing Development Plan policies relating to achievable

densities, levels of site coverage possible and stormwater management policies guiding development outcomes.

Specifically, this report considers:

- **Development potential and likely population growth – based on**
  - Department of Planning, Transport and Infrastructure (DPTI) population projections.
  - Additional population growth based on major new developments (primarily residential and industrial)
  - Additional population growth based on infill opportunities in existing residential and industrial zoned land
  - Information on constraints such as heritage listed properties, flood plain and zones.
- **Council Development Plans, Strategic Plans and Infrastructure Plans**
- **Implications of development potential for imperviousness**

2 STUDY AREA

2.1 Location

The project Study Area, as shown in **Figure 1,** lies within the four jurisdictions of the Town of Gawler, Light Regional Council, City of Playford and The Barossa Council. The study area includes:

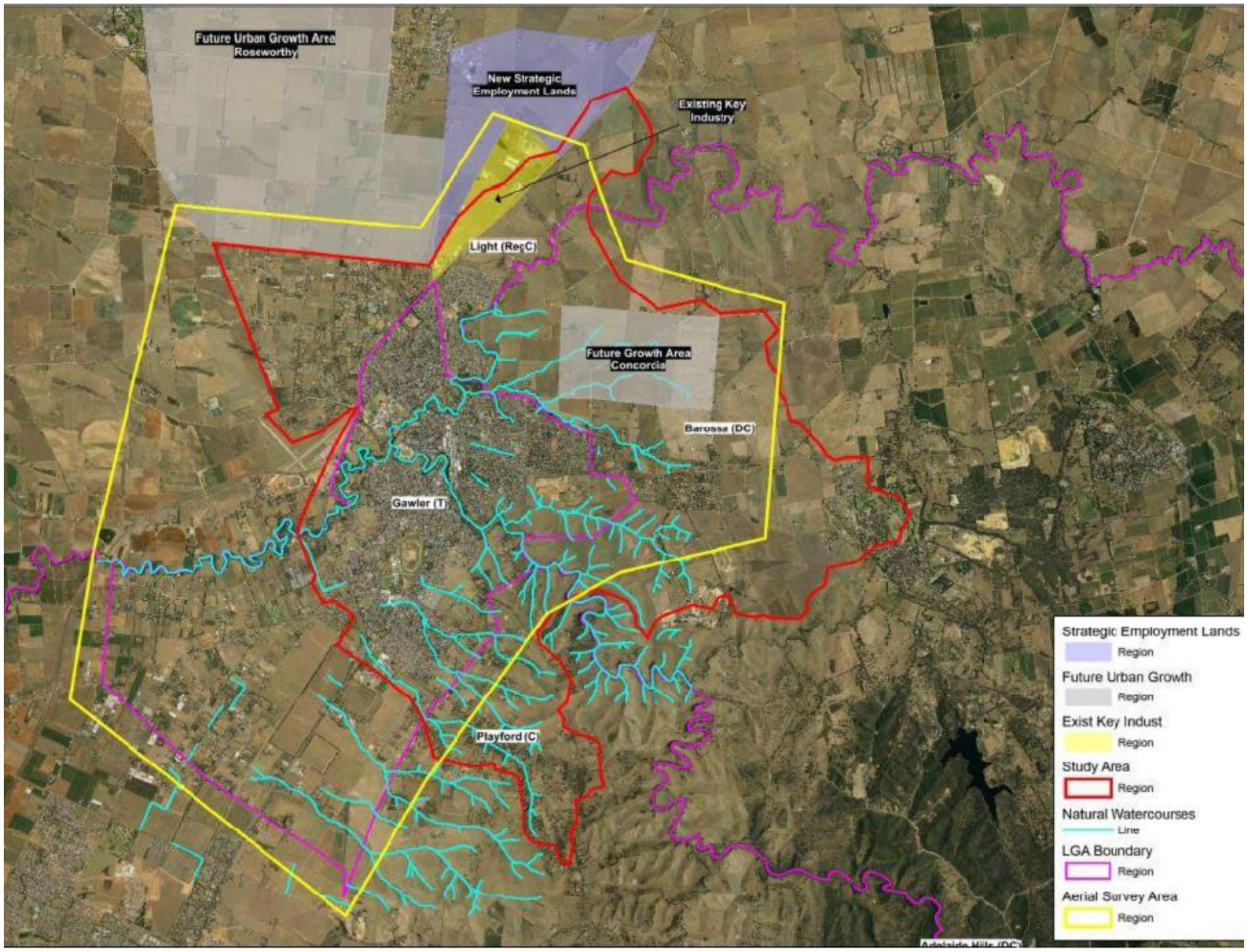
- The Town of Gawler, north of the Evanston catchment area that discharges to the Smiths Creek catchment.
- Gawler Belt, Hewett and Kingsford within Light Regional Council.
- The future Concordia growth area and Kalbeeba, within The Barossa Council.

2.2 Existing Stormwater Catchment

The natural watercourses within the Study Area are also shown in **Figure 1**. The natural watercourses typically have catchments extending to the east and are bounded by the foothills of the Mount Lofty Ranges. The North Para River and the South Para River are the dominant natural watercourses, converging within the Town of Gawler to form the Gawler River, which ultimately discharges to the Gulf St Vincent.

Stormwater runoff within the Study Area is captured and conveyed by a range of methods including; stormwater pits and underground pipes, box culverts and open channels. There are stormwater detention basins scattered throughout the Study Area to reduce peak flow rates. To a lesser extent there are water quality treatment devices in the form of sediment basins, wetlands and gross pollutant traps, to improve stormwater quality discharging to the receiving waterways. Additionally, the Gawler River and South and North Para Rivers carry some stormwater run off.

There is a significant amount of new and proposed development within the study area. The Gawler Water Reuse Scheme (GWRS) has constructed infrastructure within the study area to provide a stormwater harvesting and non-potable water supply to selected areas including the Bunyip Water pipeline. The Gawler River Floodplain Management Authority (GRFMA) has undertaken floodplain mapping of the North and South Para Rivers and the Gawler River, within the study area.



gure 1 - Study Area

2.3 Existing Zoning and Land Use

Land within the study area comprises a range of activities characterised by the central business district of Gawler with the dominant form outside of this area comprising residential, rural residential and primary production, as well as areas of industrial / commercial, reserve and recreation / open space, predominantly around the Gawler township (refer **Figure 2**).

Kingsford Regional Industrial Estate forms the majority of the industrial land use within the study area, and is currently zoned 'Industry' under the Light Regional Council Development Plan.

The existing land use reflects the existing zoning in the area, with the majority of the Study Area covered by primary production, residential and rural living zones (refer **Figure 3**). The Roseworthy Township Expansion DPA is currently being finalised and as such the future Residential Zone, Suburban Neighbourhood Zone and Employment Zone are respectively not shown on the zoning map. The area subject to the DPA is not within the study area and as such is not considered as part of this Discussion Paper.

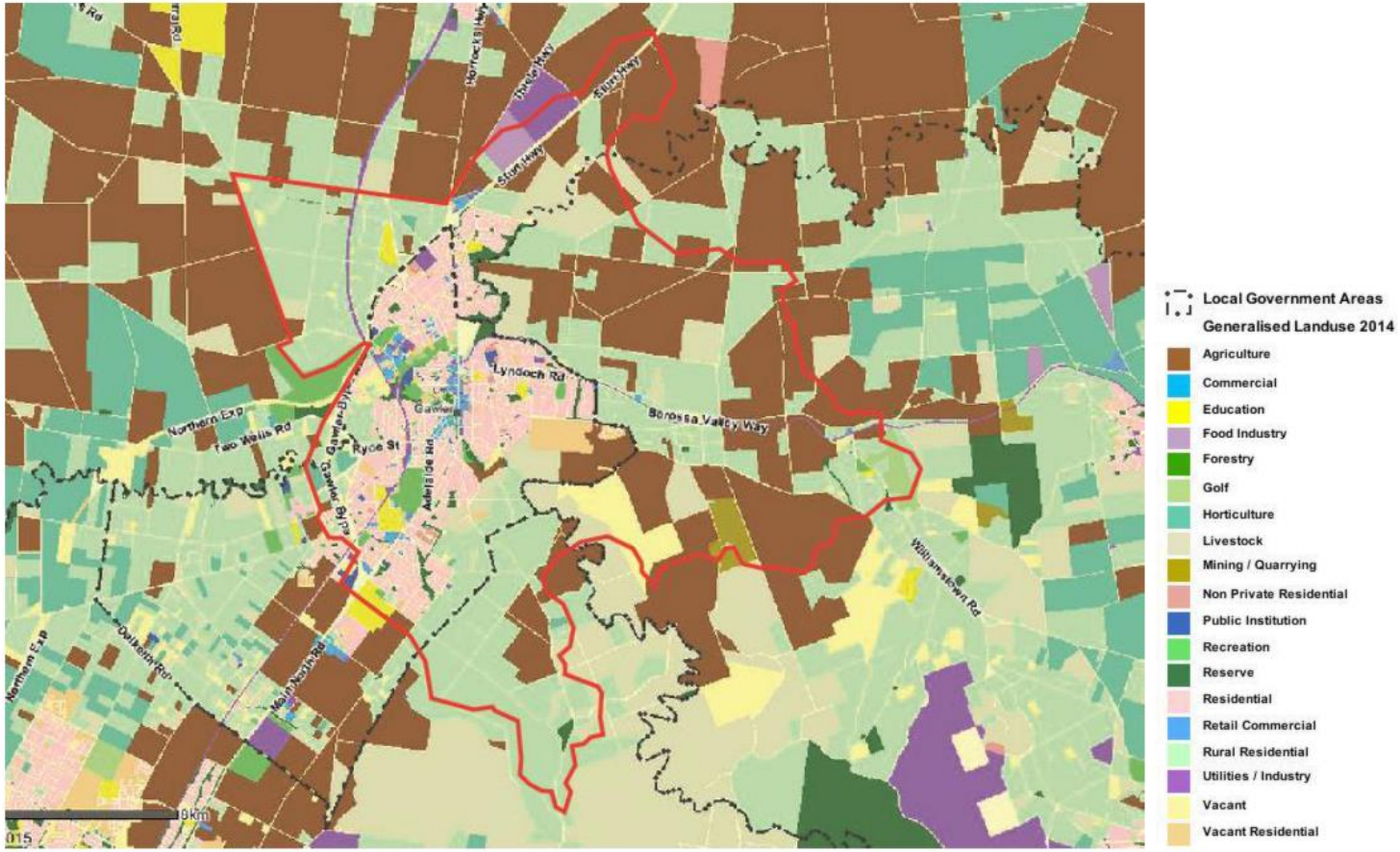


Figure 2 - Existing Land Use

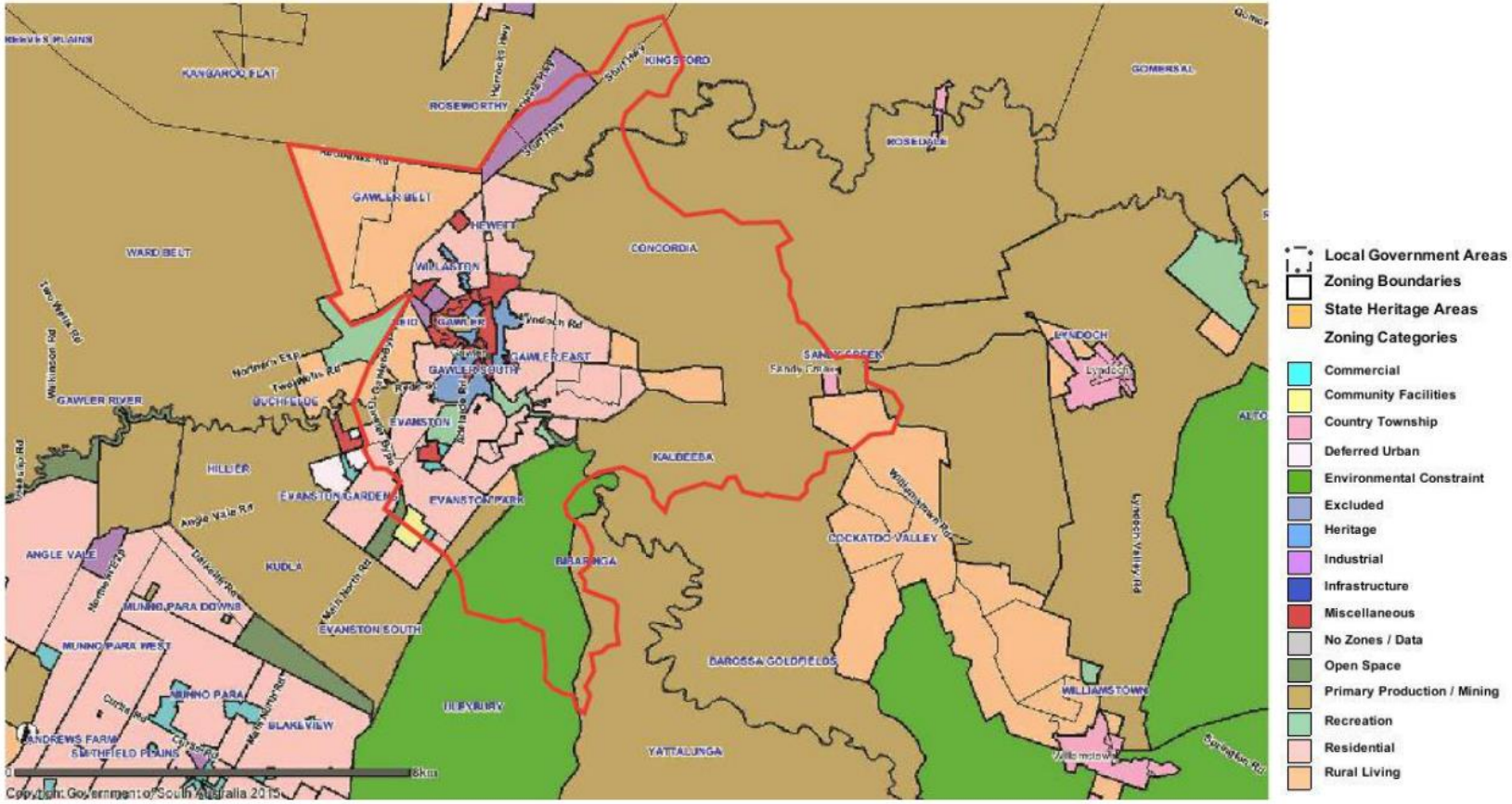


Figure 3 - Existing Zoning

2.4 Existing Heritage Places

There are a number of state and local heritage places located within the Study Area as shown in **Figure 4**. The majority are located within and surrounding the township of Gawler.

Some of the Study Area which lies within the jurisdiction of the Barossa Council is covered by the Character Preservation District, as well as the northern most portion of the Study Area within the Light Regional Council.

The Character Preservation District seeks to protect the natural form and landscape character of the land. Specifically, it seeks to retain scenic and rural landscapes, ensure that development does not diminish rural character and heritage, and the long term use of land for primary production is promoted. The contribution to tourism is also promoted. The policies encourage residential development to occur within townships, settlements and rural living areas, with no expansion of rural living and settlement zones outside of townships.

The proposed Environment and Food Production Area (EFPA) surrounds the built up area of Adelaide from the north of the Gawler River, following the foothills southwards, along the western boundary of the McLaren Vale Preservation District and back towards the coast south of Sellicks Beach. Some of the study area lies inside of the EFPA boundary, including the Gawler Belt area and Bibaringa. The EFPA is part of the Planning, Development and Infrastructure Bill that was ascended to in April 2016, and will be legislated when the Act is enacted. Areas within the EFPA will only be able to be developed for urban purposes if both Houses of Parliament agree. Land divisions to produce additional residential allotments within the EFPA will only be approved if the land is within a 'rural living area', and all of the following criteria is met:

- The application is lodged within 2 years of operation of the Act
- The allotment size sought is the same as or larger than that allowed by planning rules that applied on 1 December 2015
- The local Council and State Planning Commission concur on the approval.

As a result of the EFPA (when it is enacted), there will be little change to the existing built form to the areas within the Study Area that are subject to it.

Figure 5 illustrates the extent of the Character Preservation District and the EFPA. It is noted that the urban growth area of Concordia is not included within the Character Preservation District or the EFPA.

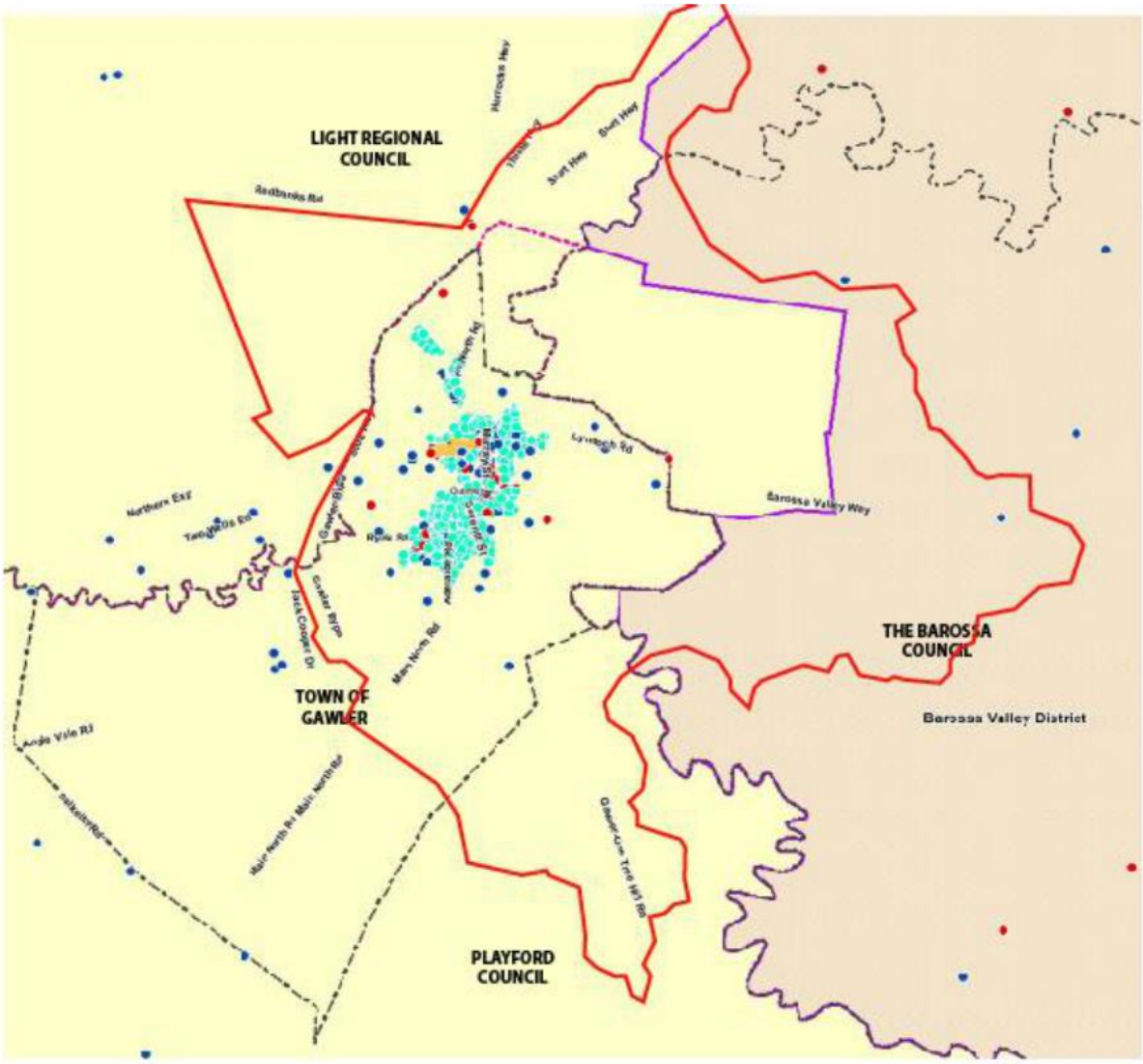


Figure 4 - Heritage Places and Character Preservation Districts

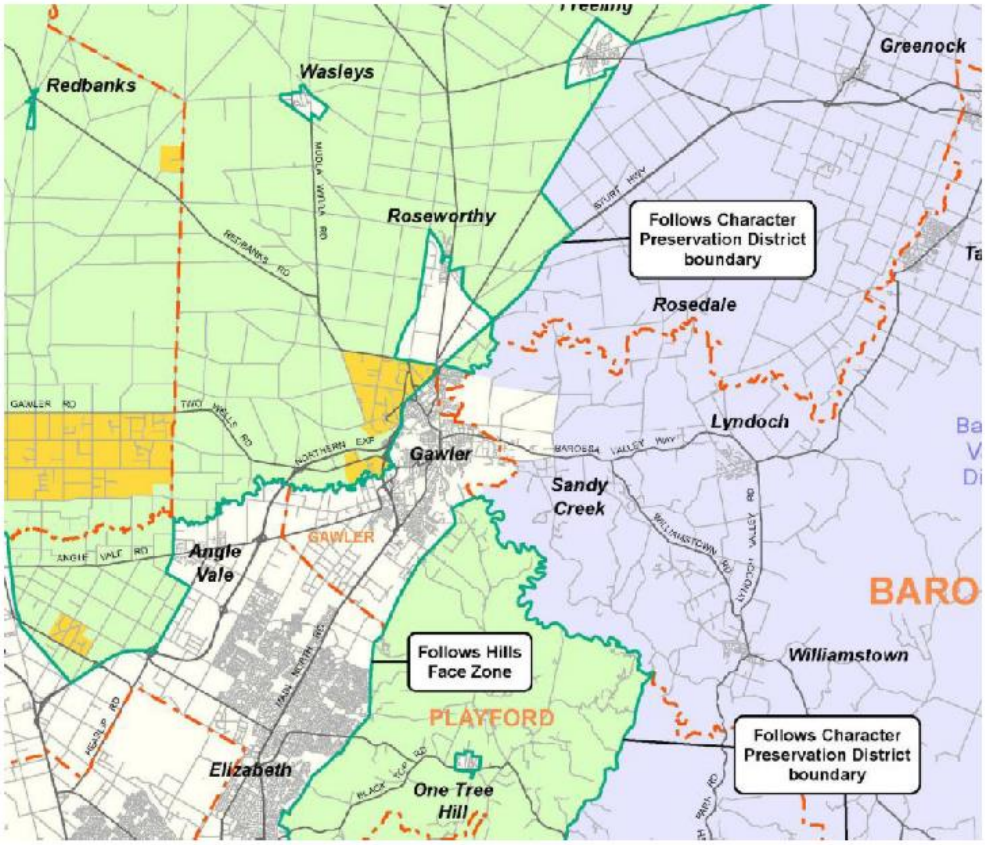


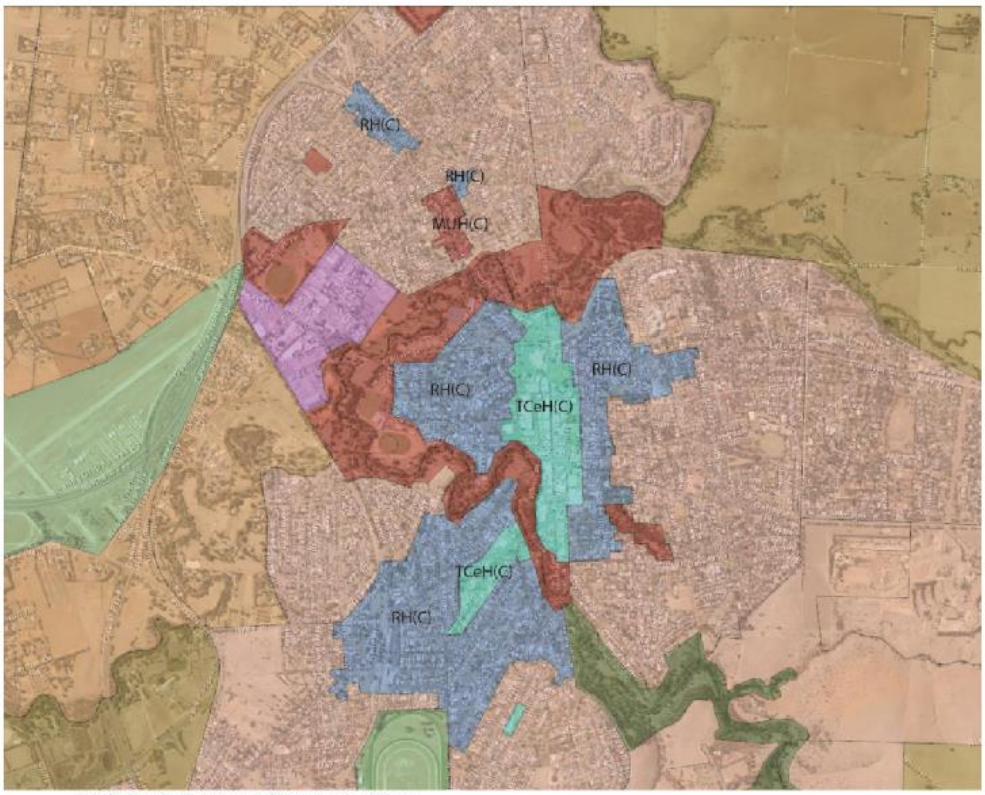
Figure 5 - Extent of Character Preservation District (purple) and EFPA (green) (Source: DPTI)

2.4.1 Conservation Zones

Areas within the Town of Gawler include various Historic (Conservation) Zones, shown in **Figure 6** below. Historic (Conservation) areas within the Study Area are not likely to experience any significant development, with the majority of any development likely to be in the form of additions and outbuildings.

These areas form approximately 20% of the total area of the Town of Gawler, and it can be expected that due to the limitations placed on development through Council policy, the resulting increase in imperviousness for these areas will be nominal.

There are no further Conservation Zones outside of the Town of Gawler within the Study Area.



RH(C) - Residential Historic (Conservation) Zone
TCeH(C) - Town Centre Historic (Conservation) Zone
MUH(C) - Mixed Use Historic (Conservation) Zone

Figure 6 - Heritage Conservation Zones within Study Area

3 EXISTING POPULATION

3.1 2011 Population

Table 1 provides an overview of the population in 2011 within the Study Area using ABS census data. As the Study Area does not follow the boundaries of the smallest population statistics available (State Suburbs or SSCs), a visual analysis has provided estimates of the population living with the Study Area, and has been discounted from the overall population (see **Figure 7** for boundaries). While some SSCs have approximately 50% of their area within the Study Area, the percentage of population living within the area may differ, and as such may result in more or less of the population living within the Study Area.

The estimated number of dwellings is based on the average people per household (based on 2011 ABS census data), and is as follows:

- Town of Gawler: 2.4 per household
- Light Regional Council: 2.8 per household
- Barossa Council: 2.5 per household
- Playford Council: 2.6 per household

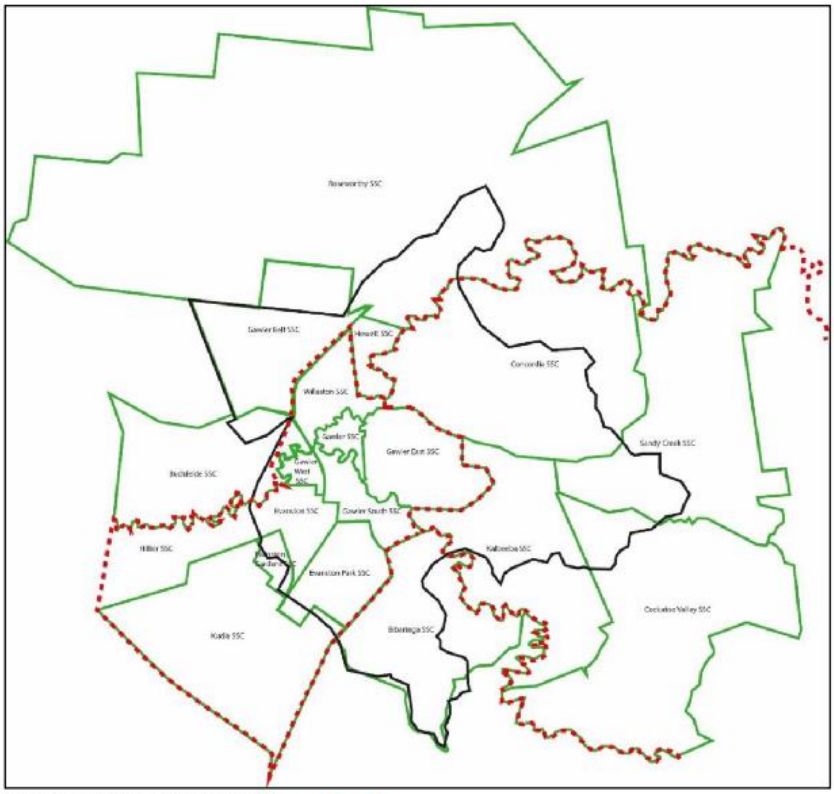
Table 1 - Population Statistics (Source: ABS Census Data 2011)

Suburb	Population 2011	Physical Area within Study Area	Estimated Population within Study Area	Estimated Number of Dwellings
Town of Gawler				
Gawler	688	✓	688	287
Gawler South	2435	✓	2435	1015
Gawler West	1003	✓	1003	418
Gawler East	4740	✓	4740	1975
Kudla	694	X	0	0
Hillier	796	X	0	0
Evanston	1988	✓	1988	828
Evanston Park	4001	✓	4001	1667
Evanston Gardens	921	50%	460	192
Willaston	3294	✓	3294	1372
Subtotal	*20,560*		*18,609*	*7,754*

Table 1 (cont.) - Population Statistics (Source: ABS Census Data 2011)

Light Regional Council				
Roseworthy[T]	1216	20%	20	7
Hewett	2755	✓	2755	984
Gawler Belt	954	50%	800	286
Buchfelde*	359	50%	180	64
Subtotal	*5,284*		*3,755*	*1,341*
Barossa (DC) – Barossa				
Kalbeeba^	375	50%	375	150
Concordia	140	50%	140	56
Sandy Creek	439	20%	439	174
Cockatoo Valley	517	20%	10	4
Subtotal			*964*	*384*
Playford Hills (C)				
Bibaringa	347	50%	250	96
Total	**27,662**		**23,578**	**9,575**

Notes:
[T]There is no SSC data available for Kingsford (which is partially within the study area) as it is a Gazetted Locality of the wider Roseworthy SSC.
*there is no SSC data available for Reid (which is wholly within the study area), as it is a Gazetted Locality of the wider Buchfelde SSC. It is estimated that half of the population living within Buchfelde lives within the study area.
^the Kalbeeba area includes a large amount of land to the south of the border outside of the study area, however from a visual analysis, the amount of properties outside the study area is nominal.



Local Government Boundary
SSC Boundary
Study Area

Figure 7 - State Suburb Boundaries for Population Data

In the absence of data being available specifically for the Study Area, and utilising a visual estimate and census data available for 2011, it is estimated that the population living within the study area in 2011 was approximately **23,578**.

3.2 Population Projections to 2016 (current)

Table 2 provides an estimation of the 2016 population based on the latest DPTI figures available. Data is available for the Town of Gawler as a whole only, and doesn't exclude the areas of Kudla and Hiller that lie outside of the Study Area. To accommodate this, we have estimated that the area of Kudla and Hillier will have a growth rate of approximately 50 people per year, and have discounted the 2011 population from the population projection data.

Table 2 - 2016 Population Estimates

	2011	2016
Town of Gawler (within Study Area)	18,609	21,382*
Other areas within Study Area	4,969	5,222^

*This figure assumes a 2.8% increase per annum as per DPTI figures
^This figure assumes an approximate 0.5% increase per annum (Jensen Planning + Design estimate)

4 LONG TERM POTENTIAL FOR GROWTH WITHIN STUDY AREA

4.1 Overview

It is important to gain an understanding of the actual location and nature of any future development sites planned in the Study Area. As identified within the 30-Year Plan for Greater Adelaide, growth projects within the Study Area include:

- An additional 7,500 - 10,000 households to be located within Concordia
- An additional 4,000 households within Gawler East

The exact timing of growth within Concordia is unknown, and part of the site within Gawler East (Springwood) is currently under construction. An overview of each major development site is provided in the following sections.

4.2 Town of Gawler

4.2.1 Infill Development

As discussed in Section 2.4, the Town of Gawler includes Historic (Conservation) zones where there will be limited infill development (e.g. alterations / additions, replacement of homes that do not contribute to the heritage character, some medium density housing on larger sites (refer Section 6.1.2), etc).

The residential areas within the Town of Gawler comprise two different typologies. The first is the older parts of the town that generally consist of larger allotments with smaller homes and low site coverage. As time evolves it can be expected that these properties will be redeveloped at higher densities and higher site coverages.

The second typology comprises more recent housing subdivisions and estates (generally post 1980's), where allotments are generally smaller and houses larger. Given the more recent construction and higher site coverage it is expected that future development will largely comprise alterations and additions, with minimal redevelopment at higher densities. Within these more established areas there are still some smaller pockets of vacant land suitable for significant subdivision, including an area south of Ryde Street and east of Jack Cooper Drive.

Other areas that do allow for growth within the Town of Gawler are those areas zoned Industrial and to a lesser extent, Rural Living.

4.2.2 Greenfields Development

A large amount of "green-field" land within the Town of Gawler has recently been rezoned from rural to Residential and Deferred Urban. This land was identified in the 30-Year Plan for Greater Adelaide as Planned Urban Lands to 2038, with the Housing and Employment Land Supply Program Report 2010 suggesting the urban land supply identified for Gawler was considered unlikely to meet the projected demand over a 15 year period.

While the economic downturn slowed Gawler's residential growth rate in 2011 with only 158 new dwellings approved, dwelling approvals in 2012 increased by 58% to 268, which is comparable with the residential growth rate anticipated in the Housing and Employment Land Supply Program Report 2010.

Gawler has approximately 350ha of 'greenfield' land zoned Residential and 100ha of land zoned Deferred Urban (located outside of the Study Area). This Deferred Urban land has been earmarked for potential residential development and represents the next logical step in delivering orderly and sequential development in the Evanston Gardens / Hillier area. All of this land is required to meet Gawler's predicted growth.[1]

The Town of Gawler's Residential Zone stipulates that site coverage should not exceed 50% in low hazard flood risk areas, 40% in medium hazard flood risk areas, and 30% in high hazard flood risk areas.

The significant amount of rural living allotments within the Study Area is important to consider, given that these allotments are typically capable of on-site stormwater management.

New South Urban Area

An additional 3,000 dwellings are anticipated to be developed within the Evanston Gardens area. A very small portion of this development lies within the Study Area (in the south-west).

[1] *Town of Gawler, 2013, Strategic Directions Report*

Gawler East

Since the review of the State Government's urban boundary in 2007, the Gawler East area has been rezoned and is now being developed. 'Springwood', a 220ha site, involves the planned construction of a master-planned community that will house approximately 2,000 – 2,500 households upon completion. The site is located 1.2km from the main street of Gawler along Calton Road. The development was initiated by Lend Lease (refer to **Figure 8** for the original Lend Lease Master Plan), but is now being completed by a new development company.

Figure 8 - Springwood Master Plan (source: Lend Lease)

Within the Gawler East area most recently rezoned to residential is another 130 hectares (approx.) of land located north of Potts Road and either side of Gawler-One Tree Hill Road) which will lead to another potential 1000-1500 dwellings (noting that most of this land is undulating).

Gawler East lies wholly within the Town of Gawler, and as such its drainage strategy is largely regarded to be the Councils responsibility. The Barossa Council has noted

that a portion of the stormwater discharge from the Gawler East ("Springwood") area flows through private properties in the Kalbeeba West Area within the Barossa Council, and continues to create issues for property owners. The water re-enters the Town of Gawler area near the railway crossing on the Barossa Valley Way.

4.2.3 Population and Dwelling Projections for the Town of Gawler within the Study Area

Table 3 provides a long term population and dwelling projection for the Town of Gawler, excluding the areas of Kudla and Hillier as they do not lie within the Study Area. The estimated increase in dwellings is based on the population data, at a rate of 2.4 persons per dwelling (the 2011 ABS Census average for the Town of Gawler).

Table 3 - Long Term Population and Dwelling Projections for Town of Gawler (Source: Based on DPTI population projections)

	2011	2016	2021	2026	2031
Population	18,609	21,382	23,411	25,495	27,147
Dwellings	7,753	8,909	9,754	10,622	11,311

4.2.4 Non-Residential Infill

Industry Zones

Gawler has approximately 14 hectares of land zoned General Industry and approximately 18 hectares of land zoned Light Industry (see **Figure 9**). While there appears to be a number of vacant allotments in the General Industry Zone, the number of vacant sites in the Light Industry Zone is substantially less.

In order to accommodate additional employment targets and demand for industrial activity to service the larger population, consideration has been given to further utilising the existing industry zoned areas within the Study Area.

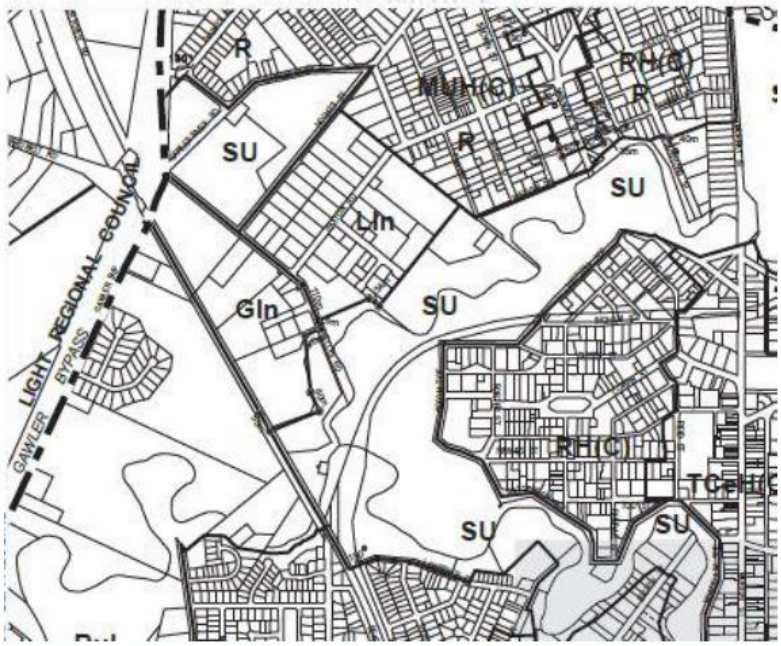


Figure 9 - Industry Zones within the Town of Gawler (Source: Gawler Development Plan)

Commercial and Centre Zones

Gawler has a number of existing commercial/retail precincts including:

Name	Gross Floor Area (sqm)	Vacancy Rate (approx.)
Cheeky Shopping Centre	1,050	12.4%
Gawler's Town Centre (Main North Road/Potts Road)	49,440	3%
Gawler Park	11,170	3%
Hewett	860	16%
Main North Road	900	
Gawler By-Pass Motel	550	0%
Willaston	2,850	9%
Gawler Green	5,900	

Source: Town of Gawler, Strategic Directions Report 2013-17, p. 21

Gawler also has a number of planned commercial/retail precincts including:

Name	Potential Gross Floor Area (sqm)
Gawler East	10,000
Trinity area Local Shops	1,500

Source: Town of Gawler, Strategic Directions Report 2013-17, p. 21

Many of the commercial and centre zones that exist within the Study area are located along the corridor identified for growth within the 30 Year Plan. To accommodate the demand for employment and service needs of the growing population, it is expected that these locations would be developed to their full potential. It is therefore likely that, similar to industry land, the bulk of these areas would have near complete coverage of land for buildings, access ways, car parks and other hardstand areas for servicing of retail and commercial uses. Permeable areas are likely to be limited to landscaped areas within car parks, along road frontages and where small plazas and other gathering areas are proposed. These spaces are anticipated to be less than 10% of the overall site.

Open Space Zones

It is assumed that Open Space Zones would stay as is, including the Gawler Sport and Recreation facility. These will increase in importance into the future as population density increases. It has also been assumed that open spaces identified within master planned growth development (and those reflected within existing Concept Plan Maps in Development Plans) will be retained for such purposes, and within the identified scale and format.

Council is establishing an open space corridor along Main North Road on the entrance to Gawler within the land zoned for urban purposes. This land is primarily in public ownership.

The location of the Open Space corridor is depicted in Councils' Development Plan in MAP Ga/1 (Overlay 1) Enlargement H (Evanston Gardens/Evanston South Structure Plan) as shown below in **Figure 10**.

The open space corridor will be approximately 45 hectares in area and straddle Main North road with a linear reserve of between 100 -200 metres either side of the road. Approximately 95% of this land is currently being vested in Council's care and control through land division processes. Council has indicated that it intends to utilise the land for a combination of active and passive recreational activities, in an open landscape character.

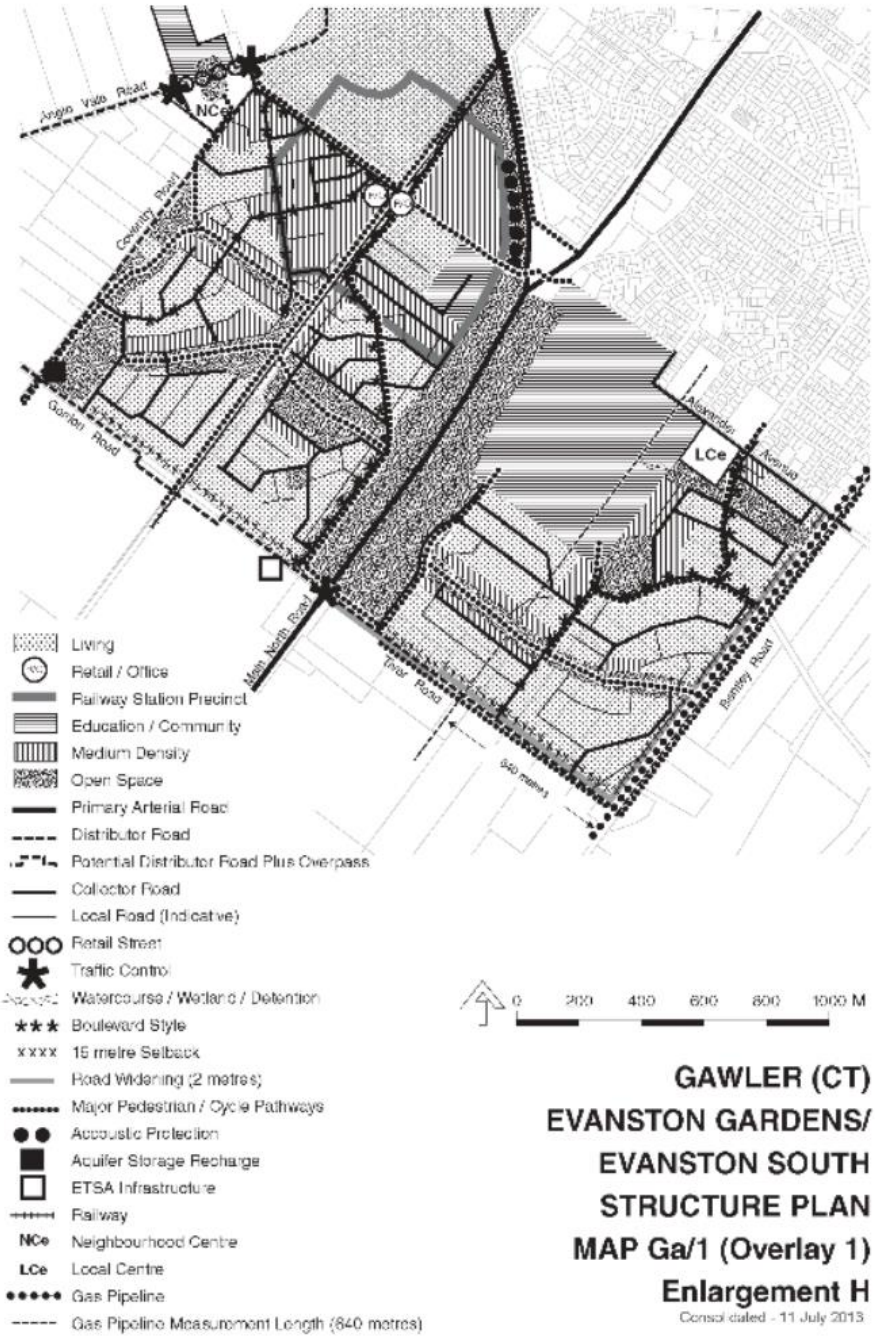


Figure 10 - Evanston Gardens/Evanston South Structure Plan (source: Town of Gawler Development Plan)

4.3 Barossa Regional Council

4.3.1 Concordia

The Concordia township is identified as a future growth area in the State Government's 30-Year Plan for Greater Adelaide. The planning strategy envisages future urban development to the order of approximately 580 hectares of land.

Masterplanning for the Concordia development is underway, and is expected to result in a largely self-contained and finite development comprising housing, a town centre, community facilities, and open space / drainage network and local centres serving individual neighbourhoods. Designed to preserve and enhance the qualities and character of the Barossa Valley and its townships, Concordia will accommodate the majority of the Barossa Valley's forecast growth. This strategy will significantly reduce demand for additional urban land on the fringes of the Barossa Valley's existing townships.

There have been various estimates of future population expectations for Concordia, but the latest estimate suggests that a long term population of approximately 20,000, equating to approximately 8,500 dwellings.

It is expected that the Concordia development area will drain into the North Para River upstream of the Gawler Township and downstream of the Bruce Eastick flood mitigation dam, via a number of gullies that discharge directly to the River, and a major creek on the northern side of the disused railway line.

A drainage strategy will be formulated as part of the masterplanning work. The potential for the Concordia development to increase the risk of flooding in Gawler is recognised and it is expected that there will be a need to continually review stormwater detention / retention requirements throughout the planning process.

4.3.2 Kalbeeba

Following the urban boundary change and the Gawler East rezoning, The Barossa Council received various requests from property owners in the Kalbeeba area to either rezone their land or to review existing rural living policies to allow smaller lots. Following these requests, The Barossa Council has now commenced the 'Kalbeeba Infill Investigations' study to investigate the potential for infill development within the 'Precinct 26 Kalbeeba West' rural living area as well as development opportunities within adjoining Primary Production zoned land to the east. The study area of the investigations is shown in **Figure 11**.

Barossa Council is currently finalising its study of the Kalbeeba area and consideration is being given to increasing the development density by reducing the minimum lot size in this Rural Living Zone. The additional dwellings that may result if

the proposal proceeds are nominal in comparison to the other growth areas, such as Concordia. Improvements to drainage infrastructure may be required, particularly north of Lawson Road and north of Sunnydale Avenue.

It is expected that a minimum allotment size to 1,200m^2 will create an additional 150 allotments.

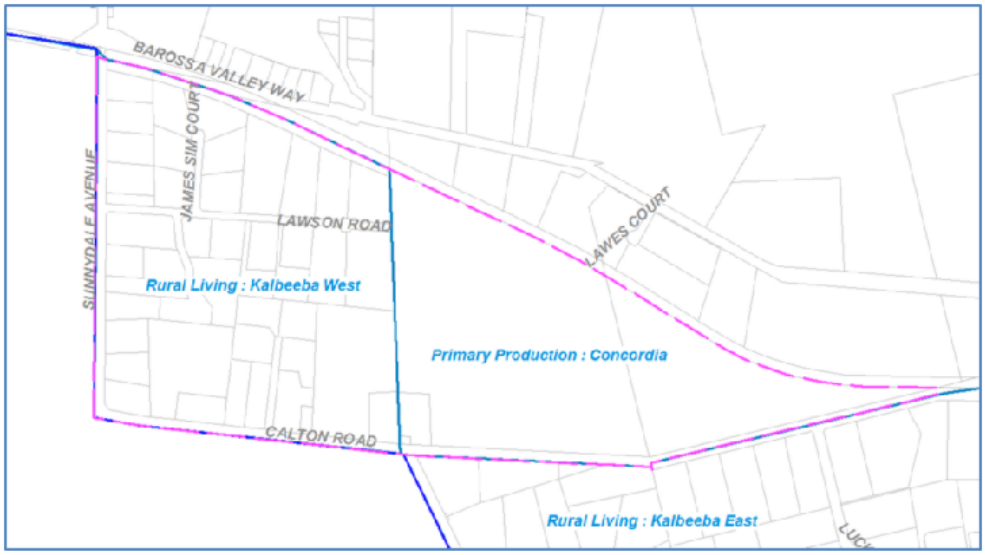


Figure 11 - Kalbeeba Infill Investigations Study Area (Source: Barossa Council)

4.4 Light Regional Council

4.4.1 Gawler Belt (SSC)

The Gawler Belt area lies within the Light Regional Council area. The area that is within the Study Area is comprised largely of Rural Living and Primary Production zones.

There may be an intensification of development and an increase in impervious areas within the Gawler Belt areas, due to a change in Development Plan Policy that will allow for land division creating allotments of a minimum of 1 hectare and a maximum of 2 hectares within Precinct 31 – Rural Living Gawler Belt, and a minimum of 1 – 4 hectares (dependent of location) within Precinct 32 – Rural Living Gawler Belt West.

The Roseworthy Township Expansion DPA currently under consideration sits outside the Study Area. The affected area of the DPA is shown in **Figure 12**, with the border of the Gawler Stormwater Study Area abutting the DPA Affected Area at the southern extent. For the purposes of this study it is assumed that all stormwater

from this area (if developed in the future) will be managed such that it does not impact on areas within the study area (through appropriate stormwater detention / retention / reuse).

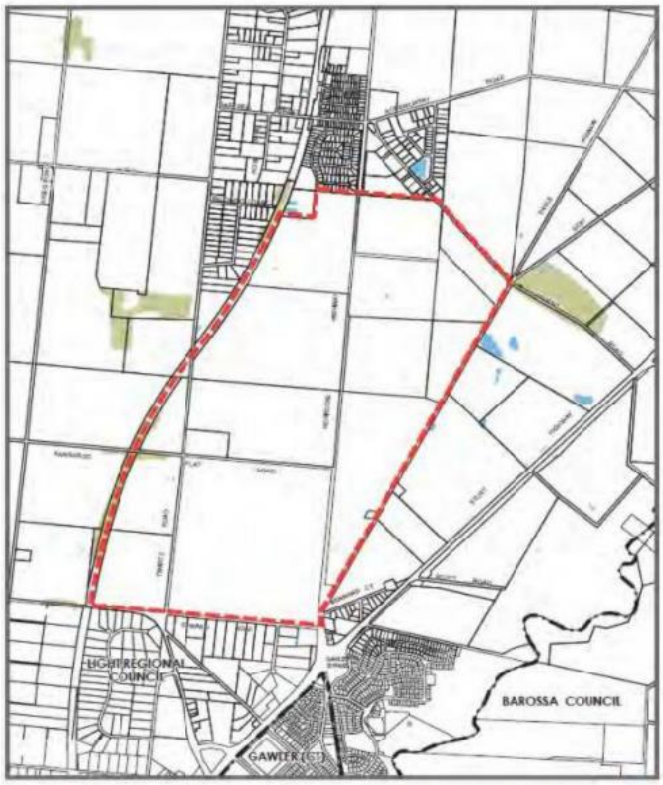


Figure 12 - Area Affected by Roseworthy Township Expansion DPA (Source: Explanatory Statement and Analysis, Light Regional Council)

It is expected that the remainder of the Gawler Belt locality within the Study Area will not have a large amount of infill development long term, pending any rezoning in the future.

4.4.2 Kingsford Regional Industrial Estate

The Kingsford Regional Industrial Estate is located within the Light Regional Council area, in the northern portion of the Study Area. This is a designated industrial estate within the Industry Zone. The Concept Plan for the area (refer **Figure 13**), illustrates the anticipated development of this land for industrial purposes.

It is envisaged that allotments within the Kingsford North Precinct 7 should have a minimum average allotment area of 50,000 square metres (5 hectares), and allotments within Kingsford South Precinct 8 should have a minimum average allotment area of 2,500 square metres (0.25 hectares). The Development Plan seeks the retention of stormwater to be provided on-site in order to limit run-off to levels

consistent with the capacity of existing drainage works external to the site. The Concept Plan includes the provision of several stormwater retention basins along the south-eastern boundary of the estate, along with three distinct stormwater catchment areas.

The development of the Kingsford Regional Industrial Estate is only partially developed, and is considered to be a major economic project as it has the potential to contribute significantly to employment growth in the region. Additionally, it is ideally located in terms of major road and rail links.

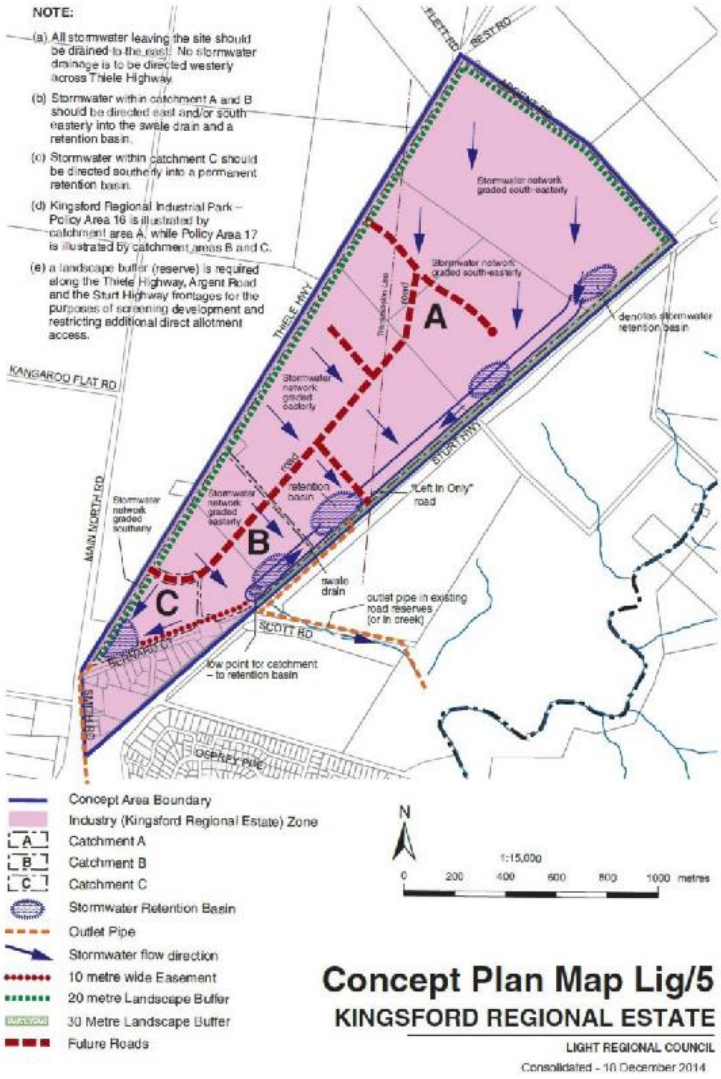


Figure 13 - Kingsford Regional Estate Concept Plan Map (Source: Light Regional Council Development Plan)

Any long term expansion of industrial development to the north-west of the Kingsford Regional Industrial Estate is assumed to accommodate all future stormwater run off without impacting on stormwater drainage systems to the south (i.e. through on site detention / retention / reuse).

4.5 City of Playford

The area of Playford Hills within the City of Playford that is situated within the Study Area is not expected to experience growth in the long term. The areas are zoned Hills Face and Primary Production. Development in these zones is typically in the form of dwellings associated with low-intensity agriculture or primary production, and land division is typically not undertaken. Development, therefore, is likely to consist mainly of outbuildings and additions to existing properties.

5 REVIEW OF STRATEGIC, INFRASTRUCTURE AND DEVELOPMENT PLANS

5.1 Implications of the Residential Development Code

The Development Act, 1993 and Development Regulations, 2008 were changed in 2009 to incorporate a number of measures to reduce red tape and speed up approvals for some forms of residential development. Referred to as the 'Residential Code', the changes allowed for some forms of new housing and additions to be 'complying' (as of right) forms of development. This means that assuming they achieve certain design parameters, there is no direct level of control or influence by planning authorities on them.

Selected areas of the Town of Gawler are covered by the Residential Development Code. **The criteria have implications for the levels of imperviousness within the identified catchment as one of the criterion for qualification of Residential Code development relates to the extent of site coverage of buildings on any site of up to 60 per cent.** This figure is typically higher than those within Residential Zones in the relevant areas of the Town of Gawler (where the Residential Code applies). The Gawler Development Plan states that site coverage should allow for pedestrian and vehicle access and vehicle parking, storage and clothes drying, private open space and landscaping, and appropriate front, side and rear boundary set-backs. In achieving this, Design Technique 251.1 suggests the following maximum site coverage (depending on allotment size):

Site area (m²)	Maximum site coverage (%)
≤ 300	55
301 – 450	50
451 – 800	45
>800	40

Source: Town of Gawler Development Plan

It is also important to note that as the site coverage only relates to roofed areas, it is likely that total impervious areas will exceed this level to include all pathways, driveway, courtyard areas and outbuildings around the building. Potentially these can add an additional 10 – 15% imperviousness to the site.

Over time, due to infill development and alterations / additions, the imperviousness of the Residential Zone could be expected to reach level of 75% in a worst case scenario.

5.2 Existing Stormwater Policies - Town of Gawler

The Town of Gawler's Development Plan provides policy direction relating to stormwater management and flooding at the Council Wide and zone levels. Policies are targeted to both land division and existing sites.

Residential Zone

- The design of a dwellings should minimise the impact of a 1 in 100 ARI flood event
- Dwellings within a flood risk area must be certified by a qualified engineer to minimise the impact of a 1 in 100 ARI flood event.
- Have a minimum finished floor area of 300mm or more above 1 in 100 ARI level
- In low hazard flood risk areas:
  - Site coverage should not exceed 50 percent
  - Setback of 1 metre to side boundaries, and 4 metres to rear boundaries
- In medium hazard flood risk areas:
  - Site coverage should not exceed 40 percent
  - Setback of 2 metres to side boundaries, and 5 metres to rear boundaries
- In high hazard flood risk areas:
  - Site coverage should not exceed 30 percent
  - Setback of 3 metres to side boundaries, and 6 metres to rear boundaries
- Ground floor additions to dwellings should not exceed 40 sqm increase in floor area, be at same or higher finished floor level.
- Additions in excess of 40 sqm should be in the form of upper level additions, or have a finished floor level of at least 300mm above 1 in 100 ARI level.
- A dwelling within the Gawler Rivers Floodplain Area is non-complying, except for:
  - detached dwellings
  - other forms of dwelling where the application includes a report from a suitably qualified engineer expert which states that the proposed dwelling(s) will be located above the predicted level for a 1 in 100 year ARI event and will not exacerbate the risk of flooding on any other land in the surrounding area.

Land Division

- Land division should:
  - Facilitate major storm drainage
  - Incorporate onsite stormwater detention, retention and reuse (where practicable)

- Provide for onsite infiltration
- Allow access to all components of the drainage system for maintenance and not cause damage on site or adjoining properties

- Land division should facilitate a minor storm drainage system that:
  - Maximises retention and removal of pollutants, ensures healthy and diverse wetland environments, and minimises potential for sewage overflows.

Water Sensitive Urban Design

- Development should maximise conservation, minimise consumption and encourage reuse of water
- Development should:
  - Capture and reuse stormwater
  - Minimise surface water runoff
  - Prevent soil erosion and pollutions
  - Protect water flows and quality
- Water discharged from a site should be of a physical, chemical and biological condition equivalent to or better than its pre-developed state and not exceed the rate of discharge from the site as it existed in pre-development conditions.
- Development should include stormwater management systems to mitigate peak flows and manage the rate and duration of stormwater discharges from the site
- Stormwater management systems should utilise one or more of the following harvesting methods:
  - the collection of roof water in tanks
  - the discharge to open space, landscaping or garden areas, including strips adjacent to car parks
  - the incorporation of detention and retention facilities
  - aquifer recharge

5.3 Existing Stormwater Policies - The Barossa Council, Light Regional Council and Playford Council (SAPPL)

The majority of the General provisions within the Barossa, Light Regional and Playford Councils' Development Plans relate to the minimisation of flooding and inundation, the avoidance of any impact on watercourses or flow of floodwaters, and the retention, detention and treatment of stormwater runoff.

Hazards Module

The Hazards Module focuses on the prevention of development on land subject to flooding, and the impediment of the flow of floodwaters. In summary, the policies include:

- Development should not be undertaken in areas liable to inundation by tidal, drainage or flood waters unless:
  - it is developed with a public stormwater system capable of catering for a 1-in-100 ARI event
  - buildings are designed and constructed to prevent the entry of floodwaters in a 1-in-100 ARI event.
- Development should not:
  - impede the flow of floodwaters through the land or other surrounding land
  - increase the potential hazard risk during a flood event
  - aggravate the potential for erosion or siltation or lead to the destruction of vegetation during a flood
  - cause any adverse effect on the floodway function
  - increase the risk of flooding of other land
  - obstruct a watercourse

The Light Regional Council and Playford Council Development Plans includes several additional flooding policies within the 'Hazards' module, and relate to the Gawler River Flood Plain. The policies include a delineation of a minimum floor level of dwellings 300 millimetres above the 1-in-100 year average return interval flood event. PDC 9 also stipulates a maximum filling of land to 100 millimetres above natural ground level.

Similarly, the Playford Council Development Plan includes an additional policy in this module relating to the Gawler River Flood Plain in which development should be designed and sited to minimise the varying potential flood impacts that occur within 'Flood Hazard Zones 1, 2 or 3', as shown on the Gawler River Flood Hazard Map .

Land Division Module

The land division module includes various policies relating to the drainage of stormwater and the suitable design and layout of land division to minimise inundation and impact on drainage. These include:

- Land division layout should keep flood-prone land free from development
- When land is divided, stormwater should be capable of being drained safely and efficiently from each proposed allotment and disposed of from the land in an environmentally sensitive manner
- Land division should allow for the protection for existing vegetation and drainage lines
- Within defined townships and settlements land division should make provision for a reserve or an area of open space that is at least 25 metres wide from the top of the bank of a watercourse and that incorporates land located within the 1-in-100 ARI event area.

Playford Council provides additional policies in this module. These relate to:

- Division of land with a frontage to the Gawler River should include a reserve at least 100 metres wide, measured from the centre line of the river
- Allotments within the **Gawler River Flood Plain** on land outside '**Flood Hazard Zones 2 and 3**' should contain sufficient area to accommodate the uses for which the land is intended
- The development of drainage networks should be designed to provide an open space system of linear parks, wetlands, aquifer storage and re-charge sites

Natural Resources Module

The policies within the Natural Resources module focus on the physical, chemical and biological condition of stormwater runoff, as well as the protections of natural ecological systems, and the sustainable use of water.

Key policies include:

- Water discharged from a development site should:
  - be of a physical, chemical and biological condition equivalent to or better than its pre-developed state
  - not exceed the rate of discharge from the site as it existed in pre-development conditions.
- Development should include stormwater management systems to protect it from damage during a minimum of a 1-in-100 year average return interval flood.
- Development should include stormwater management systems to mitigate peak flows and manage the rate and duration of stormwater

discharges from the site to ensure the carrying capacities of downstream systems are not overloaded.

- Development should include stormwater management systems to minimise the discharge of sediment, suspended solids, organic matter, nutrients, bacteria, litter and other contaminants to the stormwater system.
- The location and construction of dams, water tanks and diversion drains should:
  - occur off watercourse
  - not take place in ecologically sensitive areas or on erosion-prone sites
  - provide for low flow by-pass mechanisms
  - not negatively affect downstream users
  - minimise in-stream or riparian vegetation loss
  - incorporate features to improve water quality
  - protect ecosystems dependent on water resources.

Light Regional Council's Development Plan includes additional flooding policies within the 'Natural Resources' module. These include:

- Stormwater runoff directed to the Gawler River or North Para River should first be filtered on-site before reaching the river.
- Where stormwater is used for industrial purposes, break tanks should be incorporated to prevent any back contamination with process liquids.

Additional policy within Playford Council's Development Plan states that stormwater runoff directed to the Gawler River should first be filtered by wetlands along the river.

Zone Level Policies

Light Regional Council's Development Plan includes specific non-complying controls within the Primary Production Zone and Rural living Zone.

The Barossa Council's Residential (Gawler East) Zone includes a specific policy targeted at the detention and/or retention basins. In particular, these basins should:

- allow sediments to settle so as to treat stormwater prior to discharge
- ensure human health and safety
- ensures the control of mosquitoes and nuisance insects
- where wetlands are used for the cleaning of stormwater it is advisable that the storage is able to retain the 1-in-25 year average return interval, 24 hour rainfall event.

5.4 Other SAPPL Policies that Influence the Stormwater Management of Development

Light Regional Council, The Barossa Council and Playford Council Development Plans have adopted the SA Planning Policy Library (SAPPL) suite of modules. The Town of Gawler has not adopted the modules, having not undergone a Better Development Plan DPA.

Whilst all zones within the three Development Plans adopting the SAPPL modules provide guidance on site coverage (and therefore the extent of imperviousness built form on sites), they also contain policies that discuss the management of stormwater, both in terms of quantity and quality of run-off from development. Some of the key policies seek the following:

- minimise surface water runoff
- not exceed the rate of discharge from the site as it existed in pre-development conditions.
- Design of a stormwater management system that can accommodate a minimum of a 1-in-100 year average return interval flood
- where practical capture and re-use stormwater

5.5 Summary of Key Relevant Development Plan Policies

5.5.1 Town of Gawler

The Town of Gawler applies the following site coverage parameters to residential development across the whole of the Council (other than in the Residential (Gawler East) Zone:

Site area (m²)	Maximum site coverage (%)
≤ 300	55
301 – 450	50
451 – 800	45
>800	40

Residential Zone (Evanston / Evanston Park Policy Area)

No minimum lot areas apply, however site coverage should not exceed the Council Wide maximum site coverages.

Residential Zone (Gawler East Policy Area)

An area where the existing housing stock is maintained and the number of dwellings is increased through development of vacant large parcels. Any undeveloped land can be expected to be developed for residential purposes, with medium density being located in proximity to the Town Centre or Cheek Avenue shops. No minimum lot sizes apply, however site coverage should not exceed the Council Wide maximum.

Residential Zone (Gawler South Policy Area)

No minimum lot sizes apply (however site coverage should not exceed the Council Wide maximum), except a small escarpment within the Policy Area where the minimum lot size is 2000m^2.

Residential Zone (Evanston Gardens / Evanston South / Hillier Policy Area)

There is a minimal amount of this Policy Area that lies within the Study Area, however for the portion that lies within the Study Area, it can be expected that vacant land will be developed at low - medium density, and although minimum lot sizes do not apply site coverage is limited to the Council Wide maximum.

Residential Zone (Hillier Road Residential Policy Area)

This area has been identified for potential infill development within the areas not affected by the Gawler Flood Plain. While minimum lot sizes do not apply, site coverage should not exceed the Council Wide maximum.

Residential Zone (Gawler West Residential Policy Area)

Infill development is identified for areas not identified as being prone to flooding. While minimum lot sizes do not apply, site coverage should not exceed the Council Wide maximum.

Residential Zone (Wheatsheaf Policy Area)

The minimum allotment size within this Policy Area should not be less than 2000m^2. Maximum building site coverage should not exceed 40% of the site, and it is expected that this area be used for detached dwellings only, although granny flats (that are attached to dwellings) will be considered.

Residential Zone (Willaston Policy Area)

The Willaston Policy Area is not identified for major residential expansion other than infill of vacant land parcels or residential use of very large gardens or former agricultural plots. These areas are expected to have the potential to increase

Willaston's capacity by 200 dwellings (or 50%). A small southern section of the Willaston Policy Area is identified as being flood prone. Minimum lot sizes are not identified, however site coverage should not exceed the Council Wide maximum.

Residential (Gawler East) Zone

The area includes the broad hectare land under the Springwood development area that is expected to support approximately 2000 – 2500 homes.

Land division should not exceed 1000 allotments (outside of Springwood) until the following infrastructure has been constructed:

- A collector road between Calton Road and One Tree Hill Road, and
- A collector road between One Tree Hill Road and Potts Road, and
- An upgrade of Potts Road and its intersection with Main North Road to accommodate the traffic flows associated with further continued development.

Development with frontages to the eastern side of the Gawler – One Tree Hill scenic road should be 1000m^2 or more.

Land located west of the South Para River should not be divided for additional allotments unless part of an integrated development scheme.

Where development is undertaken, land division can occur up to a minimum of 250m^2 – however allotments of this size should be located within the Local Centre Policy Area.

Residential Hills Zone

Development of semi-detached dwellings and land division for such purposes should only occur when the gradient of each semi-detached dwelling site is no steeper than 1-in-8.

Development with frontages to the eastern side of the Gawler – One Tree Hill scenic road should be 1000 square metres or more.

Land division should not exceed 1000 allotments until the following infrastructure has been constructed:

- A collector road between Calton Road and One Tree Hill Road, and
- A collector road between One Tree Hill Road and Potts Road, and
- An upgrade of Potts Road and its intersection with Main North Road to accommodate the traffic flows associated with further continued development

Dwellings should have a minimum site area of the following:

Dwelling type	Site area (square metres)
Detached	250 minimum
Semi-detached	250 minimum
Group dwelling	250 minimum
Residential flat building	250 average
Row dwelling	200 minimum

Residential Historic (Conservation) Zones

Development within the Gawler Rivers Floodplain Area will not result in an increase in densities or site coverage. Detached dwellings should only be developed where it does not exceed a site coverage of 50% in low hazard flood risk areas, 40% in medium hazard flood risk areas, and 30% in high hazard flood risk areas.

5.5.2 Light Regional Council

Residential Zone (Residential Gawler Belt Policy Area)

Minimum lot sizes apply as per the following table:

Dwelling type	Site area (square metres)
Detached	500 minimum
Semi-detached	400 minimum
Group dwelling	300 minimum
Residential flat building	250 average
Row dwelling	250 minimum
Supported accommodation	175 minimum

Maximum site coverage on all allotments should not exceed 50%, with the dwelling itself covering no more than 35% of the site.

Rural Living (Precinct 31 Gawler Belt)

Land should only be divided when all allotments created conform to a minimum of 1 hectare and a maximum of 2 hectares.

Rural Living (Precinct 32 Gawler Belt West)

Land should only be divided where it can meet the minimum allotment area within the locations specified below:

Location	Minimum allotment area (hectares)
West of Clancy Road and north of Ward Belt Road	2
East of Clancy Road	1
South of Ward Belt Road	4

5.5.3 Barossa Council

Rural Living (Precinct 21 Cockatoo Valley)

Land division should not result in allotments of less than 1 hectare.

Township Zone

The Desired Character Statement identifies Sandy Creek as a small settlement, and that this characteristic is to be retained, and additional development should reflect the low density. Land division within this area should create allotments with a minimum site area of not less than 1200m^2.

5.6 Other Trends in Development and Lifestyles

A number of other elements of the way the catchment is developed can have an influence on the degree of imperviousness on any given piece of land. This is demonstrated within the examples provided above, however can also include the following trends:

- desire for rural living allotments
- larger outdoor entertaining areas – generally covered or paved – may include outdoor kitchen, dining and lounge spaces
- increase in installation of swimming pools / lap pools
- smaller rear yards
- garaging of vehicles (including associated driveways) – noticeable in front yards which have historically been large impervious areas
- less pervious garden spaces (more paving)
- less desire for gardens due to rising costs of water and increased potential for droughts and water restrictions – evidenced through use of artificial lawns

Some of the aspects listed above are not easily controlled by the planning system in South Australia (for example paving your rear or front yard in itself is not

development) and therefore difficult to influence within existing statutory frameworks.

Whilst the above listed trends are applicable to some areas within the Study Area, they are experienced to a lesser extent when compared to metropolitan Adelaide. This is due to a preference for rural living allotments within the Study Area, and a generally lower density of dwelling development. The median lot size within the Study Area is likely to be greater than that of Greater Adelaide (given the presence of rural living allotments). This has a significant impact on the amount of impervious area within the Study Area.

6 IMPLICATIONS FOR IMPERVIOUSNESS

6.1 Different Forms of Development and How They Influence Imperviousness

The 30 Year Plan for Greater Adelaide identifies net residential dwelling yield ranges for determining densities. Net residential yield excludes land required for roads, open space and other non-residential uses. These definitions have been used within this report due to an inconsistency between Council Development Plan's use of the terms medium and high density. It is also the range used to inform the SA Planning Policy Library. Densities are defined as follows:

- Low Density – less than 35 dwellings units per hectare
- Medium Density – between 35 and 70 dwelling units per hectare
- High Density – more than 70 dwelling units per hectare

These densities are reflected within the SA Planning Policy Libraries within the growth corridor and the fringe growth policy modules namely:

Urban Core Zone	150 – 250 dwellings / hectare (net)
Suburban Activity Node Zone	45-70 dwellings / hectare in transition areas over 70 dwellings / hectare in core areas
Urban Corridor Zone	between 45 and 200 dwellings / hectare (net)
Suburban Neighbourhood Zone	30-45 dwellings/hectare 45-70 dwellings/hectare where adjacent activity centres

It is noted that the Urban Core Zone, Suburban Activity Node Zone and Urban Corridor Zone do not currently exist within the Development Plans within the study area. However, given the identified 'major corridor' through the Town of Gawler within the 30-Year Plan, it is possible that these zones may be included in a future revision of the Town of Gawler's Development Plan.

Illustrated below are examples of differing densities and residential built form that have previously been developed within the study area. These examples are provided as a guide to how increasing density has the potential to profoundly impact on the provision of permeable private open space and permeability across sites in general.

6.1.1 High Density Development

Whilst there are limited examples of high density development within the Study Area, the projected growth and corridor development may contribute to higher residential densities within Gawler.

In the example below, private open space is confined to balconies, and car parking is located at the rear within the building envelope. **Figure 14** is a site in Unley (outside Study Area) and is taken from the 'Understanding Residential Densities: A Pictorial Handbook of Adelaide Examples' publication.

Developments, such as aged care accommodation and retirement villages can also yield high densities with a high site coverage.

Figure 14 - Medium Density Development – Charles Street, Unley

<u>Charles Street, Unley</u>

Site area:	2,147 m^2
Built form:	Two storey residential flat buildings
No of dwellings:	18
Net density:	85 dwellings per hectare
Average lot area:	117m^2
Average impervious surface coverage:	Approx. 95 - 100%

6.1.2 Medium Density Development

There have been a limited number of medium density forms of development that have occurred throughout the Study Area. The 'Riverwalk on Eighth' development and 1-3 Fifteenth Street (both in Gawler South) are two examples of infill development close to commercial zones and open space (refer **Figure 15**).

Medium density development typically consists of detached and semi-detached dwellings, and could also accommodate group dwellings, row dwellings and residential flat buildings, typically between one and three storeys.

Example 1: Consolidated site – Eighth Street, Gawler South

Figure 15 - Medium density development - 'Riverwalk on Eighth'

'Riverwalk on Eighth', 21A Eighth Street, Gawler South

Site area:	2,147 m^2
Built form:	Two storey group dwellings
No of dwellings:	9
Net density:	42 dwellings per hectare
Average lot area:	238m^2
Average impervious surface coverage:	Approx. 95%

Example 2: Consolidated site – Fifteenth Street, Gawler South

Figure 16 - Medium density development, 1-3 Fifteenth Street, Gawler South

1-3 Fifteenth Street, Gawler South

Site area:	1,779 m^2
Built form:	Two storey residential flat building
No of dwellings:	12
Net density:	67 dwellings per hectare
Average lot area:	148m^2
Average impervious surface coverage:	Approx. 95%

Observations

- Infill and consolidated site development include a significant area of imperviousness due to the provision of driveways/roadways.
- Large proportions of private open space areas are impervious due to paving treatments.
- The above two examples in Gawler South are located in the Residential Historic (Conservation) Zone, indicating that medium density developments that are not "in character" with the general heritage character are being approved and developed on larger sites that do not incorporate heritage places.

- Large, medium density developments will generally be restricted to larger, undeveloped (or under-developed) sites in the Residential Zones.

6.1.3 Low Density Development

Suburban allotments in established areas

These areas represent typical residential development patterns, with their land division pattern and extent of site coverage limited and protected by policy within Development Plans. These areas contain predominantly single storey (with some two-storey) detached dwellings set on larger allotments with protections on land division pattern and extent of site coverage within Development Plan policy.

Within areas that are not identified as being of low, medium or high flood risk, maximum site coverage should not exceed:

Site area (m^2)	Maximum Site Coverage (%)
≤ 300	55
301 – 450	50
451 – 800	45
> 800	40

Based on the above, an average maximum site coverage of 50% could be assumed.

It is noted that there are small areas within the residential zones of the Town of Gawler that lie within medium or high flood risk areas, where lower site coverage requirements prevail.

Example 1: Traditional subdivision, Fourth Street, Gawler

Figure 17 - Low density housing, Gawler

Fourth Street, Gawler

Site area:	14,910m²
Built form:	Single storey detached dwellings
No of dwellings:	15
Net density:	10 dwellings per hectare
Average lot area:	994m²
Average impervious surface coverage:	Approx. 50%

Example 2: Master planned housing estate – Explorer Parade, Hewett

Figure 18 - Low density housing, Gawler

Explorer Parade, Hewett

Site area:	11,323m²
Built form:	Single storey detached dwellings
No of dwellings:	16
Net density:	14 dwellings per hectare
Average lot area:	707m²
Average impervious surface coverage:	Approx. 75%

New Greenfields Communities

The conversion of greenfields land into new suburban communities will result in increased site coverage in the form of new roads as well as new buildings and associated paved surfaces.

Generally, within a new community approximately 20% of the land area is taken up by road reserves, with road pavements and paved footpaths comprising approximately 60% of the road reserve area. This results in approximately 12% of the total area being taken up with new roadways.

Approximately 12.5% of greenfields land is attributed to public open space, and this percentage can increase where greenfields areas incorporate creek lines that are not included within the public open space allowance, or designated areas for stormwater drainage that are not allocated as part of the 12.5% open space provision. For the purposes of this study, therefore, an average allowance of 15% for public open space / undeveloped land could be allowed for.

Site coverage for dwellings and associated paved surfaces will be similar to new residential communities that incorporate a mix of allotment sizes and generally higher site coverage.

Observations

- Newer housing developments, including housing estates, tend to have a higher density of dwellings, due to smaller allotment sizes.
- Traditional subdivision layouts allow for higher proportion of private open space, and therefore have less impervious surface coverage (as a percentage).
- Masterplanned housing estates tend to have smaller allotment sizes (less than 500m^2) and greater site coverage, leading to higher impervious surface coverage (as a percentage).
- Low density does not necessarily equate with low site coverage, due to comparatively small rear gardens and larger building footprints.
- Infill development density controls are quite flexible, meaning that the extent of potential infill is largely governed by the age/quality of existing houses (older homes more likely to be replaced by more than one), the availability of vacant land in any particular location, the size of existing allotments relative to the size of the home (ie older areas more likely to have larger lots and smaller homes and hence more potential for infill / redevelopment), and whether or not the land is affected by flooding.

6.1.4 Historic (Conservation) Zones

Large areas within the Town of Gawler are located within Historic (Conservation) Zones. In these areas new development is likely to be in the form of alterations and additions (which could include some increase in site coverage), as well as replacement of non-contributory buildings with new buildings (which could result in some increase in site coverage). As outlined above, where there are larger sites in these areas, Council is approving medium density development with very high site coverage.

The Development Plan provides for a maximum site coverage of:

- 50% in low hazard flood risk areas

- 40% in medium hazard flood risk areas
- 30% in high hazard flood risk areas

within the Residential Historic (Conservation) zones, and a preliminary review of existing coverage suggests that most buildings do not currently have this extent of site coverage.

6.1.5 Rural Living (Very Low Density)

Rural living allotments are characterised by low-density living areas with a rural character. Often these allotments incorporate a range of agricultural activities including small hobby farms.

Figure 19 – Rural living housing, Gawler

<u>Sailplane Court, Gawler</u>

Site area:	468,027m²
Built form:	Single storey detached dwellings
No of dwellings:	12
Net density:	0.3 dwellings per hectare
Average lot area:	39,002m²
Average impervious surface coverage:	Approx. 5%

Figure 20 – Rural living housing, Gawler West

Ryde Street, Gawler West

Site area:	29,896m²
Built form:	Single storey detached dwellings
No of dwellings:	4
Net density:	5 dwellings per hectare
Average lot area:	7,474m²
Average impervious surface coverage:	Approx. 10%

Observations

Rural living allotments allow for low impervious site coverage, given the larger allotment sizes. Rural living allotment sizes can vary in size, depending on policy direction. The Gawler Development Plan's Rural Living Zone seeks a minimum allotment size of four hectares within the zone. Whilst the existing allotments are typically greater than this minimum allotment size, as illustrated in the examples above, allotments of four hectares would still allow for a very low impervious site coverage.

6.1.6 Industrial Land

For the purpose of determining the amount of an industrial site that could be covered with impervious surface, we have assumed existing industrial land would be utilised to its full potential. This most likely means that there would be near complete cover of impervious surfaces, either in the form of buildings, hard stand areas or car parking areas. It is noted that within the Barossa Council Area there is a policy within the Development Plan which seeks 10% of the site for landscaping purposes within the Light Industry Zone. The Light Regional Council seeks a minimum of 5% landscaping within the Industry Zone. Whilst the Town of Gawler Development Plan does not include policy relating to industry site coverage, Council expects a minimum of 10% of industry sites to be reserved for landscaping[2]. Therefore, a maximum degree of imperviousness of up to 90% is expected for industrial development within the Study Area, while a reasonable average long term expectation could be in the order of 75%.

6.2 Summary of Implications for Imperviousness

As outlined in Section 6.1, the Study Area and the wider stormwater catchment comprises a range of land uses, each with different implications for establishing stormwater runoff coefficients. These include:

- Residential areas (established neighbourhoods)
- Historic (Conservation) residential areas
- Rural living areas
- Industrial areas
- Commercial areas
- Greenfields residential areas
- Open space areas

In addition, some areas have a high potential for further development, while others, such as areas within the Gawler Flood Plain, have minimal or less potential.

To assist in the formulation of future stormwater runoff coefficients for land within the Study Area and within the catchment, land use / zoning maps have been prepared that provide an indication of the likely level of increase in stormwater runoff in the longer term. This assessment has been based on factors such as:

- Existing zoning
- Existing land use / built form / site coverage
- Flood liability
- Likelihood of redevelopment due to age of development
- Typical coefficients for undeveloped areas with potential for major change

[2] Town of Gawler, 2015, 'Industrial/Commercial and Retail Development', <http://www.gawler.sa.gov.au/page.aspx?u=610>

Figures 21 - 26 and **Table 4** indicate the potential for change, and show that there are quite large areas where there is significant scope for change (but where new stormwater management infrastructure is likely to minimise downstream flooding potential), while there are other areas in established parts of Gawler (in particular) where there will be minimal change through increased intensity of development or where infill development will result in increases in stormwater runoff.

Areas that have not been highlighted in **figures 21 – 26** are likely to remain undeveloped (in terms of analysis for the Stormwater Management Plan).

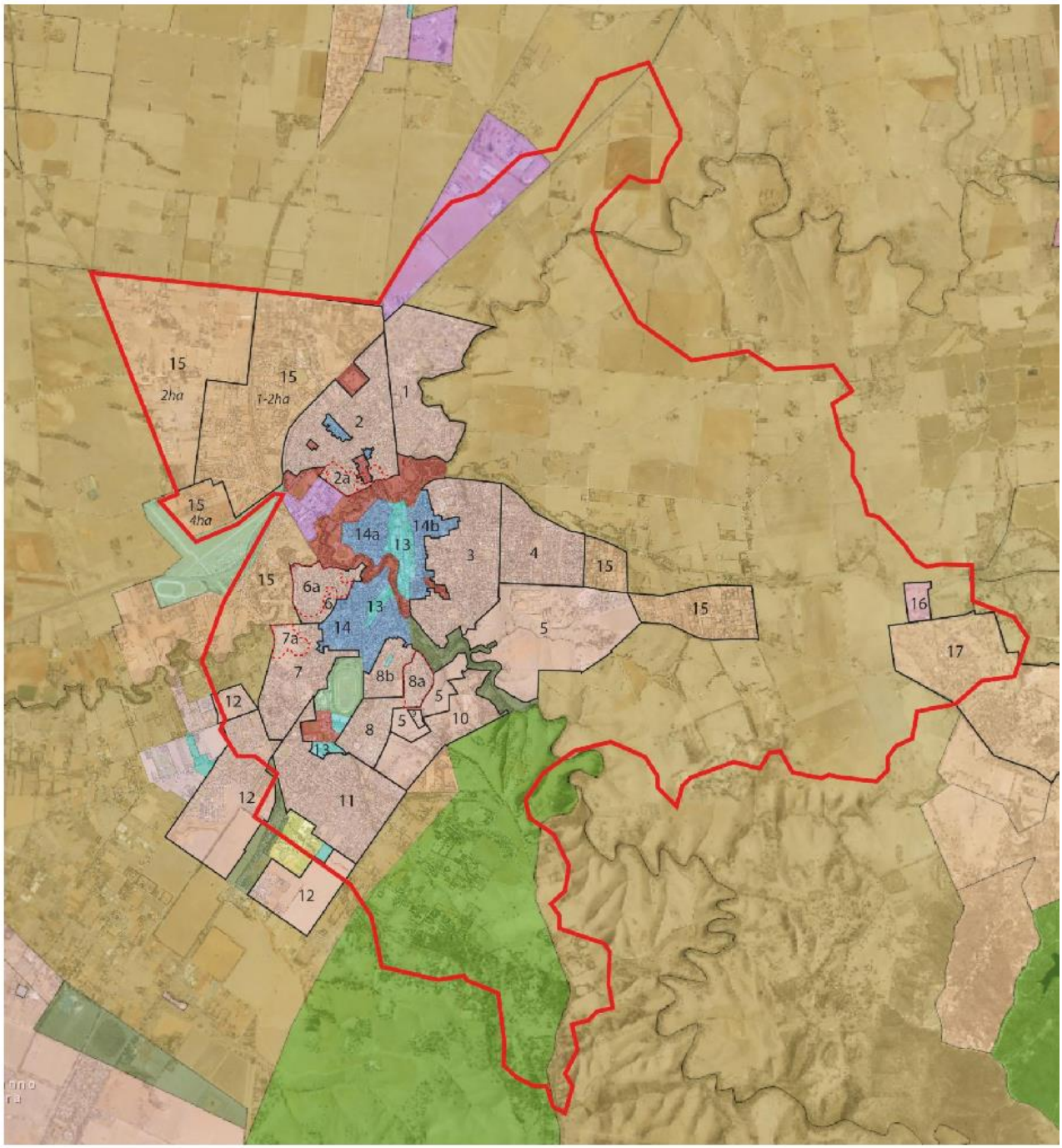


Figure 21 - Development Potential Analysis (refer to Figures 23 - 27 for enlargements)

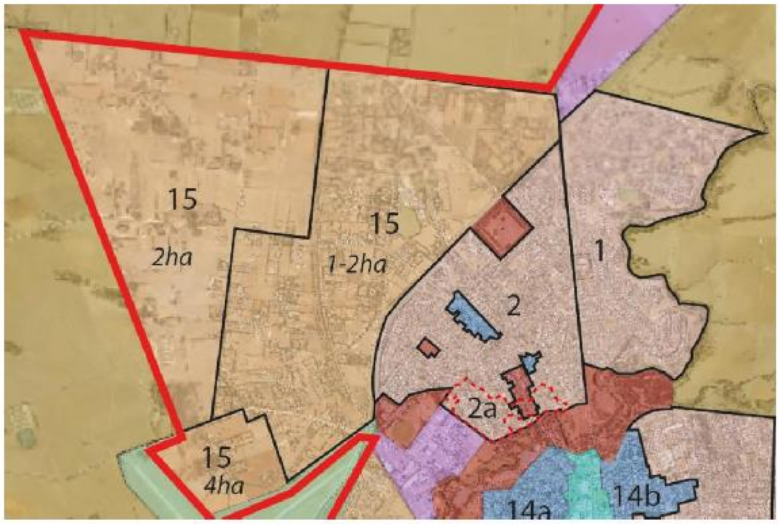


Figure 22 - Development Potential Analysis (Enlargement)

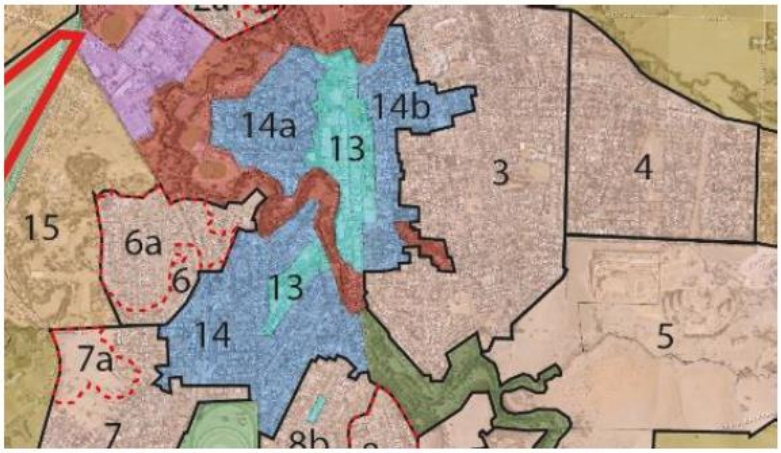


Figure 23 - Development Potential Analysis (Enlargement)

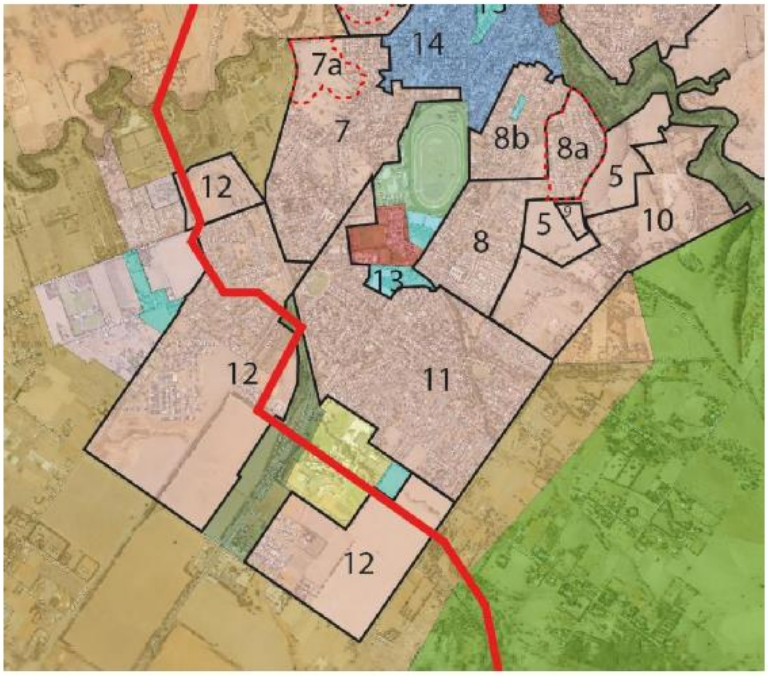


Figure 24 - Development Potential Analysis (Enlargement)

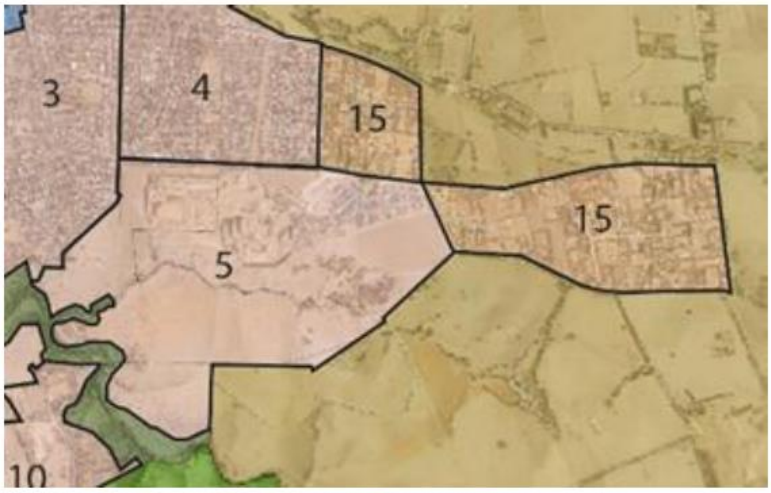


Figure 25 - Development Potential Analysis (Enlargement)

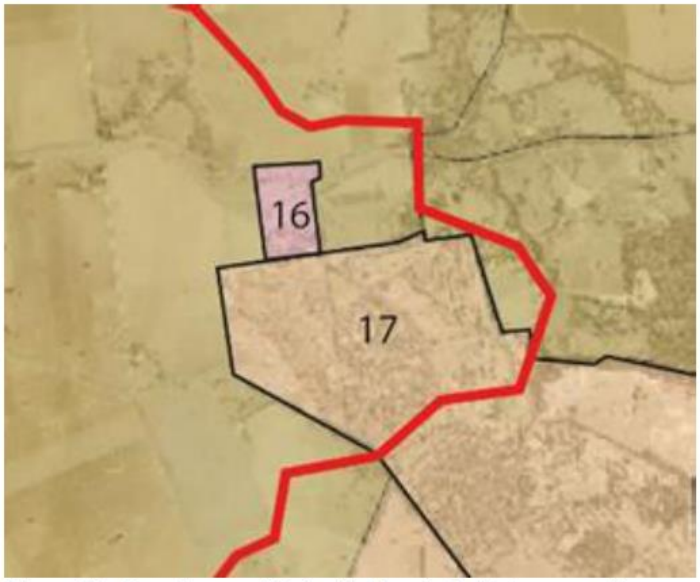


Figure 26 - Development Potential Analysis (Enlargement)

Table 4 - Potential for Change in Imperviousness by Area

Area	Zone/Policy Area	Potential for Change in Imperviousness
1	Gawler Belt – Policy Area 7 (Light Regional Council)	Low – typical new suburban
2	Residential Zone - Willaston Policy Area	Medium – infill potential on many larger residential lots
2a	Residential Zone - Willaston Policy Area – Flood Risk	Low / medium – infill potential but within a flood risk area
3	Residential Zone – Gawler East Policy Area 6	Low / medium – infill potential but only on vacant (or larger) lots
4	Residential Zone - Wheatsheaf Policy Area	Low – 2000m^2 minimum lot size and area is fully developed
5	Residential (Gawler East) Zone	High – transition from greenfield to residential
6	Residential Zone – Gawler West	Low – medium
6a	Residential Zone – Gawler West – Flood Risk	Low – flood prone land but infill sites available
7	Residential Zone - Hillier Road Policy Area	Medium – infill potential on many larger residential lots
7a	Residential Zone – Hillier Road Policy Area – Flood Risk	High – assuming development on flood risk vacant land is approved
8	Residential Zone – Gawler South Policy Area	Low – fully developed newer homes

8a	Residential Zone – Gawler South Policy Area	Low – fully developed new homes (minimum lot size of 2000m^2)
8b	Residential Zone – Gawler South Policy Area	Low / medium – infill potential on larger residential lots
9	Local Centre Zone	High – currently vacant
10	Residential (Hills) Zone	High – assuming transition from rural living to residential
11	Residential Zone – Evanston / Evanston Park Policy Area	Low – fully developed new homes
12	Residential Zone – Evanston Gardens / Evanston South / Hillier Policy Area	High – mostly vacant (transition to residential)
13	Town Centre Historic (Conservation) Zones	Low – fully developed
14	Residential Historic (Conservation) Zones	Low / medium – infill potential on larger sites and sites without heritage / contributory places, but within Historic (Conservation) Zone
14a	Residential Historic (Conservation) Zones	Low
14b	Residential Historic (Conservation) Zones	Low
15	Rural Living Zones (including Light Regional Council)	Low – rural living, fully developed residential (although some additional land division may occur), flood prone
16	Township Zone (Barossa Council)	High – further residential potential on 1200m^2 lots
17	Rural Living – Precinct 21 Cockatoo Valley (Barossa Council)	Low – fully developed rural residential (minimum lot size of 1ha)

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Appendix E – Cost estimates for mitigation strategies

CONSTRUCTION COST ESTIMATE

Project: Gawler SMP
Job No: 20141387
Date: 04-04-18
Revision: A
Summary of works: Gawler Racecourse flood control basin
Estimated: MM
Review: TAK

Item No	Description	Comment	Unit	Qty	Rate	Cost
1.0	**Preliminaries**					
1.1	Preliminaries	Assumed to be 15% of estimate	Item	1	$ 548,683.50	$ 548,683.50
	Sub-Total					**$ 548,683.50**
2.0	**Pipe Network**					
2.1	750 mm RCP		m	160	$ 830.00	$ 132,800.00
2.2	1200 mm RCP		m	197	$ 1,560.00	$ 307,320.00
2.3	1350 mm RCP		m	170	$ 1,800.00	$ 306,000.00
2.4	1500 mm RCP		m	70	$ 2,140.00	$ 149,800.00
2.5	1200 sq Junction Box		Each	1	$ 6,570.00	$ 6,570.00
2.6	1800 sq Junction Box		Each	10	$ 9,130.00	$ 91,300.00
2.7	2100 sq Junction Box		Each	5	$ 10,100.00	$ 50,500.00
2.8	Headwall		Each	4	$ 1,000.00	$ 4,000.00
2.9	Scour Protection		m^2	64	$ 150.00	$ 9,600.00
	Sub-Total					**$ 1,057,890.00**
3.0	**Detention Basin**					
3.1	Topsoil stripping and stockpiling		m^2	28,000	$ 3.50	$ 98,000.00
3.2	Basin earthworks		m^3	33,000	$ 19.00	$ 627,000.00
3.3	Topsoil respreading		m^2	28,000	$ 5.00	$ 140,000.00
3.4	Oval irrigation replacement		Item	1	$ 10,000.00	$ 10,000.00
3.5	Wetland	Assume 80% of basin footprint used for a wetland	ha	2.3	$ 750,000.00	$ 1,725,000.00
	Sub-Total					**$ 2,600,000.00**

Sub-total		**$ 4,206,573.50**
Contingency	20%	$ 841,314.70
GST	10%	$ 504,788.82
Grand Total		**$ 5,552,677.02**

Note: **Cost estimates provided by Tonkin Consulting are based upon historic cost information and experience, and do not allow for:**

- Latent conditions
- Changes in scope
- Market conditions (i.e. competition, escalation)
- No allowance for approvals for these works
- No allowance for site contamination and remediation or disposal of contaminated material
- No allowance for land acquisition
- No allowance has been made for the staging of these works
- No allowance has been made for landscaping works
- No allowance has been made for service depthing, liaison with service authorities, design of service relocations
- No allowance has been made for project delivery costs including project management
- Calculations assume clay soil and no rock will be encountered

These estimates are to be considered as indicative only, and are not purported to represent anything more than an indication of the cost of the scope of the work.

Tonkin Consulting recommend that an appropriately qualified quantity surveyor be consulted to provide detailed market cost inputs.

CONSTRUCTION COST ESTIMATE

Project: Gawler SMP
Job No: 20141387
Date: 20-04-18
Revision: A
Summary of works: Tingara Road flood control basin
Estimated: MM
Review: TAK

Item No	Description	Comment	Unit	Qty	Rate	Cost
1.0	**Preliminaries**					
1.1	Preliminaries	Assumed to be 15% of estimate	Item	1	$ 70,382.57	$ 70,382.57
	Sub-Total					**$ 70,382.57**
2.0	**Stormwater Drainage**					
2.1	Low level outlet pipe, 300 mm RCP		m	20	$ 400.00	$ 8,000.00
2.2	High level outlet pipe, twin 1500 RCP		m	100	$ 2,140.00	$ 214,000.00
2.3	Junction box to suit high level outlet pipes		Each	2	$ 15,000.00	$ 30,000.00
2.4	Outlet headwall with scour protection		Each	1	$ 20,000.00	$ 20,000.00
	Sub-Total					**$ 272,000.00**
3.0	**Earthworks**					
3.1	Fill volume	Assuming a clay material	m^3	3,200	$ 26.00	$ 83,200.00
3.2	Embankment surface treatment	Trim surfaces	m^2	700	$ 3.45	$ 2,417.10
	Sub-Total					**$ 85,617.10**
4.0	**Miscellaneous**					
4.1	Land acquisition		m^2	2,500	$ 30.00	$ 75,000.00
4.2	Tree removal		Each	8	$ 200.00	$ 1,600.00
4.3	Cleaning up		Item	1	$ 15,000.00	$ 15,000.00
4.4	Testing		Item	1	$ 20,000.00	$ 20,000.00
	Sub-Total					**$ 111,600.00**

Sub-total		**$ 539,599.67**
Contingency	20%	$ 107,919.93
GST	10%	$ 64,751.96
Grand Total		**$ 712,271.56**

Note: **Cost estimates provided by Tonkin Consulting are based upon historic cost information and experience, and do not allow for:**

- Latent conditions
- Changes in scope
- Market conditions (i.e. competition, escalation)
- No allowance for engineering design and survey
- No allowance for approvals for these works
- No allowance for site contamination and remediation or disposal of contaminated material
- No allowance has been made for the staging of these works
- No allowance has been made for landscaping works
- No allowance has been made for service depthing, liaison with service authorities, design of service relocations
- No allowance has been made for project delivery costs including project management
- Calculations assume clay soil and no rock will be encountered

These estimates are to be considered as indicative only, and are not purported to represent anything more than an indication of the cost of the scope of the work.

Tonkin Consulting recommend that an appropriately qualified quantity surveyor be consulted to provide detailed market cost inputs.

CONSTRUCTION COST ESTIMATE

Project: Gawler SMP
Job No: 20141387
Date: 04-04-18
Revision: A
Summary of works: Trinity College creek upgrades
Estimated: MM
Review: TAK

Item No	Description	Comment	Unit	Qty	Rate	Cost
1.0	**Preliminaries**					
1.1	Preliminaries	Assumed to be 15% of estimate	Item	1	$ 38,456.25	$ 38,456.25
	Sub-Total					**$ 38,456.25**
2.0	**Open Channel**					
2.1	Channel earthworks		m^3	1,070	$ 19.00	$ 20,330.00
2.2	Stripping of topsoil and stockpile (150 mm)		m^2	1,770	$ 3.50	$ 6,195.00
2.3	Topsoil respreading		m^2	1,770	$ 5.00	$ 8,850.00
2.4	Culvert (2700 x 750 RCBC)		m	60	$ 3,100.00	$ 186,000.00
2.5	Headwall (to suit 2700 x 750 RCBC)		Each	6	$ 4,500.00	$ 27,000.00
	Sub-Total					**$ 248,375.00**
3.0	**Miscellaneous**					
3.1	Tree removal		Each	40	$ 200.00	$ 8,000.00
	Sub-Total					**$ 8,000.00**

Sub-total		**$**	**294,831.25**
Contingency	20%	$	58,966.25
GST	10%	$	35,379.75
Grand Total		**$**	**389,177.25**

Note: **Cost estimates provided by Tonkin Consulting are based upon historic cost information and experience, and do not allow for:**

- Latent conditions
- Changes in scope
- Market conditions (i.e. competition, escalation)
- No allowance for approvals for these works
- No allowance for site contamination and remediation or disposal of contaminated material
- No allowance for land acquisition
- No allowance has been made for the staging of these works
- No allowance has been made for landscaping works
- No allowance has been made for service depthing, liaison with service authorities, design of service relocations
- No allowance has been made for project delivery costs including project management
- Calculations assume clay soil and no rock will be encountered

These estimates are to be considered as indicative only, and are not purported to represent anything more than an indication of the cost of the scope of the work.

Tonkin Consulting recommend that an appropriately qualified quantity surveyor be consulted to provide detailed market cost inputs.

CONSTRUCTION COST ESTIMATE

Project: Gawler SMP
Job No: 20141387
Date: 04-04-18
Revision: A
Summary of works: Jarvis Street drain upgrades
Estimated: MM
Review: TAK

Item No	Description	Comment	Unit	Qty	Rate	Cost
1.0	**Preliminaries**					
1.1	Preliminaries	Assumed to be 15% of estimate	Item	1	$ 335,079.75	$ 335,079.75
	Sub-Total					**$ 335,079.75**
2.0	**Stormwater Drainage**					
2.1	675 mm RCP		m	100	$ 730.00	$ 73,000.00
2.2	825 mm RCP		m	50	$ 950.00	$ 47,500.00
2.3	900 mm RCP		m	17	$ 1,065.00	$ 18,105.00
2.4	1050 mm RCP		m	254	$ 1,295.00	$ 328,930.00
2.5	1200 mm RCP		m	255	$ 1,560.00	$ 397,800.00
2.6	1350 mm RCP		m	686	$ 1,800.00	$ 1,234,800.00
2.7	1200 sq Junction Box		Each	2	$ 6,570.00	$ 13,140.00
2.8	1500 sq Junction Box		Each	3	$ 2,140.00	$ 6,420.00
2.9	1800 sq Junction Box		Each	9	$ 9,130.00	$ 82,170.00
2.10	Headwall		Each	2	$ 1,000.00	$ 2,000.00
	Sub-Total					**$ 2,203,865.00**
3.0	**Miscellaneous**					
3.1	Deep excavation allowance		Item	1	$ 30,000.00	$ 30,000.00
	Sub-Total					**$ 30,000.00**

Sub-total		**$ 2,568,944.75**
Contingency	20%	$ 513,788.95
GST	10%	$ 308,273.37
Grand Total		**$ 3,391,007.07**

Note: **Cost estimates provided by Tonkin Consulting are based upon historic cost information and experience, and do not allow for:**

- Latent conditions
- Changes in scope
- Market conditions (i.e. competition, escalation)
- No allowance for approvals for these works
- No allowance for site contamination and remediation or disposal of contaminated material
- No allowance for land acquisition
- No allowance has been made for the staging of these works
- No allowance has been made for landscaping works
- No allowance has been made for service depthing, liaison with service authorities, design of service relocations
- No allowance has been made for project delivery costs including project management
- Calculations assume clay soil and no rock will be encountered

These estimates are to be considered as indicative only, and are not purported to represent anything more than an indication of the cost of the scope of the work.

Tonkin Consulting recommend that an appropriately qualified quantity surveyor be consulted to provide detailed market cost inputs.

CONSTRUCTION COST ESTIMATE

Project: Gawler SMP
Job No: 20141387
Date: 09-05-18
Revision: A
Summary of works: Gawler East flow path improvements
Estimated: MM
Review:

Item No	Description	Comment	Unit	Qty	Rate	Cost
1.0	**Preliminaries**					
1.1	Preliminaries	Assumed to be 15% of estimate	Item	1	$ 78,556.50	$ 78,556.50
	Sub-Total					**$ 78,556.50**
2.0	**Stormwater Drainage**					
2.1	375 mm RCP		m	155	$ 450.00	$ 69,750.00
2.2	825 mm RCP		m	20	$ 950.00	$ 19,000.00
2.3	750 x 600 RCBC		m	10	$ 1,900.00	$ 19,000.00
2.4	900 x 600 RCBC		m	13	$ 2,200.00	$ 28,600.00
2.5	1200 x 600 RCBC		m	30	$ 2,600.00	$ 78,000.00
2.6	1800 x 600 RCBC		m	13	$ 3,000.00	$ 39,000.00
	Sub-Total					**$ 253,350.00**
3.0	**Channel Earthworks**					
3.1	Topsoil stripping		m^2	4,200	$ 19.00	$ 79,800.00
3.2	Excavation (cut to disposal)		m^3	3,000	$ 5.00	$ 15,000.00
3.3	Topsoil respreading		m^2	4,200	$ 1.80	$ 7,560.00
	Sub-Total					**$ 102,360.00**
4.0	**Miscellaneous**					
4.1	Land acquisition		m^2	5,600	$ 30.00	$ 168,000.00
	Sub-Total					**$ 168,000.00**

Sub-total		**$ 602,266.50**
Contingency	20%	$ 120,453.30
GST	10%	$ 72,271.98
Grand Total		**$ 794,991.78**

Note: **Cost estimates provided by Tonkin Consulting are based upon historic cost information and experience, and do not allow for:**

- Latent conditions
- Changes in scope
- Market conditions (i.e. competition, escalation)
- No allowance for engineering design and survey
- No allowance for approvals for these works
- No allowance for site contamination and remediation or disposal of contaminated material
- No allowance has been made for the staging of these works
- No allowance has been made for landscaping works
- No allowance has been made for service depthing, liaison with service authorities, design of service relocations
- No allowance has been made for project delivery costs including project management
- Calculations assume clay soil and no rock will be encountered

These estimates are to be considered as indicative only, and are not purported to represent anything more than an indication of the cost of the scope of the work.

Tonkin Consulting recommend that an appropriately qualified quantity surveyor be consulted to provide detailed market cost inputs.

CONSTRUCTION COST ESTIMATE

Project: Gawler SMP
Job No: 20141387
Date: 04-04-18
Revision: A
Summary of works: Potts Road detention basin
Estimated: MM
Review: TAK

Item No	Description	Comment	Unit	Qty	Rate	Cost
1.0	Preliminaries					
1.1	Preliminaries	Assumed to be 15% of estimate	Item	1	$ 245,077.50	$ 245,077.50
	Sub-Total					**$ 245,077.50**
2.0	Pipe Network (Potts Road West)					
2.1	375 mm RCP		m	950	$ 450.00	$ 427,500.00
2.2	450 mm RCP		m	200	$ 500.00	$ 100,000.00
2.3	600 mm RCP		m	150	$ 650.00	$ 97,500.00
2.4	Headwall (suit pipe 375 mm)		Each	1	$ 800.00	$ 800.00
2.5	Headwall (suit pipe 600 mm)		Each	1	$ 1,000.00	$ 1,000.00
2.6	900 sq Junction Box		Each	8	$ 3,700.00	$ 29,600.00
	Sub-Total					**$ 656,400.00**
3.0	Pipe Network (Corey Street)					
3.1	375 mm RCP		m	530	$ 450.00	$ 238,500.00
3.2	450 mm RCP		m	220	$ 500.00	$ 110,000.00
3.3	Headwall (suit pipe 375 mm)		Each	5	$ 800.00	$ 4,000.00
3.4	900 sq Junction Box		Each	8	$ 3,700.00	$ 29,600.00
	Sub-Total					**$ 382,100.00**
4.0	Detention Basin (Potts Road West)					
4.1	Topsoil stripping and stockpiling		m^2	7,500	$ 3.50	$ 26,250.00
4.2	Basin earthworks		m^3	7,500	$ 19.00	$ 142,500.00
4.3	Topsoil respreading		m^2	7,500	$ 5.00	$ 37,500.00
4.4	Gross Pollutant Trap		Each	2	$ 42,000.00	$ 84,000.00
	Sub-Total					**$ 290,250.00**
5.0	Local Basin (Corey Street)					
5.1	Topsoil stripping and stockpiling		m^2	1,000	$ 3.50	$ 3,500.00
5.2	Basin earthworks		m^3	1,400	$ 19.00	$ 26,600.00
5.3	Topsoil respreading		m^2	1,000	$ 5.00	$ 5,000.00
5.4	Gross Pollutant Trap		Each	1	$ 42,000.00	$ 42,000.00
5.5	In-stream plantings		m	850	$ 80.00	$ 68,000.00
5.6	In-stream wetland ponds		Each	4	$ 40,000.00	$ 160,000.00
	Sub-Total					**$ 305,100.00**

Sub-total		**$ 1,878,927.50**
Contingency	20%	$ 375,785.50
GST	10%	$ 225,471.30
Grand Total		**$ 2,480,184.30**

Note: **Cost estimates provided by Tonkin Consulting are based upon historic cost information and experience, and do not allow for:**

- Latent conditions
- Changes in scope
- Market conditions (i.e. competition, escalation)
- No allowance for approvals for these works
- No allowance for site contamination and remediation or disposal of contaminated material
- No allowance for land acquisition
- No allowance has been made for the staging of these works
- No allowance has been made for landscaping works
- No allowance has been made for service depthing, liaison with service authorities, design of service relocations
- No allowance has been made for project delivery costs including project management
- Calculations assume clay soil and no rock will be encountered

These estimates are to be considered as indicative only, and are not purported to represent anything more than an indication of the cost of the scope of the work.

Tonkin Consulting recommend that an appropriately qualified quantity surveyor be consulted to provide detailed market cost inputs.

CONSTRUCTION COST ESTIMATE

Project: Gawler SMP
Job No: 20141387
Date: 04-04-18
Revision: A
Summary of works: Gawler Belt railway culvert
Estimated: MM
Review: TAK

Item No	Description	Comment	Unit	Qty	Rate	Cost
1.0	**Preliminaries**					
1.1	Preliminaries	Assumed to be 15% of estimate	Item	1	$ 23,370.00	$ 23,370.00
	Sub-Total					**$ 23,370.00**
2.0	**Rail Culvert**					
2.1	Culvert (900 mm RCP)	Cost includes installation	m	25	$ 2,600.00	$ 65,000.00
2.2	Headwall (to suit 900 mm RCP)		Each	2	$ 1,500.00	$ 3,000.00
2.3	Scour protection		m^2	40	$ 150.00	$ 6,000.00
	Sub-Total					**$ 74,000.00**
3.0	**Outfall Channel**					
3.1	Topsoil stripping		m^2	1,600	$ 3.50	$ 5,600.00
3.2	Excavation (cut to disposal)		m^3	800	$ 19.00	$ 15,200.00
3.3	Topsoil respreading		m^2	1,600	$ 5.00	$ 8,000.00
3.4	Land acquisition		m^2	1,600	$ 30.00	$ 48,000.00
	Sub-Total					**$ 76,800.00**
4.0	**Miscellaneous**					
4.1	Traffic control (rail)		Item	1	$ 5,000.00	$ 5,000.00
4.2	Pipe jacking		Item	1		$ -
	Sub-Total					**$ 5,000.00**

Sub-total		**$ 179,170.00**
Contingency	20%	$ 35,834.00
GST	10%	$ 21,500.40
Grand Total		**$ 236,504.40**

Note: **Cost estimates provided by Tonkin Consulting are based upon historic cost information and experience, and do not allow for:**

- Latent conditions
- Changes in scope
- Market conditions (i.e. competition, escalation)
- No allowance for approvals for these works
- No allowance for site contamination and remediation or disposal of contaminated material
- No allowance for land acquisition
- No allowance has been made for the staging of these works
- No allowance has been made for landscaping works
- No allowance has been made for service depthing, liaison with service authorities, design of service relocations
- No allowance has been made for project delivery costs including project management
- Calculations assume clay soil and no rock will be encountered

These estimates are to be considered as indicative only, and are not purported to represent anything more than an indication of the cost of the scope of the work.

Tonkin Consulting recommend that an appropriately qualified quantity surveyor be consulted to provide detailed market cost inputs.

CONSTRUCTION COST ESTIMATE

Project: Gawler SMP
Job No: 20141387
Date: 04-04-18
Revision: A
Summary of works: Gawler Belt interception drain
Estimated: MM
Review: TAK

Item No	Description	Comment	Unit	Qty	Rate	Cost
1.0	**Preliminaries**					
1.1	Preliminaries	Assumed to be 15% of estimate	Item	1	$ 534,600.00	$ 534,600.00
	Sub-Total					**$ 534,600.00**
2.0	**Open Channel**					
2.1	Stripping of topsoil and stockpile (150 mm)		m^2	56,000	$ 3.50	$ 196,000.00
2.2	Swale earthworks		m^3	33,600	$ 19.00	$ 638,400.00
2.3	Topsoil respreading		m^2	56,000	$ 5.00	$ 280,000.00
2.4	Culvert (3300 x 600 RCBC)		m	198	$ 3,200.00	$ 633,600.00
2.5	Headwall (to suit 3300 x 600 RCBC)		Each	8	$ 3,200.00	$ 25,600.00
2.6	Scour protection		m^2	64	$ 150.00	$ 9,600.00
2.7	Hydroseed		m^2	56,000	$ 1.80	$ 100,800.00
	Sub-Total					**$ 1,884,000.00**
3.0	**Miscellaneous**					
3.1	Land acquisition		m^2	56,000	$ 30.00	$ 1,680,000.00
	Sub-Total					**$ 1,680,000.00**

Sub-total		**$ 4,098,600.00**
Contingency	20%	$ 819,720.00
GST	10%	$ 491,832.00
Grand Total		**$ 5,410,152.00**

Note: **Cost estimates provided by Tonkin Consulting are based upon historic cost information and experience, and do not allow for:**

- Latent conditions
- Changes in scope
- Market conditions (i.e. competition, escalation)
- No allowance for approvals for these works
- No allowance for site contamination and remediation or disposal of contaminated material
- No allowance for land acquisition
- No allowance has been made for the staging of these works
- No allowance has been made for landscaping works
- No allowance has been made for service depthing, liaison with service authorities, design of service relocations
- No allowance has been made for project delivery costs including project management
- Calculations assume clay soil and no rock will be encountered

These estimates are to be considered as indicative only, and are not purported to represent anything more than an indication of the cost of the scope of the work.

Tonkin Consulting recommend that an appropriately qualified quantity surveyor be consulted to provide detailed market cost inputs.

CONSTRUCTION COST ESTIMATE

Project: Gawler SMP
Job No: 20141387
Date: 24-05-18
Revision: A
Summary of works: Hewett Rear of Allotment Drainage
Estimated: MM
Review: TAK

Item No	Description	Comment	Unit	Qty	Rate	Cost
1.0	**Preliminaries**					
1.1	Preliminaries	Assumed to be 15% of estimate	Item	1	$ 20,002.50	$ 20,002.50
	Sub-Total					**$ 20,002.50**
2.0	**Stormwater Drainage**					
2.1	150 mm uPVC		m	90	$ 230.00	$ 20,700.00
2.2	225 mm uPVC		m	90	$ 305.00	$ 27,450.00
2.3	300 mm uPVC		m	40	$ 380.00	$ 15,200.00
2.4	Concrete grated inlet pit		Each	7	$ 2,500.00	$ 17,500.00
	Sub-Total					**$ 80,850.00**
3.0	**Miscellaneous**					
3.1	Formation of easement	3 m wide	Each	7	$ 7,500.00	$ 52,500.00
	Sub-Total					**$ 52,500.00**

Sub-total		**$**	**153,352.50**
Contingency	20%	$	30,670.50
GST	10%	$	18,402.30
Grand Total		**$**	**202,425.30**

Note: **Cost estimates provided by Tonkin Consulting are based upon historic cost information and experience, and do not allow for:**

- Latent conditions
- Changes in scope
- Market conditions (i.e. competition, escalation)
- No allowance for approvals for these works
- No allowance for site contamination and remediation or disposal of contaminated material
- No allowance for land acquisition
- No allowance has been made for the staging of these works
- No allowance has been made for landscaping works
- No allowance has been made for service depthing, liaison with service authorities, design of service relocations
- No allowance has been made for project delivery costs including project management
- Calculations assume clay soil and no rock will be encountered

These estimates are to be considered as indicative only, and are not purported to represent anything more than an indication of the cost of the scope of the work.

Tonkin Consulting recommend that an appropriately qualified quantity surveyor be consulted to provide detailed market cost inputs.

CONSTRUCTION COST ESTIMATE

Project: Gawler SMP
Job No: 20141387
Date: 04-04-18
Revision: A
Summary of works: Evanston Oval parallel pipe upgrade
Estimated: MM
Review: TAK

Item No	Description	Comment	Unit	Qty	Rate	Cost
1.0	**Preliminaries**					
1.1	Preliminaries	Assumed to be 15% of estimate	Item	1	$ 23,353.50	$ 23,353.50
	Sub-Total					**$ 23,353.50**
2.0	**Stormwater Drainage**					
2.1	1050 mm RCP		m	118	$ 1,155.00	$ 136,290.00
2.2	1500 sq Junction Box		Each	2	$ 3,700.00	$ 7,400.00
2.3	Headwall replacement		Each	2	$ 1,000.00	$ 2,000.00
	Sub-Total					**$ 145,690.00**
3.0	**Miscellaneous**					
3.1	Oval irrigation replacement		Item	1	$ 10,000.00	$ 10,000.00
	Sub-Total					**$ 10,000.00**

Sub-total		**$**	**179,043.50**
Contingency	20%	$	35,808.70
GST	10%	$	21,485.22
Grand Total		**$**	**236,337.42**

Note: **Cost estimates provided by Tonkin Consulting are based upon historic cost information and experience, and do not allow for:**

- Latent conditions
- Changes in scope
- Market conditions (i.e. competition, escalation)
- No allowance for approvals for these works
- No allowance for site contamination and remediation or disposal of contaminated material
- No allowance for land acquisition
- No allowance has been made for the staging of these works
- No allowance has been made for landscaping works
- No allowance has been made for service depthing, liaison with service authorities, design of service relocations
- No allowance has been made for project delivery costs including project management
- Calculations assume clay soil and no rock will be encountered

These estimates are to be considered as indicative only, and are not purported to represent anything more than an indication of the cost of the scope of the work.

Tonkin Consulting recommend that an appropriately qualified quantity surveyor be consulted to provide detailed market cost inputs.

CONSTRUCTION COST ESTIMATE

Project: Gawler SMP
Job No: 20141387
Date: 04-04-18
Revision: A
Summary of works: Gross Pollutant Traps
Estimated: MM
Review: TAK

Item No	Description	Comment	Unit	Qty	Rate	Cost
1.0	**Preliminaries**					
1.1	Preliminaries	Assumed to be 15% of estimate	Item	1	$ 133,650.00	$ 133,650.00
	Sub-Total					**$ 133,650.00**
2.0	**Gross Pollutant Traps**					
2.1	GPT 4900	Supply and installation	Item	1	$ 120,000.00	$ 120,000.00
2.2	GPT 4750	Supply and installation	Item	2	$ 100,000.00	$ 200,000.00
2.3	GPT 4450	Supply and installation	Item	3	$ 87,000.00	$ 261,000.00
2.4	GPT 41350	Supply and installation	Item	1	$ 170,000.00	$ 170,000.00
2.5	Excavation works		Each	7	$ 20,000.00	$ 140,000.00
	Sub-Total					**$ 891,000.00**
3.0	**Miscellaneous**					
3.1	GPT annual operation and maintenance		Item/year	7	$ 200.00	$ 1,400.00
	Sub-Total				**Cost/year**	**$ 1,400.00**

Sub-total (excluding annual costs)		**$ 1,024,650.00**
Contingency	20%	$ 204,930.00
GST	10%	$ 122,958.00
Grand Total (excluding annual costs)		**$ 1,352,538.00**

Note: **Cost estimates provided by Tonkin Consulting are based upon historic cost information and experience, and do not allow for:**

- Latent conditions
- Changes in scope
- Market conditions (i.e. competition, escalation)
- No allowance for approvals for these works
- No allowance for site contamination and remediation or disposal of contaminated material
- No allowance for land acquisition
- No allowance has been made for the staging of these works
- No allowance has been made for landscaping works
- No allowance has been made for service depthing, liaison with service authorities, design of service relocations
- No allowance has been made for project delivery costs including project management
- Calculations assume clay soil and no rock will be encountered

These estimates are to be considered as indicative only, and are not purported to represent anything more than an indication of the cost of the scope of the work.
Tonkin Consulting recommend that an appropriately qualified quantity surveyor be consulted to provide detailed market cost inputs.

CONSTRUCTION COST ESTIMATE

Project: Gawler SMP
Job No: 20141387
Date: 04-04-18
Revision: A
Summary of works: Raingardens
Estimated: MM
Review: TAK

Item No	Description	Comment	Unit	Qty	Rate	Cost
1.0	**Preliminaries**					
1.1	Preliminaries	Assumed to be 15% of estimate	Item	1	$ 45,000.00	$ 45,000.00
	Sub-Total					**$ 45,000.00**
2.0	**Raingardens**					
2.1	Streetscape raingarden		Item	15	$ 20,000.00	$ 300,000.00
	Sub-Total					**$ 300,000.00**
3.0	**Miscellaneous**					
3.1	Raingarden maintenance		Item/year	15	$ 300.00	$ 4,500.00
	Sub-Total					**Cost/year $ 4,500.00**

Sub-total (excluding annual costs)		**$ 345,000.00**
Contingency	20%	$ 69,000.00
GST	10%	$ 41,400.00
Grand Total (excluding annual costs)		**$ 455,400.00**

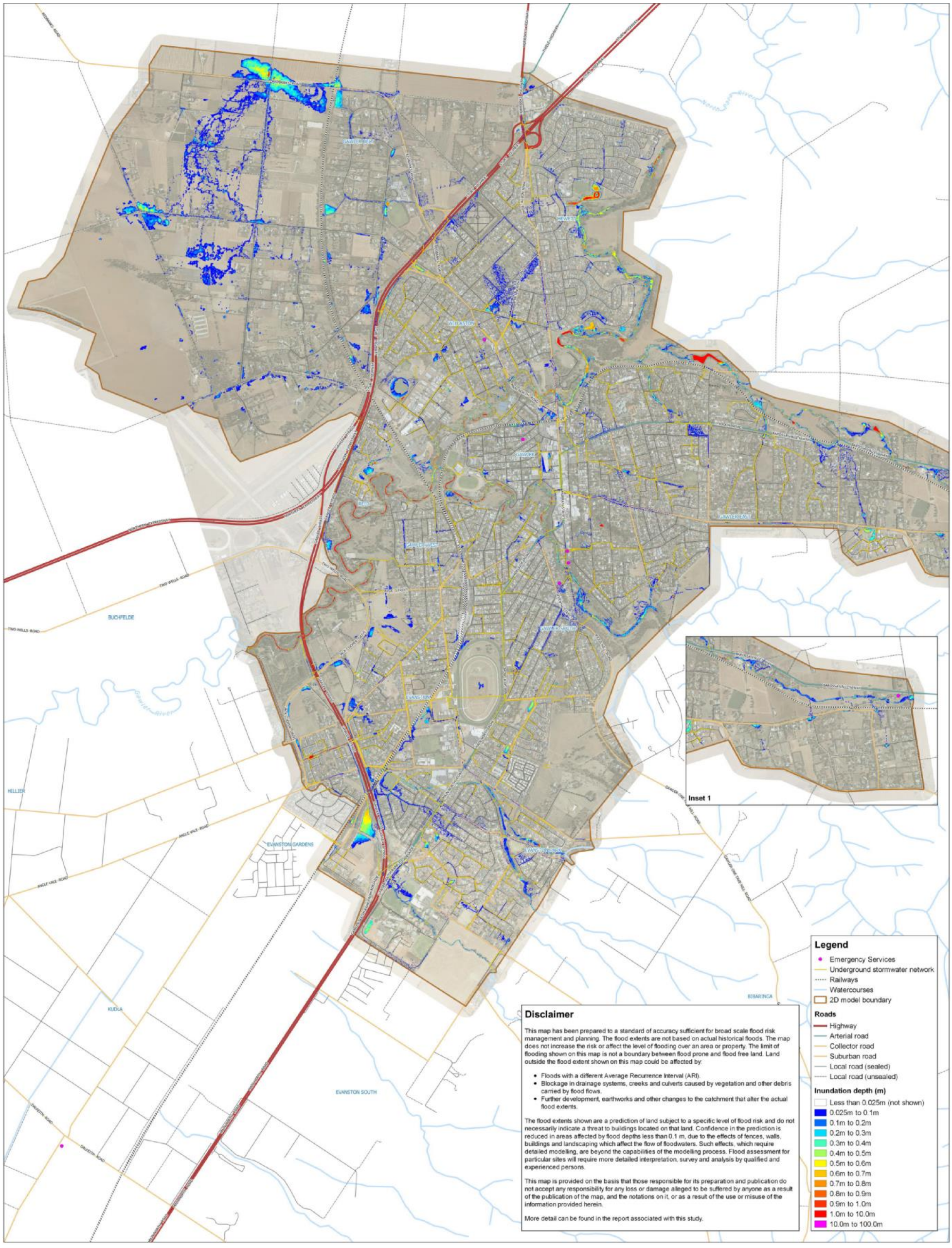
Note: **Cost estimates provided by Tonkin Consulting are based upon historic cost information and experience, and do not allow for:**

- Latent conditions
- Changes in scope
- Market conditions (i.e. competition, escalation)
- No allowance for approvals for these works
- No allowance for site contamination and remediation or disposal of contaminated material
- No allowance for land acquisition
- No allowance has been made for the staging of these works
- No allowance has been made for landscaping works
- No allowance has been made for service depthing, liaison with service authorities, design of service relocations
- No allowance has been made for project delivery costs including project management
- Calculations assume clay soil and no rock will be encountered

These estimates are to be considered as indicative only, and are not purported to represent anything more than an indication of the cost of the scope of the work.

Tonkin Consulting recommend that an appropriately qualified quantity surveyor be consulted to provide detailed market cost inputs.

Appendix F – Flood inundation and hazard maps

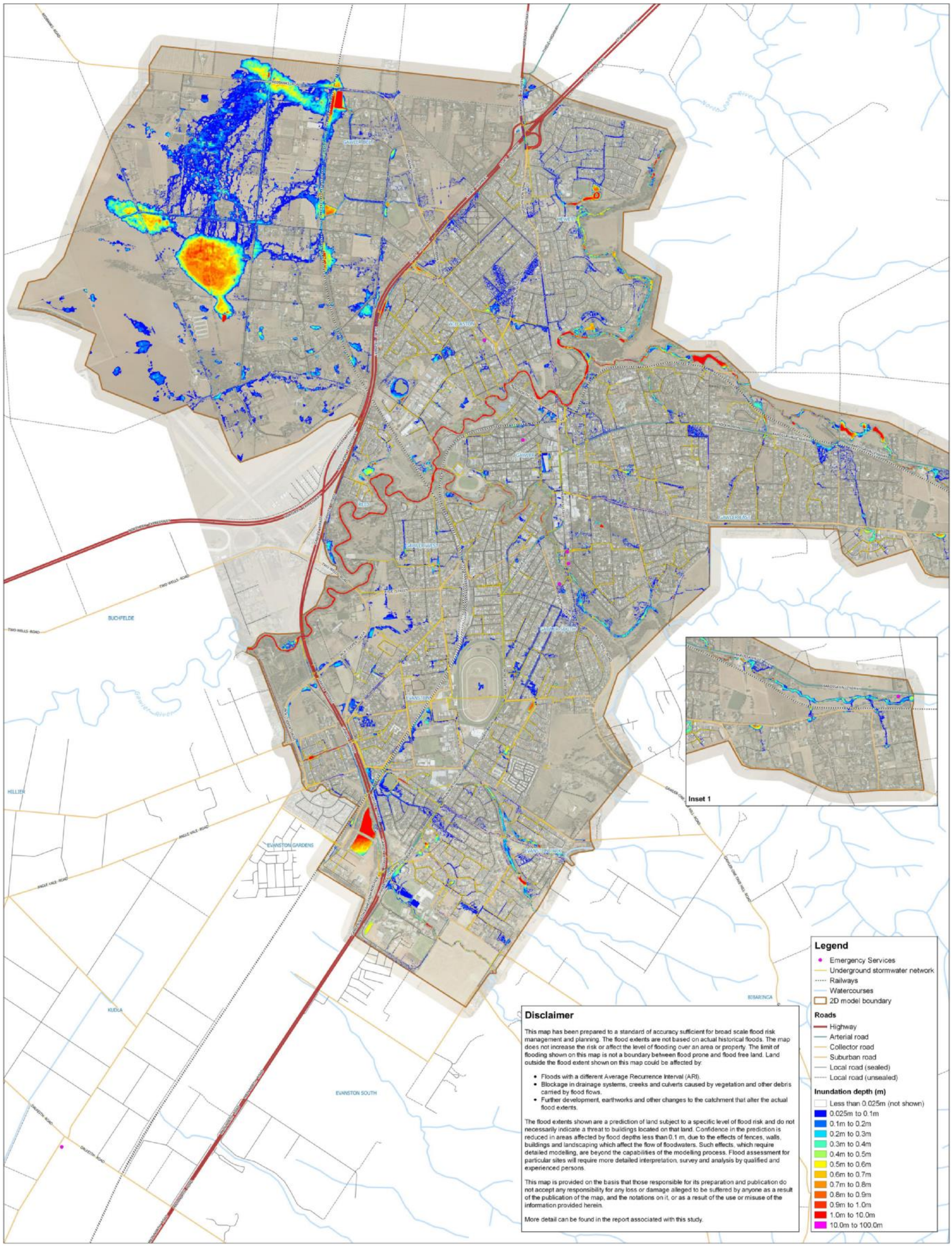


Town of Gawler, Light Regional Council, and Barossa Council

tonkin

GAWLER AND SURROUNDS STORMWATER MANAGEMENT PLAN
20% AEP flood depth existing development scenario

Map 1



Town of Gawler, Light Regional Council, and Barossa Council

0 500 1000 1500 2000 m

1:15,000 at A1

tonkin

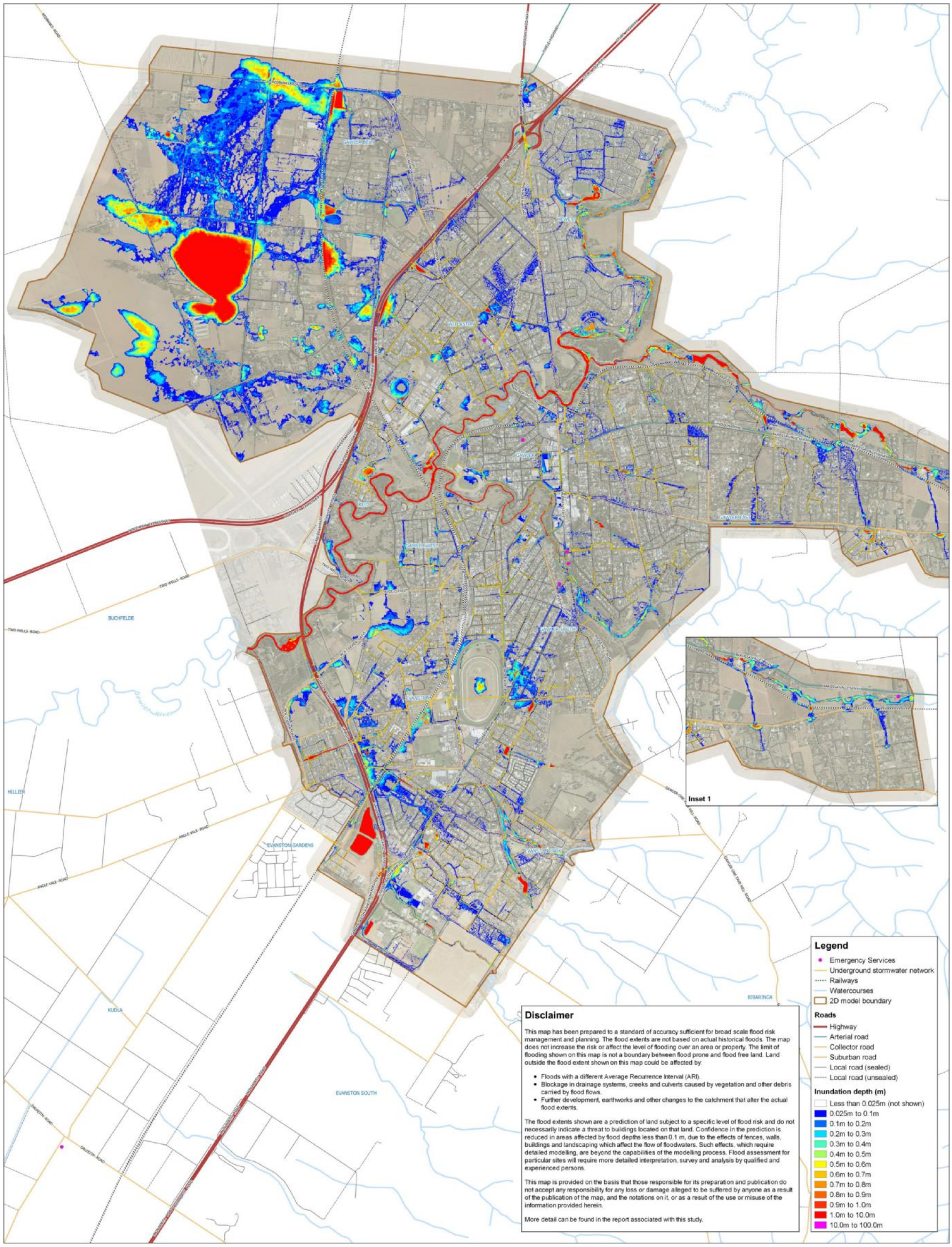
Job Number: 20141387
Filename: 20141387M001.qgs
Revision: E
Date: 2019-03-22
Drawn: JDN

Data Acknowledgement
Aerial imagery provided by and used with permission of Council

GAWLER AND SURROUNDS STORMWATER MANAGEMENT PLAN
5% AEP flood depth existing development scenario

N

Map 2



Town of Gawler, Light Regional Council, and Barossa Council

0 500 1000 1500 2000 m

1:15,000 at A1

tonkin

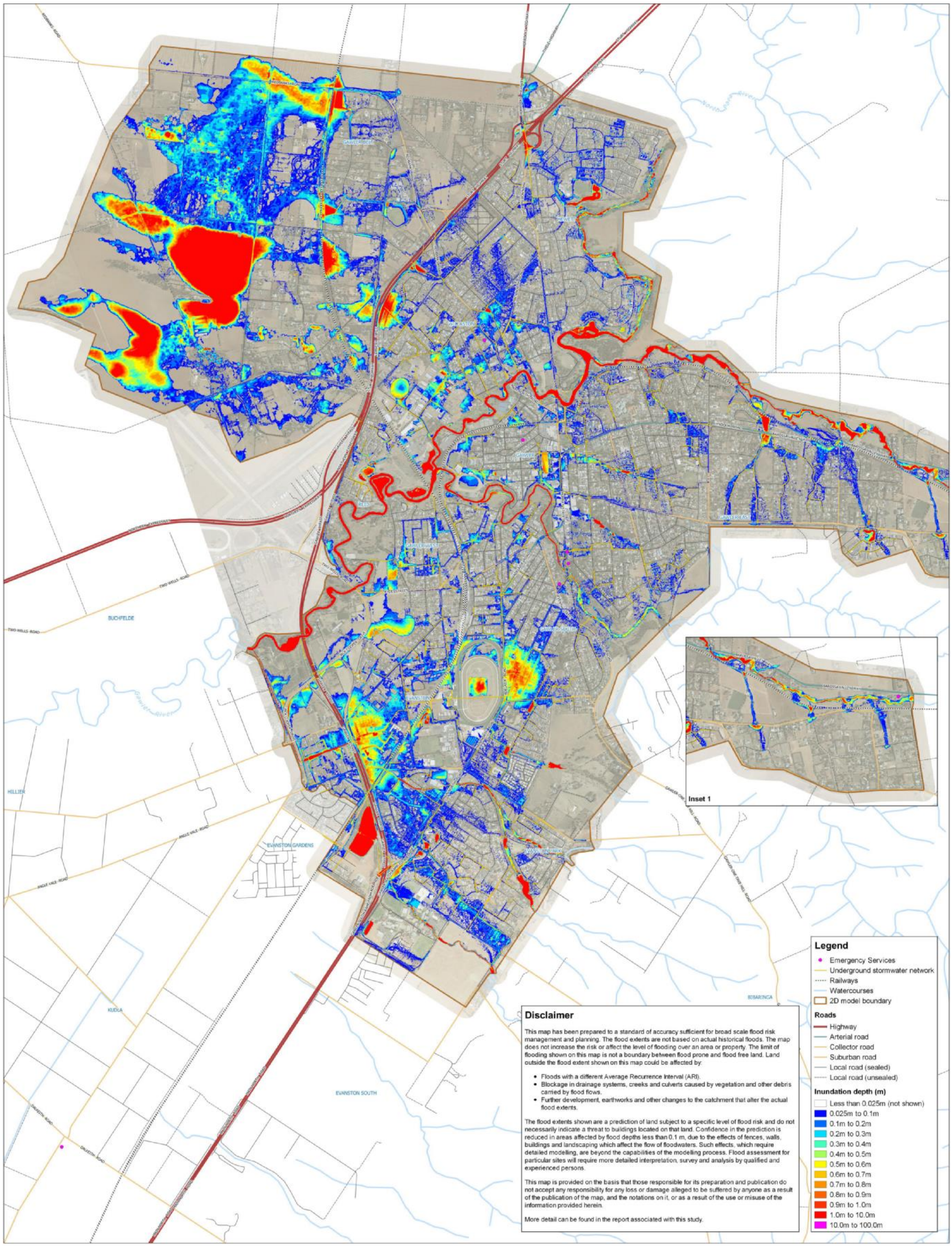
Job Number: 2014.1387
Filename: 20141387M001.qgs
Revision: E
Date: 2019-03-22
Drawn: JDN

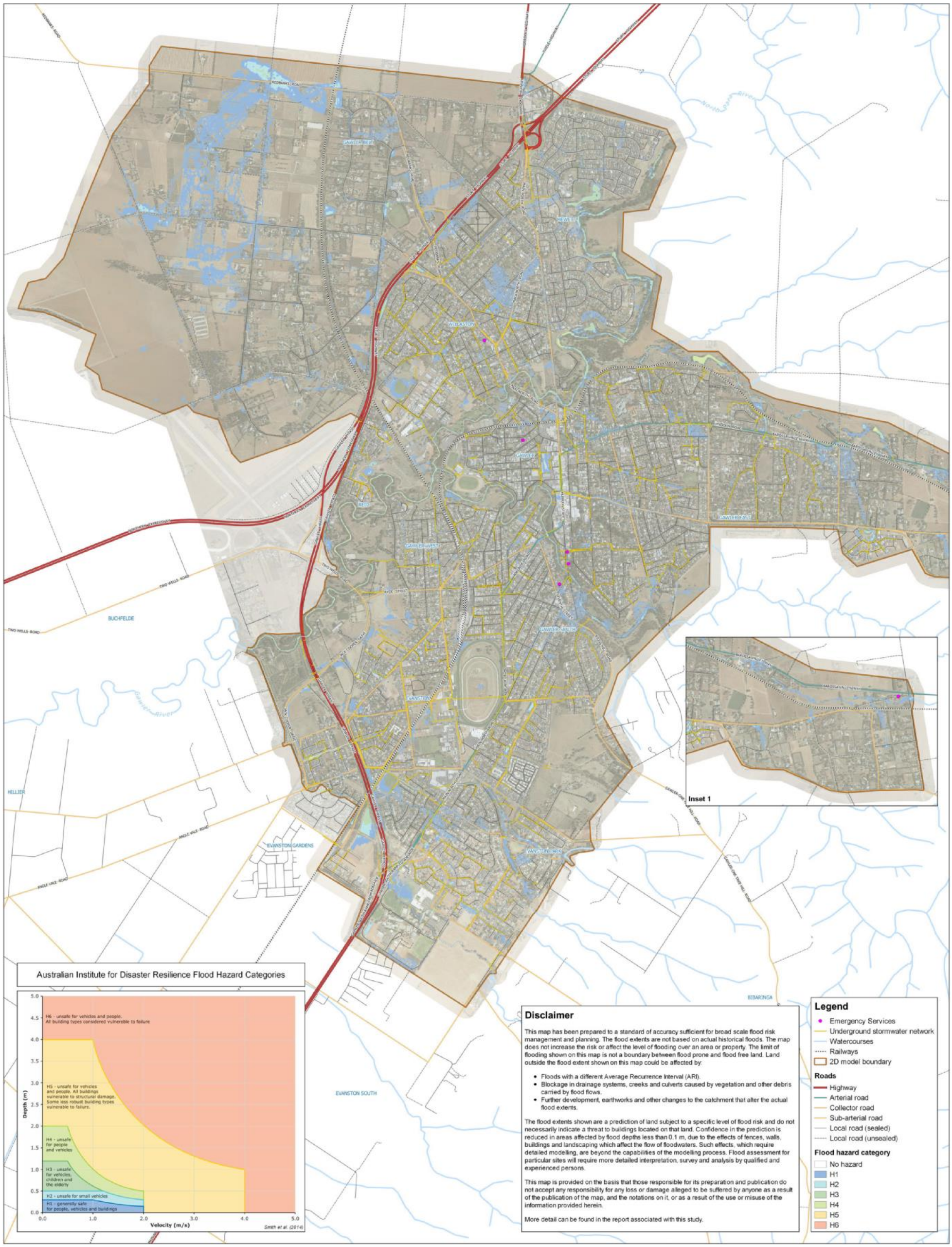
Data Acknowledgement
Aerial imagery provided by and used with permission of Council

GAWLER AND SURROUNDS STORMWATER MANAGEMENT PLAN
1% AEP flood depth existing development scenario

N

Map 3


Inset 1
Legend
Emergency Services
Underground stormwater network
Railways
Watercourses
2D model boundary
Roads
Highway
Arterial road
Collector road
Suburban road
Local road (sealed)
Local road (unsealed)
Inundation depth (m)
Less than 0.025m (not shown)
0.025m to 0.1m
0.1m to 0.2m
0.2m to 0.3m
0.3m to 0.4m
0.4m to 0.5m
0.5m to 0.6m
0.6m to 0.7m
0.7m to 0.8m
0.8m to 0.9m
0.9m to 1.0m
1.0m to 10.0m
10.0m to 100.0m
Disclaimer
This map has been prepared to a standard of accuracy sufficient for broad scale flood risk management and planning. The flood extents are not based on actual historical floods. The map does not increase the risk or affect the level of flooding over an area or property. The limit of flooding shown on this map is not a boundary between flood prone and flood free land. Land outside the flood extent shown on this map could be affected by:
• Floods with a different Average Recurrence Interval (ARI).
• Blockage in drainage systems, creeks and culverts caused by vegetation and other debris carried by flood flows.
• Further development, earthworks and other changes to the catchment that alter the actual flood extents.
The flood extents shown are a prediction of land subject to a specific level of flood risk and do not necessarily indicate a threat to buildings located on that land. Confidence in the prediction is reduced in areas affected by flood depths less than 0.1 m, due to the effects of fences, walls, buildings and landscaping which affect the flow of floodwaters. Such effects, which require detailed modelling, are beyond the capabilities of the modelling process. Flood assessment for particular sites will require more detailed interpretation, survey and analysis by qualified and experienced persons.
This map is provided on the basis that those responsible for its preparation and publication do not accept any responsibility for any loss or damage alleged to be suffered by anyone as a result of the publication of the map, and the notations on it, or as a result of the use or misuse of the information provided herein.
More detail can be found in the report associated with this study.
BUCHFELDE
HILLIER
EVANSTON GARDENS
KUDLA
EVANSTON SOUTH
RIBARINGA
Town of Gawler, Light Regional Council, and Barossa Council
0 500 1000 1500 2000 m
1:15,000
at A1
Job Number: 2014.1387
Filename: 20141387M001.qgs
Revision: E
Date: 2019-03-22
Drawn: JDN
Data Acknowledgement
Aerial imagery provided by and used with permission of Council
tonkin
N
GAWLER AND SURROUNDS STORMWATER MANAGEMENT PLAN
0.2% AEP flood depth existing development scenario
Map 4



GAWLER AND SURROUNDS STORMWATER MANAGEMENT PLAN
20% AEP flood hazard existing development scenario