Hydrosphere Consulting

Lismore Urban Stormwater Management Plan

Volume 1: USMP Implementation Program

FINAL

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PROJECT 15-013 – LISMORE URBAN STORMWATER MANAGEMENT PLAN

REV	DESCRIPTION	AUTHOR	REVIEW	APPROVAL	DATE
0	Draft issued for LCC review	R. Campbell, K. Pratt, U. Makings, M. Howland	M. Howland	M. Howland	1 Sept 2015
1	Second Draft	R. Campbell		R. Campbell	15 Oct 2015
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EXECUTIVE SUMMARY

This Urban Stormwater Management Plan (USMP) has been prepared to improve the sustainability of Lismore's urban stormwater management systems. The plan reviews Council's asset management and planning processes to ensure that stormwater systems are designed, constructed and maintained to best practice standards and provides a management framework to address priority issues. Stormwater improvements are proposed in locations that will maximise the environmental, social and economic benefits to the community. The aim is to deliver the greatest benefit to the community at least cost.

The USMP integrates both stormwater quality and quantity objectives delivered within the context of Council's asset management framework, thus taking a holistic, long-term approach to urban stormwater management. Implementation of the USMP will provide the following outcomes:

1. Improvements in water quality through delivery of effective structural (capital, renewal and maintenance works) and non-structural (education, regulatory, policy development and research) stormwater management programs; and
2. Management of water quantity such that damage to private property, Council and community assets caused by localised flooding is minimised. This will be achieved through improved asset management, maintenance and upgrades as well as the provision of new assets where these are warranted.

Volume 1 of the USMP (this document) provides an Implementation Program for the priority management actions. Volume 2 provides the background information used in the development of the Implementation Program.

Management issues were identified from available background data, site assessments and stakeholder consultation activities. Many of the urban stormwater management issues have been previously identified by Council and in some cases are being addressed through existing Council actions. The issues are generally:

- Significant catchment-wide stormwater management issues which are expensive to address;
- A legacy of an ageing stormwater system;
- A result of local climatic conditions and topography;
- A result of under-funding of asset management activities (such as maintenance and renewal); and/or
- Occur throughout the urban area and will require a coordinated approach to achieve the best outcome for stakeholders.

Council's urban stormwater management will be enhanced through improved administration and governance and increased emphasis on planning and asset management, consistent with Council's strategic direction and policies. More strategic consideration of stormwater management requirements is required through the whole asset lifecycle including allocation of internal Council responsibilities and ensuring adequate skills, funding and supporting policies are in place. Key outcomes will include:

- During the land use planning and development stages, Council will identify how stormwater infrastructure will be designed to suit local circumstances and funded through the whole asset life cycle;
- Management of stormwater assets through design, construction and operational phases will be improved to ensure Council inherits assets that are functioning properly and that meet the design intent as well as any Council requirements for technology and resources. Council will develop a clear understanding and funding commitment (and also minimise the burden) for ongoing maintenance of the assets;

- Increased construction phase compliance enforcement to ensure adequate operation of erosion/sediment controls. Increased funding for regulatory compliance officers is required, with clear policies and support mechanisms;
- Asset handover procedures will be developed to improve outcomes of transfer of ownership and responsibility to Council;
- Details of all existing stormwater infrastructure (including vegetated assets) will be documented with sufficient accuracy to allow identification of future maintenance, upgrade and renewal requirements;
- Function and performance requirements will be identified for all asset types and maintenance will be undertaken to these desired standards; and
- Increased focus on compliance of private treatment systems will be implemented.

Structural actions are proposed to address the priority site-based issues which include:

- Poor quality of urban stormwater;
- Gross pollutants;
- Sedimentation;
- Localised flooding;
- Weeds (restricted stormwater conveyance);
- Inadequate drainage;
- Water logging; and/or
- Poor riparian condition.

The site-based management issues have been prioritised according to the risk of not achieving Council's stormwater management objectives as well as the urgency of developing a solution to the problem. The stormwater management objectives include both quantity and quality objectives as well as reducing impacts on amenity.

The ability to achieve the USMP management objectives will be determined through the success of the management actions. This will require coordinated monitoring as well as on-going review of performance against defined targets. Ongoing reporting of progress of the USMP will be undertaken on an annual basis as part of budgeting processes. A major 10-year review of the USMP is also required.

The management actions have been compiled into a ten year implementation program (Table 1) with responsibilities and indicative costs estimated over the ten year implementation period. The total cost of the USMP implementation is estimated to be $9.590 million over ten years. The actions will be delivered through a combination of the Stormwater Management Service (SMS) charge, Council's general fund, developer contributions (to be determined), grant funding (where available) and partnerships with other organisations. The delivery of the actions may be influenced by the availability of this funding as well as human resources.

Table 1: USMP Implementation Program

Actions	USMP Ten Year Implementation Program (2015 $ '000)	Location[1]	Responsibility	10 year total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
					2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Operations														
NS22	Contributions Plan	Urban area	Manager Development and Compliance	20	20									
NS13, NS14, NS15, NS16	Community Education	Urban area	Manager Integrated Planning	75		15		15		15		15		15
NS4	Staff Training	Urban area	Manager Integrated Planning, Manager Works, Manager Assets, Manager Development and Compliance, Manager Civic Pride	75	15		15		15		15		15	
NS21	Project Management/Delivery	Urban area	Manager Assets	80		20	20	20				10	10	
NS9, NS23	Compliance	Urban area	Manager Development and Compliance	20	20									
Conduits and Pits														
NS1, NS2, NS3	Asset Management	Urban area	Manager Assets	417	50	50	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.6
NS18	Survey and Design - internal	Urban area	Manager Assets	308	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8
NS6, NS10, NS11, NS19	Administration and management	Urban area	Manager Works, Manager Assets, Manager Civic Pride	943	94.3	94.3	94.3	94.3	94.3	94.3	94.3	94.3	94.3	94.3
Stormwater Treatment														
NS1, NS2, NS3	Asset Management	Urban area	Manager Assets	206	50	50	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2
NS18	Survey and Design - internal	Urban area	Manager Assets	308	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8
NS5, NS6, NS7, NS8, NS12, NS19	Administration and management - stormwater treatment	Urban area	Manager Integrated Planning	913	91.3	91.3	91.3	91.3	91.3	91.3	91.3	91.3	91.3	91.3
NS17	Monitoring	Urban area	Manager Integrated Planning	100	10	10	10	10	10	10	10	10	10	10
Maintenance														
Conduits and Pits														
	Programmed drainage maintenance	Urban area	Manager Works	1,305	118.8	131.8	131.8	131.8	131.8	131.8	131.8	131.8	131.8	131.8
S8	27-41 Cathcart Street restorative maintenance	12 - Gasworks Creek	Manager Works	5	5									
S7	Larkin Lane restorative maintenance	14 - CBD	Manager Works	5	5									
S6A	Trinity Drive inspection and restorative maintenance	6 – Howards Grass	Manager Works	3	3									
	Reactive drainage maintenance	Urban area	Manager Works	565	56.5	56.5	56.5	56.5	56.5	56.5	56.5	56.5	56.5	56.5
Stormwater Treatment														
	Routine treatment system maintenance	Urban area	Manager Integrated Planning	450	46.2	34.2	46.2	46.2	46.2	46.2	46.2	46.2	46.2	46.2
S9	Camilla Place retention basin restorative maintenance	9 – Tucki Tucki	Manager Integrated Planning	6		6								

Actions	USMP Ten Year Implementation Program (2015 $ '000)	Location[1]	Responsibility	10 year total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
					2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
S10	Joy Street sedimention basin restorative maintenance	9 – Tucki Tucki	Manager Integrated Planning	6		6								
Asset Upgrade														
Conduits and Pits														
S19	Trunk drainage upgrades as part of roadworks	Urban area	Manager Assets	439		48.8	48.8	48.8	48.8	48.8	48.8	48.8	48.8	48.8
S1B	Drain rehabilitation - Zadoc Street to bat cave	1 – Browns Creek	Manager Assets	38				20	3	3	3	3	3	3
S3	Union Street stormwater upgrade	15 – South Lismore/ Hollingworth Creek	Manager Assets	19				19						
S4	Reshaping/enlargement of Snow Street channel	16 – South Lismore/ Airport	Manager Assets	5						5				
S5	Terania Street stormwater upgrade	2 – Slaters Creek	Manager Assets	141								141		
S6B	Trinity Drive drainage modifications	6 – Howards Grass	Manager Assets	35						35				
S8	27-41 Cathcart Street drainage modifications	12 – Gasworks Creek	Manager Assets	70		70								
Stormwater Treatment														
S12	Kookaburra Terrace sedimentation basin (#3)	9 – Tucki Tucki	Manager Integrated Planning	7						7				
S13	Kookaburra Terrace sedimentation basin (#2)	9 – Tucki Tucki	Manager Integrated Planning	3						3				
S14	Kookaburra Terrace sedimentation basin (#1)	9 – Tucki Tucki	Manager Integrated Planning	8				8						
S2B	Monaltrie Creek - rehabilitation of drainage/creeks	10 - Monaltrie Creek	Manager Integrated Planning	74				48		10		10		6
S11	Gasworks Creek detention basin/channel vegetation	12 – Gasworks Creek	Manager Integrated Planning	27									27	
S15	Just Street bioretention basin	9 – Tucki Tucki	Manager Integrated Planning	8			8							
S16	Riparian rehabilitation	Urban area	Manager Integrated Planning	40		10		10		10		10		
New Assets														
Conduits and Pits														
S20	2009/10 trunk drainage program loan repayment	15 - South Lismore/ Hollingworth Creek	Manager Integrated Planning	302	30	30	30	30	30	30	30	30	30	30
S1C	Lismore Workers golf course detention basin/s	1 – Browns Creek	Manager Integrated Planning, Manager Assets	92	10	62	5		5		5		5	
Stormwater Treatment														
S1A	Browns Creek catchment water quality/flooding improvements	1 – Browns Creek	Manager Integrated Planning, Manager Assets	1,620	80	500	500	300	50	50	50	30	30	30

Actions	USMP Ten Year Implementation Program (2015 $ '000)	Location[1]	Responsibility	10 year total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
					2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
S2A	Upper Monaltrie Creek sediment containment structures	10 - Monaltrie Creek	Manager Integrated Planning, Manager Assets	55			26	5	3	5	3	5	3	5
S2C	Monaltrie Creek catchment stormwater treatment system	10 - Monaltrie Creek	Manager Integrated Planning, Manager Assets	523							80	200	176	67
S17	Newbridge St stormwater treatment system	15 - South Lismore/ Hollingworth Creek	Manager Integrated Planning, Manager Assets	100										100
S18	Treatment systems as part of roadworks	Urban area	Manager Integrated Planning, Manager Assets	175	25	25	25	25	25	25	25			
			Total Funded Program (including Reserves)	**9,590**	**792**	**1,373**	**1,222**	**1,093**	**724**	**791**	**804**	**1,047**	**892**	**849**
			Available funding - General Fund	*4,690*	*469*	*469*	*469*	*469*	*469*	*469*	*469*	*469*	*469*	*469*
			Available funding - SMS Charge	*3,800*	*380*	*380*	*380*	*380*	*380*	*380*	*380*	*380*	*380*	*380*
			Opening Reserve		*1,100*	*1,262*	*728*	*343*	*87*	*201*	*247*	*280*	*71*	*2*

1. Refers to the entire urban area or a specific Management Area.
2. Year refers to the financial year. 2017 is the 2016/17 financial year, commencing 1 July 2016.

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1. INTRODUCTION

This Urban Stormwater Management Plan (USMP) has been prepared to improve the sustainability of Lismore's urban stormwater management systems. The plan builds on Lismore City Council's 2007 Urban Stormwater Management Plan and focuses on providing an effective framework for stormwater management to address priority issues. The USMP provides a review of Council's asset management and planning processes to ensure that stormwater systems are designed, constructed and maintained to best practice standards. Stormwater improvements are proposed in locations that will maximise the environmental, social and economic benefits to the community. The aim is to deliver the greatest benefit to the community at least cost.

The USMP integrates both stormwater quality and quantity objectives delivered within the context of Council's asset management framework, thus taking a holistic, long-term approach to urban stormwater management. The USMP aims to achieve the following outcomes:

1. To improve water quality through delivery of effective structural (capital, renewal and maintenance works) and non-structural (education, regulatory, policy development and research) stormwater management programs; and
2. To manage water quantity such that damage to private property, Council and community assets caused by localised flooding is minimised through improved asset management, maintenance and asset upgrades as well as new assets where these are warranted.

The USMP brings together the available information to identify urban stormwater management issues and formulate management actions. Volume 1 of the USMP (this document) provides an Implementation Program for the priority management actions and Volume 2 provides the background information used in the development of the Implementation Program.

The city of Lismore is located in the Northern Rivers Region of NSW within the Richmond River catchment on the Wilsons River floodplain near the confluence of the Wilsons River and Leycester Creek. The study area includes the mid Wilsons River and the upper Tucki Tucki Creek catchments within the broader Richmond River catchment. For the purposes of this plan, urban stormwater management areas were developed based on the urban stormwater catchments. The management areas serve to break the large study area down into smaller units, and to visualise at a suitable scale the location of stormwater assets in relation to receiving environments and any identified problem areas. A total of 16 management areas were identified with reference to hydrological sub-catchments (Figure 1).

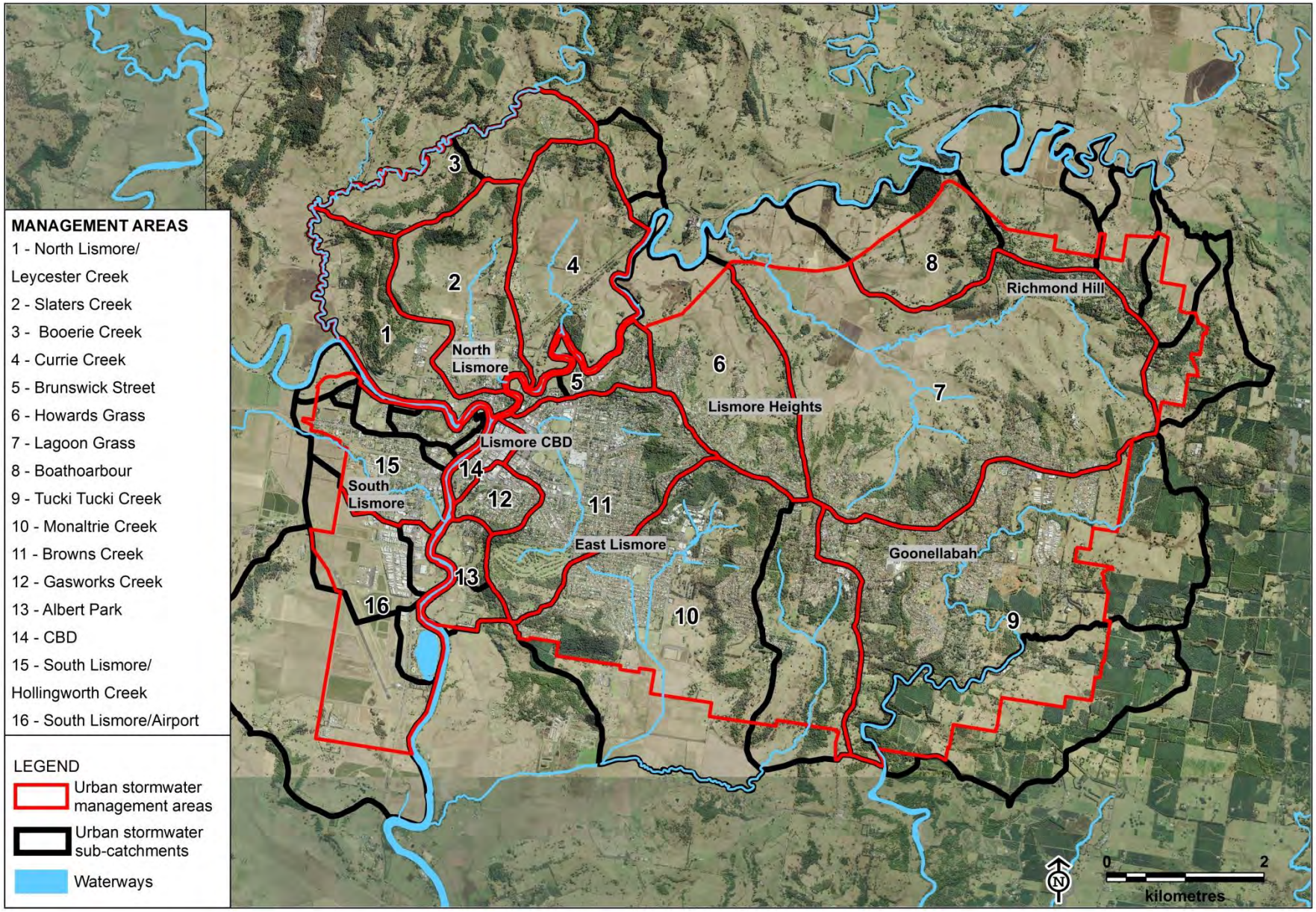


Figure 1: Urban stormwater sub-catchments and management areas

2. USMP OBJECTIVES

The USMP objectives have been developed from Council's adopted strategic direction (Imagine Lismore 10 Year Plan, 2013-2023) and stakeholder feedback. Further background is provided in Section 8 of Volume 2. With an increased focus on asset management, Council has recognised the need for consideration of the whole asset lifecycle and wider consideration of stormwater impacts. Whereas the 2007 USMP focussed on the quality of runoff, this USMP extends Council's stormwater planning to include management of quantity (i.e. localised flooding) issues as well as water quality. The overall goal for this USMP is therefore:

To provide a balanced, whole of life cycle approach to management of urban stormwater to:

- Reduce the occurrence of localised flooding to protect public and private property;
- Improve the quality of urban runoff in order to protect the natural, ecological and aesthetic values of Lismore's waterways;
- Minimise adverse impacts of stormwater runoff within the Wilsons River Source drinking water catchment; and
- Incorporate opportunities to enhance the recreational opportunities and amenity of Lismore's urban area, particularly the CBD and Wilsons riverbank.

The principles applied to stormwater management within the Lismore urban area are:

1. Protect and/or enhance downstream environments, including recognised social, environmental and economic values, by appropriately managing the quality and quantity of stormwater runoff;
2. Limit flooding of public and private property to acceptable or designated levels;
3. Ensure stormwater and its associated drainage systems are planned, designed and managed with appropriate consideration and protection of community health and safety standards, including potential impacts on pedestrian and vehicular traffic;
4. Adopt and promote water sensitive design principles, including appropriately managing stormwater as an integral part of the total water cycle, protecting natural features and ecological processes within urban waterways;
5. Appropriately integrate stormwater systems into the natural and built environments while optimising the potential uses of drainage corridors;
6. Ensure stormwater is managed at a social, environmental and economic cost that is acceptable to the community as a whole, and that the levels of service and the contributions to costs are equitable; and
7. Enhance community awareness of, and participation in, the appropriate management of stormwater.

It is intended that these principles apply to the full life cycle of stormwater management activities from land use planning to asset operation and maintenance. To achieve these objectives, the following actions are required:

- Council Commitment – Appropriate policy development to ensure the success of the USMP;
- Resources and Funding – An appropriate level of funding and resources is required to ensure successful implementation of the USMP; and
- Community Awareness – Council programs and actions will aim to increase public awareness and education on the impacts of stormwater pollution and the implementation of improved stormwater management practices.

3. MANAGEMENT ISSUES

Management issues were identified from available background data, site assessments and stakeholder consultation activities (refer Section 9 of Volume 2). Many of the urban stormwater management issues have been previously identified by Council and in some cases are being addressed through existing Council actions. The issues are generally:

- Significant catchment-wide stormwater management issues which are expensive to address;
- A legacy of an ageing stormwater system;
- A result of local climatic conditions and topography;
- A result of underfunding of asset management activities (such as maintenance and renewal); and/or
- Occur throughout the urban area and will require a coordinated approach to achieve the best outcome for stakeholders.

The management issues are discussed in detail in Volume 2 and summarised below.

Table 2: Summary of Urban Stormwater Management Issues

Issue	Key Concerns
Funding	• Drainage maintenance and issues raised by customers are not all addressed • No dedicated renewals program • Only minor drainage upgrade works are undertaken • Minimal contributions from developers • Large backlog of works and future works program
Staff resources	• Staff have limited training in stormwater function and design, particularly vegetated assets • Limited stormwater considerations applied at development assessment stage • Limited consideration of ongoing asset management requirements for treatment systems • Limited resources for construction phase compliance enforcement
Asset management	• Insufficient asset data to reliably forecast renewal requirements and plan maintenance activities • Potential deterioration of the stormwater network • Localised flooding due to blockages • Localised flooding due to inadequate systems • Insufficient planning for ongoing maintenance of treatment assets • Grass swales and vegetated assets are difficult to maintain • Insufficient management of private treatment systems
Development controls	• Potential impacts on Wilsons River Source drinking water catchment • Lack of internal approval process, development guidelines and scrutiny for Council developments • Significant development is planned within the Lismore urban area, placing increased pressure on stormwater management

Issue	Key Concerns
Site-based issues	• Poor quality of urban stormwater • Gross pollutants • Sedimentation • Localised flooding • Weeds (restricted stormwater conveyance) • Inadequate drainage • Water logging • Poor riparian condition

The locations of site-based issues are shown on Figure 2. The figure shows localised issues as well as management areas that are low-lying, relatively flat and exhibit waterlogged soils which present widespread issues with localised flooding where drainage is inadequate.

The required response to many of the management issues involves improvements in administration and governance that can generally be addressed though existing staff responsibilities.

The site-based management issues have been prioritised according to the risk of not achieving the stormwater management objectives as well as the urgency of developing a solution to the problem. Refer Section 9.2 of Volume 2 for prioritisation methodology and outcomes. Capital works funding will be required to address site-based issues and implement a renewals program.

The available funding has been set through Council's long-term financial plan (refer Section 4). The USMP Implementation Program has been developed to address the priority issues within the available level of funding, with some reallocation of funding as required.

Due to the large amount of funding required to address all identified issues, consultation with Council advisory panels has been undertaken to determine the priority management actions required to deliver an affordable stormwater management program. A prioritised works schedule has been developed to provide a balanced and affordable ten year program.

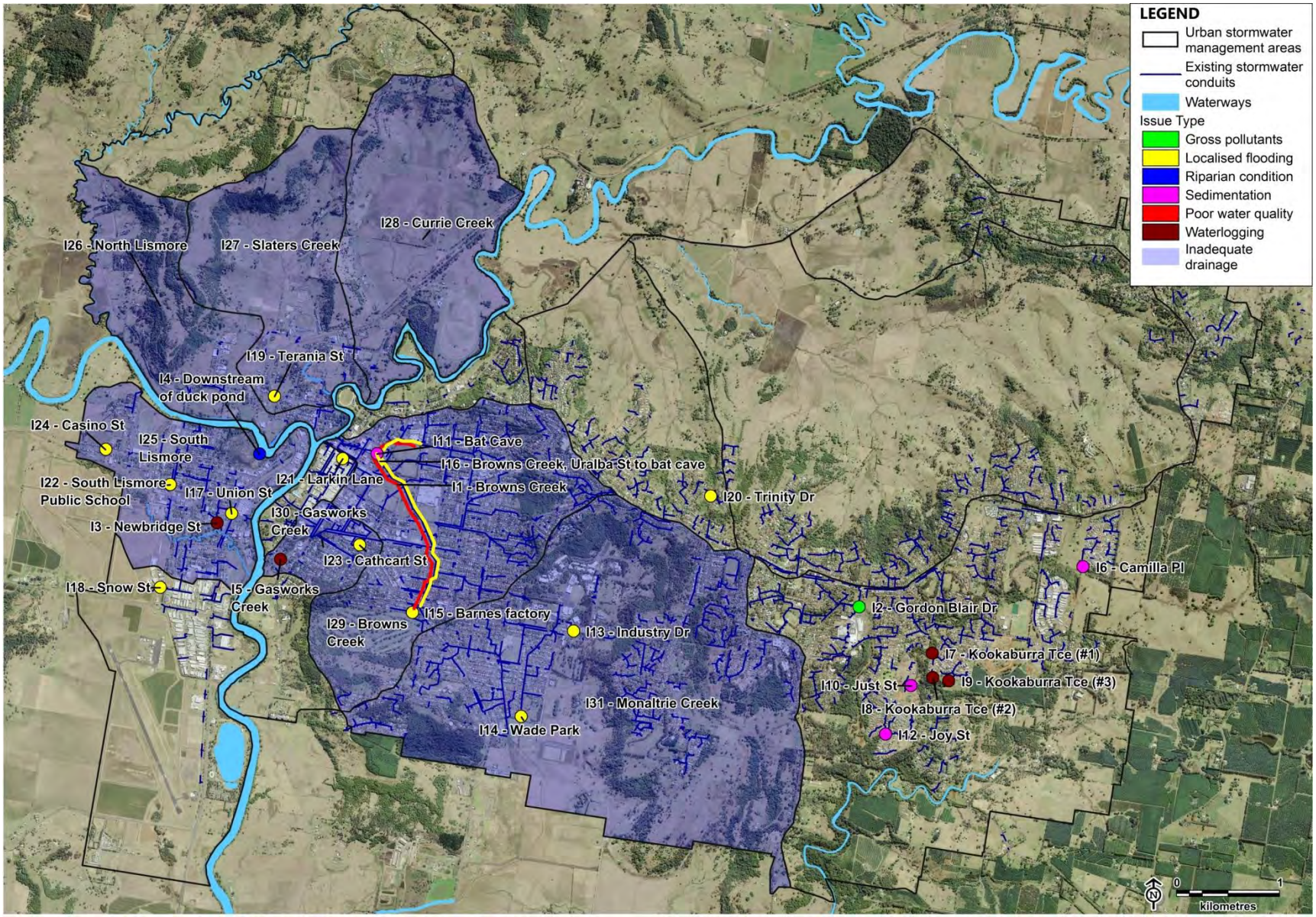


Figure 2: Locations of site-based issues

4. FUNDING

The implementation program has considered potential funding sources as follows:

- Existing funding sources:
  - General fund - $469,000 p.a.;
  - Stormwater Management Service (SMS) Charge - $380,000 p.a. - Council should continue to levy the maximum allowable stormwater charge from existing urban residential and non-residential properties;
  - SMS Reserves – approx. $1,100,000 at 2016/17;
  - Existing loan for trunk drainage program – repayments are funded through SMS charge revenue at $30,200 p.a. until 2028/29 and $19,900 in 2029/30;
  - Works on Private Land - Council should continue to charge the appropriate fee for service for works on private land. This may require improved definition and delineation of Council versus landholder responsibilities, for example, in relation to inter-allotment drainage; and
  - Partnerships – e.g. Rous Water education programs, partnerships with bush regeneration groups and human resource agencies such as EnviTE and Work for the Dole schemes to provide labour for on-ground stormwater management works. Opportunities for partnerships and project sites should continue to be identified.
- Potential new funding sources:
  - Section 94 or Section 64 contributions (see Section 6.4.4 Volume 2) – The introduction of developer contributions for stormwater works would ensure the full cost of developments is recovered at the development approval stage. Council may revise the current contributions plan based on the USMP expenditure program;
  - Other developer contributions (e.g. cash, land or in-kind contributions) as negotiated with developers;
  - Grants - Reliance on *ad hoc* grant funding will not be successful in resolving many existing issues or preventing ongoing problems. However, an awareness of grant program availability is essential to supplement Council's internal funding sources. While lobbying State and Federal governments to increase funding, consultation with agency representatives and providing sufficient human resources to access the available grants is essential for successful implementation of the USMP, this source of funding should only be considered as a supplement to internal Council funding sources. Grants are usually provided on the basis of funding matched by Council. Many grants, funding sources and partnership programs are only available up to a limited budget and as such, the available sources are changing from year to year. It will be necessary to keep abreast of current resources availability throughout the implementation of the USMP;
  - Administrative fees and charges - Additional mechanisms to enable or enhance landholder responsibilities for management and maintenance of stormwater assets may also be required to reduce the burden on Council funds and resources including:
    - Encouraging appropriate maintenance of private assets through provision of information and compliance checks and/or fee for service arrangements;
    - Establishment of a maintenance agreement as a planning obligation or as a condition attached to a planning approval;
    - Maintenance requirements included in property covenants; or

        - Mandatory reporting requirements against an agreed maintenance plan.
    - Voluntary Planning Agreements (VPAs) - Other financial instruments such as bonds and contributions may be appropriate for new developments with handover of significant assets to address the associated ongoing maintenance burden. While Council has applied these mechanisms to certain developments in the past, the inclusion of stormwater management requirements in policies and guidelines would strengthen their application and success; and
    - Other loans – e.g. to fund large capital works projects.

The delivery of projects is dependent on the availability of funding. The projects that have been identified to address management issues but are not considered to be affordable in the next 10 years are listed in Appendix 1. Council will continue to review the priority of each action and allocate funding to these actions if additional internal and/or external funds are identified.

5. IMPLEMENTATION REQUIREMENTS

5.1 Management Actions

The management issues, the current management approaches, other considerations, the recommended management approaches included in this USMP and capital cost estimates are summarised in Appendix 2. The Implementation Program (Section 9) includes the recommended actions which have been developed to deliver the desired outcomes of the USMP within the available level of funding. Actions consist of a combination of administrative tasks and on-ground works. Some of the site-specific actions require some research, design or assessment prior to implementation of on-ground works to ensure the appropriate level of expenditure. In addition, partnerships between the responsible Council groups, government agencies, landholders and community groups are required to achieve the desired outcomes.

While a management area approach (refer to Section 1) is desirable for the implementation of site-specific actions in the USMP, many of the identified issues are relevant to the whole urban area. In this USMP, the location of recommended management actions have been indicated as applicable to the urban area or specific stormwater management areas.

Management strategies and actions have been developed for a ten-year period. The USMP and the progress of the management actions should be reviewed to ensure the actions remain relevant and the objectives of the plan are being achieved (refer Section 8).

5.2 Responsibilities

Responsibilities for implementation of the management actions have been assigned to the relevant Council position or function area. In addition, support from various government and local non-government organisations and groups, including industry bodies, private landholders and community groups, will be essential in the implementation of the plan.

5.3 Timeframe

Based on the management issues and the priority identified in Volume 2, timeframes for management actions have been developed. Implementation is expected to commence from the start of the 2016/17 financial year (i.e. July 2016). Most high priority actions have been scheduled to commence within the first 3 years of the program (where funding permits). Further details of recommended timeframes is provided within each specific action and tabled in the Implementation Program (Section 9).

5.4 Costs and Funding

Cost estimates provided in the action descriptions are preliminary only and are based on the best available information. Where a study/design is required to determine the appropriate level of expenditure, the cost of the future works has been broadly estimated to provide an allowance for these works. These budget elements need to be confirmed or updated by the results of the study/design.

5.5 Community Involvement

On-going community involvement will be required to ensure successful implementation of the USMP. This will include:

- Ongoing consultation with interested and committed community groups;
- Engagement and collaboration with landholders and developers;
- On-ground participation in management actions, particularly local community groups such as EnviTE and Landcare; and
- Community education programs.

Figure 3: Costa's Backyard Big Scrub Makeover (August 2015, photo: T. Sword)

6. NON-STRUCTURAL ACTIONS

Council's urban stormwater management should be enhanced through improved administration and governance and increased emphasis on planning and asset management, consistent with Council's strategic direction and policies. More strategic consideration of stormwater management requirements is required through the whole asset lifecycle including allocation of internal Council responsibilities and ensuring adequate skills, funding and supporting policies are in place. Desired outcomes are:

- During the land use planning and development stages, Council will identify how stormwater infrastructure will be designed to suit local circumstances and funded through the whole asset life cycle;
- Management of stormwater assets through design, construction and operational phases will be improved to ensure Council inherits assets that are functioning properly and that meet the design intent as well as any Council requirements for technology and resources. Council will develop a clear understanding and funding commitment (and also minimise the burden) for ongoing maintenance of the assets;
- Increased construction phase compliance enforcement to ensure adequate operation of erosion/sediment controls. Increased funding for regulatory compliance officers is required, with clear policies and support mechanisms;
- Asset handover will be undertaken over a staged process with appropriate inspections to progressively transfer ownership and responsibility to Council;
- Details of all existing stormwater infrastructure (including vegetated assets) will be documented with sufficient accuracy to allow identification of future maintenance, upgrade and renewal requirements;
- Function and performance requirements will be identified for all asset types and maintenance will be undertaken to these desired standards; and
- Increased focus on compliance of private treatment systems will be implemented through self-regulation with spot checks or compulsory compliance inspections by Council.

Policies and procedures for water sensitive urban design have been documented by Water by Design as part of the south-east Queensland Health Waterways Partnership. Council could adopt these or similar guidelines by referring to them in planning documents and development controls or specific development applications.

The schedule of non-structural actions is included in Table 3 and further information is provided in the following sections.

Table 3: Non-Structural Actions

ID	Issue	Tasks and Desired Outcome	LCC Responsibility	Timing	Budget Area[1]
Asset Management					
NS1	• Insufficient asset data • No dedicated renewals program • Potential deterioration of the stormwater network	Update asset register to include all assets (condition, age, details, etc.) to reliably forecast renewal requirements and plan maintenance activities.	Manager Assets	Ongoing	Asset Management
NS2		Review and update Asset Management Plan incorporating asset data and expenditure requirements.	Manager Assets	Every 3 years	Asset Management
NS3		Develop a prioritised asset renewal program for stormwater conduits, pits and treatment systems.	Manager Assets	Short-term	Asset Management
Staff Training					
NS4	• Staff have limited training in stormwater function and design	Identify training needs and suitable programs to increase staff capacity and knowledge of stormwater management to enable effective implementation of the USMP. External resources may be required to provide staff training.	Manager – Integrated Planning, Manager Works, Manager Assets, Manager Development and Compliance, Manager Civic Pride	Ongoing	Staff Training
Planning and Development Controls					
NS5	• Limited stormwater considerations applied at development assessment stage • Insufficient planning for ongoing maintenance of treatment assets • Potential impacts on Wilsons River drinking water catchment	Consult with Rous Water regarding development assessment guidelines for developments within the Wilsons River drinking water catchment.	Manager Development and Compliance	Short-term	Administration and Management
NS6		Develop and implement procedures for identification and approval of ongoing maintenance requirements for all new stormwater assets.	Manager – Integrated Planning, Manager Works	Short-term	Administration and Management
NS7		Develop internal procedures for referral of designs and development applications to relevant staff with knowledge of stormwater management requirements.	Manager – Integrated Planning, Manager Works	Short-term	Administration and Management

ID	Issue	Tasks and Desired Outcome	LCC Responsibility	Timing	Budget Area[1]
NS8	• Lack of internal approval process, development guidelines and scrutiny for Council developments	Develop procedures for handover of stormwater assets to Council.	Manager – Integrated Planning, Manager Development and Compliance	Short-term	Administration and Management
NS9	• Limited resources for construction phase compliance enforcement	Review level of resources for enforcement of construction phase stormwater management requirements in development approval conditions.	Manager Development and Compliance	Short-term	Administration and Management
Maintenance					
NS10	• Drainage maintenance and issues raised by customers are not all addressed	Develop schedule of prioritised drainage works to be implemented on an annual basis (allow 70% of total drainage maintenance budget with the remainder allocated to reactive maintenance works).	Manager Works	Short-term	Programmed Drainage Maintenance
NS11	• Localised flooding due to blockages • Grass swales and vegetated assets are difficult to maintain	Develop procedures for prioritisation of reactive maintenance actions.	Manager Works	Short-term	Reactive Drainage Maintenance
NS12	• Grass swales and vegetated assets are difficult to maintain • Sedimentation • Weeds (restricted stormwater conveyance)	Review and update "*Internal Service Level Agreement for the general maintenance of Public Stormwater Treatment Devices that are currently utilised within Lismore's urban Sub catchment*" to ensure all treatment assets are adequately maintained and maintenance activities are cost-effective.	Manager – Integrated Planning	Short-term	Administration and Management
Supporting Actions					
NS13	Education	Continue to identify opportunities for community education through cost-effective programs such as community events and partnerships with other agencies such as Rous Water.	Manager – Integrated Planning	Ongoing	Community Education
NS14		Continue to provide community information through Council's website and printed information where required to support these programs.		Ongoing	

ID	Issue	Tasks and Desired Outcome	LCC Responsibility	Timing	Budget Area[1]
NS15		Develop education programs as part of the implementation of "showcase" projects such as Browns Creek water quality improvements.		Ongoing	
NS16		Develop education programs targeting developers planning major developments.		Short-term	
NS17	Monitoring	Identify research priorities and opportunities to collaborate with Southern Cross University.	Manager – Integrated Planning	Ongoing	Monitoring
NS18	Survey and Design	Where internal capability and resources are available, designs of minor works will be undertaken by Council's design team.	Manager Assets	Ongoing	Survey and Design – Internal
NS19	Internal staff resources	Ongoing review and provision of staffing requirements for delivery of the USMP implementation plan.	Manager – Integrated Planning, Manager Works, Manager Assets, Manager Development and Compliance, Manager Civic Pride	Ongoing	Administration and Management
NS20	External human resources	Specialist design and consulting services will be required to deliver the more complex and major projects. Costs for design have been included in capital works budget estimates and the implementation plan (refer Section 7 - Structural Actions).	Manager – Integrated Planning, Manager Works	As required	Asset Upgrade, New Assets
NS21	Project management/delivery	Project Management services will be required to deliver the more complex and major projects.	Manager Assets	As required	Project Management/ Delivery
NS22	• Minimal contributions from developers	Review and update Councils contributions plan to incorporate capital works identified in this USMP.	Manager Development and Compliance	Short-term	Contributions Plan
NS23	• Insufficient management of inter-allotment drainage and private treatment systems	Investigate options for implementation of a self-regulation system for operation and maintenance of private treatment systems (monitored by Council) to ensure compliance with development conditions.	Manager Development and Compliance	Short-term	Administration and Management

1. Refer Implementation Plan (Section 9)

6.1 Asset Management

6.1.1 Data Collection

NS1 - Update asset register to include all assets (condition, age, details, etc.) to reliably forecast renewal requirements and plan maintenance activities.

NS2 - Review and update Asset Management Plan incorporating asset data and expenditure requirements.

The current stormwater asset register includes stormwater conduits (channels, box culverts and pipes), pits and treatment devices although asset data such as construction date, size and depths have not been ground-truthed. Asset condition data are not currently included in the asset register. Accurate condition assessment relies on documentation of existing condition and establishing performance indicators related to function in wet and dry conditions and regular inspection of assets. To obtain accurate asset details and condition data to inform the maintenance and renewal programs, additional CCTV inspection of the network is required. Survey of the assets is also required to ground-truth the location, size and depth of assets.

Natural assets such as natural streams, wetlands and riparian open space are also integral components of the urban stormwater system but there is limited detailed included in Council's asset management system. A large component of the stormwater drainage system includes grass swales which are not mapped as stormwater assets. Natural waterways are considered as the 'receiving environment' for stormwater and the role that natural waterways provides to convey and treat stormwater has received less management consideration than built stormwater assets. It should be recognised that natural systems also require maintenance to achieve adequate functioning.

6.1.2 Asset Renewal and Rectification

NS3 - Develop a prioritised asset renewal program for stormwater conduits, pits and treatment systems.

Limited rectification of poorly performing or ageing stormwater assets has occurred due to limited funding and renewals planning. A cost-effective renewal program relies on accurate asset condition data and reviewing of functional needs.

A goal of the Asset Management Strategy is to prepare a realistic program of tackling unfunded renewals. The renewal program should also consider stormwater asset design and function and address risks such as flooding and climate change. This task requires the development of guidelines or adaption of existing guidelines for asset rectification and renewal. A pre-requisite action is the completion of asset condition assessments (NS1). A funding source for future capital works is also required to be developed as limited asset renewal works can be funded through this USMP.

6.2 Staff Training

NS4 - Identify training needs and suitable programs to increase staff capacity and knowledge of stormwater management to enable effective implementation of the USMP. External resources may be required to provide staff training.

Increased understanding of the purpose and function of stormwater assets is required for effective design, construction and ongoing maintenance. In particular, vegetated stormwater assets have a number of different components which are important for achieving the primary functions of stormwater quality improvement and visual amenity. The effective management of vegetated stormwater assets requires a team of people with skills in engineering, landscaping and ecology or horticulture. Civil components (structural and erosion control) require a basic understanding of hydrological and hydraulic processes as well as structural engineering and geomechanics while vegetation components requires understanding of plants, weeds and weed eradication. Council personnel have limited training in the design and operation of stormwater systems, particularly treatment components and in some cases there is are inferior outcomes in terms of

insufficient or inadequate treatment of stormwater. Training of staff involved in design, assessment, project management, operation and maintenance is required to provide holistic and effective stormwater management. This will assist in successful implementation of both structural and non-structural actions.

6.3 Planning and Development Controls

6.3.1 Planning and Development within the Wilsons River Drinking Water Catchment

NS5: Consult with Rous Water regarding development assessment guidelines for developments within the Wilsons River drinking water catchment.

The majority of the area being considered as part of the USMP is located within the Wilsons River Source drinking water catchment area as designated in the mapping included in the *Lismore Local Environmental Plan (LEP) 2012*. Of key significance is Clause 6.4 of the *Lismore Local Environmental Plan 2012* which was established *"to protect drinking water catchments by minimising the adverse impacts of development on the quality and quantity of water"*. Clause 6.4 should be addressed early in the design process for any significant development that is proposed.

Although Council has stormwater management requirements and objectives, these are not specifically designed to protect water quality for drinking water supply purposes. Rous Water considers that development consent should not be granted unless the proposed development would have a Neutral or Beneficial Effect (NorBE) on water quality. In order to assist LCC and consultants/developers to meet Clause 6.4 in designated water catchment areas, Rous Water has provided guidance to LCC that establishes the requirements of Rous Water in relation to significant developments in drinking water catchment areas such as residential subdivisions and associated development and assessment processes. Consultation with Rous Water is required to develop appropriate planning controls and referral processes that address the risks to water quality while satisfying Council's development objectives.

6.3.2 Identification of Asset Maintenance Requirements

NS6 - Develop and implement procedures for identification and approval of ongoing maintenance requirements for all new stormwater assets.

Traditionally, maintenance of stormwater assets has often been overlooked at the design stage, resulting in difficulties in maintaining the asset during its operational phase. Council maintenance staff also have difficulties in determining how to best maintain a device given that they are not usually involved in the design process and may be unfamiliar with the technology. New measures are required to ensure that maintenance of a proposed asset is considered in sufficient detail at the development stage. It is recommended that development assessment procedures are amended to include assessment of ongoing maintenance requirements for all private, Council and government developments to ensure that ongoing maintenance needs are adequately addressed. This may include the need for a Maintenance Plan to be approved by Council addressing the required maintenance program, skills, resources and costs as well as any ongoing monitoring needs. Referral to technical and operational staff for advice with regard to maintenance needs may also be required (NS7).

6.3.3 Internal Referrals

NS7 - Develop procedures for referral of designs and development applications to relevant staff with knowledge of stormwater management requirements.

To support the new procedures for development approvals, identification of ongoing maintenance requirements (NS6) and asset handover (NS8), staff with relevant knowledge and responsibility for Council programs and asset management/ownership should be consulted with regard to asset function, design and maintenance needs. This is particularly important with the current division of responsibilities within Council to

ensure a coordinated approach is adopted. Referral procedures identifying relevant staff, response time and feedback requirements should be developed.

6.3.4 Asset Handover

NS8 - Develop procedures for handover of stormwater assets to Council.

Following the development stage, Council needs to ensure that they receive assets that are functioning properly. This requires:

- Development of policy and procedures – intent, application, responsibilities, information requirements, timing and financial instruments (i.e. bonds and contributions) as security;
- Clearly defined minimum construction and handover requirements incorporated into approval conditions, including definition of on-going maintenance and renewal requirements in the conditions of approval;
- Ensuring that Council is satisfied with the construction and establishment of the asset by undertaking compliance inspections before the defect liability period and off-maintenance period. This should also apply to Council and State government developments;
- Require the full establishment of critical assets (such as vegetated components of the stormwater system) or provision of an uncompleted works or defects liability bond prior to provision of subdivision certificates;
- The use of compliance checklists to ensure appropriate procedures (such as those available from Water by Design) are followed.

Currently the emphasis for construction certification is on civil and structural assets such as roads with less consideration of the implications of handover of stormwater assets. The asset handover process for stormwater assets should be more integrated with the development approval process as shown in Figure 4 below.

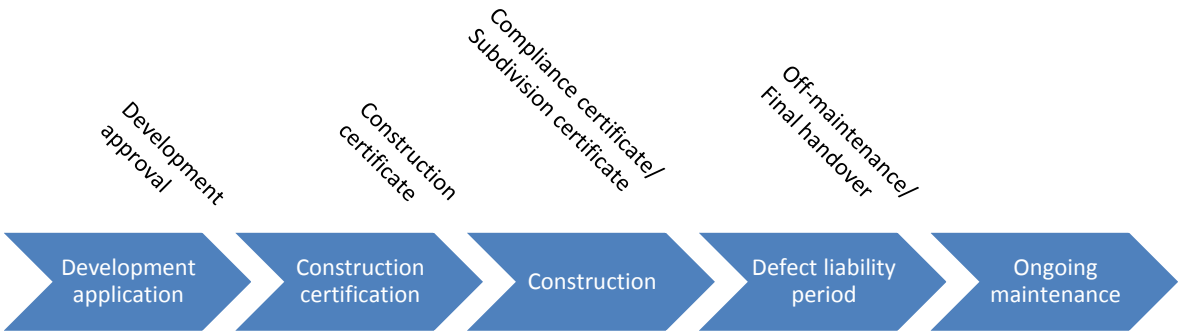


Figure 4: Process of Development and Asset Handover

Other considerations include:

- The need for referral to technical and operational staff for advice with regard to construction and operational requirements (NS7);
- Transfer of information to Council's asset database and GIS mapping (NS1);
- Financial accounting (valuing the asset); and
- Linkages with forward maintenance and renewal programs (NS3, NS6).

6.3.5 Construction Phase Erosion and Sedimentation Controls

NS9 – Review level of resources for enforcement of stormwater management requirements in development approval conditions.

Typically, inspection and auditing of construction sites is conducted by Council in response to complaints. Proactive planned inspections are generally not undertaken due to limited resources. Depending on the size of the development, previous performance of developers and characteristics of the receiving environment, there may be a need for scheduled inspections to ensure construction phase erosion and sediment controls are properly implemented. Increased resources or referral of responsibilities to appropriate staff (NS7) may be required for enforcement of development approval conditions.

Figure 5: Erosion and sedimentation during construction (Photos: A. Nguyen)

6.4 Maintenance Planning

NS10 - Develop schedule of prioritised drainage works to be implemented on an annual basis (allow 70% of total drainage maintenance budget with the remainder allocated to reactive maintenance works).

NS11 - Develop procedures for prioritisation of reactive maintenance actions.

NS12 - Review and update "Internal Service Level Agreement for the general maintenance of Public Stormwater Treatment Devices that are currently utilised within Lismore's urban Sub catchment" to ensure all treatment assets are adequately maintained and maintenance activities are cost-effective.

Council's schedule for maintenance is planned over the short-term with limited budget and is often reactive and directed to areas of complaints. Due to the large number of customer requests and maintenance issues requiring attention, a schedule of prioritised activities should be developed based on a structured risk prioritisation methodology utilising 70% of the available budget. Levels of service should be developed to ensure maintenance requirements for stormwater assets are understood and carried out to the required standard. Allowance should be made for addressing unforeseen issues (reactive maintenance with the remaining 30% of the budget).

For treatment systems, staff training (NS4) and review/extension of the existing Internal Service Level Agreement to cover all existing stormwater treatment assets is required. New assets should be included in the Agreement as they are developed.

The existing stormwater maintenance budget is expected to be sufficient to address all resulting programmed maintenance actions. Additional maintenance activities undertaken by other Council groups

(e.g. street sweeping and litter collection undertaken by the Works Section) also provide stormwater improvements and should be continued.

6.5 Education

NS13 - Continue to identify opportunities for community education through cost-effective programs such as community events and partnerships with other agencies such as Rous Water

NS14 - Continue to provide community information through Council's website and printed information where required to support these programs.

NS15 - Develop education programs as part of the implementation of "showcase" projects such as Browns Creek water quality improvements.

NS16 - Develop education programs targeting developers planning major developments

Community education and capacity building is essential to the success of the proposed management framework. This applies to:

- Residents and businesses with regard to stormwater function and pollution control;
- Council staff in relation to the introduction of new procedures for land use planning, development controls and asset maintenance; and
- Developers and builders regarding the new development requirements and erosion and sedimentation controls.

Acceptability of the management actions will increase as the stakeholder understanding of the issues and constraints in stormwater management grows. Similarly, conflict between Council groups, between Council and developers and between Council and the community can be alleviated with the provision of objective information.

6.6 Monitoring

NS17 - Identify research priorities and opportunities to collaborate with Southern Cross University.

Water quality monitoring programs are in place for the wider Richmond River catchment (e.g. Richmond River EcoHealth Program and Rous Water catchment monitoring) however these programs are not designed to provide information that will inform Council's stormwater management activities. Previous research studies have investigated the quality of urban stormwater runoff and the effectiveness of some treatment systems although follow-up studies are required. Monitoring programs may include:

- Treatment performance of Council's existing treatment systems such as Slater's Creek wetland or Gasworks Creek;
- Treatment performance of proposed new treatment systems such as Browns Creek or Monaltrie Creek water quality improvements; and
- Monitoring of urban runoff quality and habitat value within Tucki Tucki Creek catchment.

All monitoring should seek to capitalise as much as possible on existing information to provide a baseline from which the success of management actions can be measured and effort can be targeted to appropriate actions. However, as full characterisation of stormwater systems is difficult to achieve, monitoring should be prioritised to address high risk/high priority outcomes. The monitoring program should provide robust scientific data while considering the limited human and financial resources available. Council staff and stakeholders should be involved in the development of the program.

There is an opportunity to collaborate with Southern Cross University and involve students in research activities that would provide useful information for Council's stormwater management program.

6.7 Supporting Actions

NS18 – Where internal capability and resources are available, designs of minor works will be undertaken by Council's design team.

NS19 - Ongoing review and identification of staffing requirements for delivery of the USMP implementation plan.

NS20 - Specialist design and consulting services will be required to deliver the more complex and major projects.

NS21 - Project Management services will be required to deliver the more complex and major projects

NS22 - Review and update Councils contributions plan to incorporate capital works identified in this USMP.

NS23 - Investigate options for implementation of a self-regulation system for operation and maintenance of private treatment systems (monitored by Council) to ensure compliance with development conditions.

To support the implementation of the USMP, Council will ensure there are adequate human resources (internal and external) available for administration and management, survey, design, project management and compliance. A review of developer contributions (Section 64 or Section 94) is also required to ensure equity in funding of stormwater management actions.

Where Council is not responsible for operation and maintenance of stormwater assets (e.g. for inter-allotment drainage and private treatment systems), procedures are required to ensure adequate performance of these systems and minimal impact on Council infrastructure.

7. STRUCTURAL ACTIONS

Structural actions are proposed to address the priority site-based issues. Further information on the site-based issues and prioritisation methodology is provided in Section 9.2 of Volume 2.

Preliminary project scoping and budget estimates have been provided for the purposes of funding but further design development is required before projects can be implemented. Environmental assessment and approvals will also be required to assess social and environmental impacts of the projects. Cost estimates include an allowance for survey, investigation and design and contingencies. Ancillary costs such as relocation of services or land purchase are not included.

7.1 Browns Creek Catchment

ACTIONS S1A, S1B, S1C

The Browns Creek management area encompasses the Browns Creek catchment which drains an area including most of the older fully developed parts of Central Lismore and approximately half of Lismore Heights. While most of the area is residential, a part of the CBD, Lismore Square and some light industrial land use is also contained within the catchment.

On the lower slopes, stormwater is conveyed by street drainage infrastructure, a combination of open swales and concrete curb and gutter and pipes. These converge towards the CBD at an open space/floodway area where open canals convey flow. Browns Creek enters the Wilsons River via a tunnel where a pump station and floodgate are used to reduce flooding in the Lismore basin.

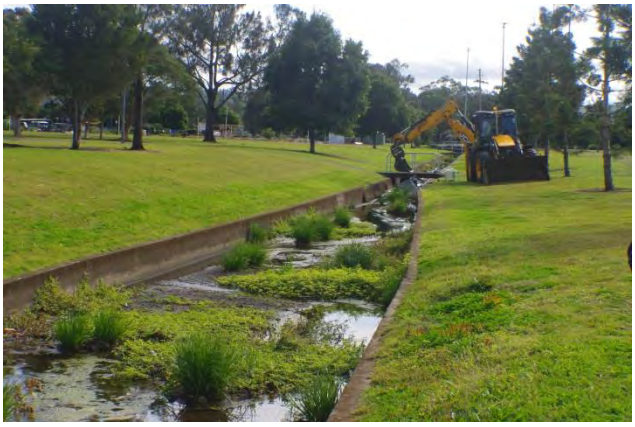


Figure 6: Browns Creek channel (July 2015) and following heavy rainfall (May 2015)

The poor quality of urban stormwater and the risk of localised flooding is a priority issue to be addressed in this plan. The proposed approach would address the site-based issues within the Browns Creek catchment including:

- I1 - Poor water quality and localised flooding;
- I11 - The Bat Cave sediment weir is not accessible for maintenance and has become ineffective;
- I16 - The northern section of Browns Creek channel is overgrown with weeds, restricting conveyance of flows to Bat Cave;
- I29 - Grass swales do not provide adequate stormwater conveyance; and
- I15 - Stormwater from the golf course backs up underneath the Barnes property.

A catchment-wide approach is proposed to address these issues with the northern section of Browns Creek channel becoming the focus of significant water quality improvements. The key outcomes would include:

- Provision of stormwater treatment systems for the majority of the drainage system;

- Increased naturalisation of the creek/drainage system;
- Removal of the majority of gross pollutants and sediments as well as a significant proportion of the pollutants associated with the sediments;
- Minimisation of open water bodies that create safety hazards;
- Protection of existing habitat and creation of habitat enhancements while reducing the incidence of pest species;
- Improved conveyance of runoff to the Wilsons River in the vicinity of the Bat Cave to reduce the risk of localised flooding; and
- Appropriate consideration of flood management requirements associated with the levee scheme.

The poor quality of urban stormwater which passes through the Browns Creek concrete channel (I1) has previously been identified as a major pollution source for the Wilsons River (refer Section 2.6, Volume 2). In addition, an upgrade of Lismore Park was identified as a high priority for recreation development within the City. To support the redevelopment of the park, Council's 2011-2021 Sport and Recreation Plan also recommended that, to the extent possible, the concept planning for stormwater improvements at Browns Creek incorporates recreational elements in the design. In response, a 'treatment train' was proposed within the Creek as part of 'naturalisation' of the creek through the replacement of the open channel. The proposed stormwater treatment system for Browns Creek Naturalisation incorporates:

- Primary Treatment – removal of gross pollutants with GPTs on the upper reaches of both channels entering Lismore Park;
- Secondary Treatment – removal of heavy sediment and nutrients in a sediment pond behind the netball courts and an additional sediment pond on the channel that runs along Magellan Street; and
- Tertiary Treatment – removal of fine sediments and nutrients by converting the concrete channel to a naturalised creek and incorporating ephemeral wetlands imitating what would have originally existed on the site.

Additional information on the naturalisation proposal is provided in Volume 2. The concept for the naturalisation project should be reviewed with priority elements incorporated in the catchment-wide solution for Browns Creek. Additional investigation is required to identify the priority components of this project to be developed within the available funding.

The Browns Creek catchment improvements would provide significant stormwater improvements for the Lismore urban area and should be considered within Council's future contribution plans. In addition, significant development is proposed within the medium density hospital precinct and there is an opportunity to improve stormwater treatment outcomes for developers, Council and the wider community as part of this development. There are four drainage catchments within the precinct flowing to Browns Creek at Magellan Street, Uralba Street, via Laurel Avenue and Gloria Mortimer Oval and via Orion Street and Jim Roder Oval. As part of the proposed Browns Creek naturalisation project, GPTs are proposed for the Magellan Street and Uralba Street catchments. The other two catchments flow into concrete channels with no treatment. Under the existing DCP, all developments within the precinct would be required to provide on-site treatment systems that provide the specified reduction in stormwater pollutants. Provision of centralised downstream treatment systems should be considered in lieu of on-site systems as centralisation would provide advantages including reduced maintenance burden, increased space for development and the ability for Council to part-fund systems that treat the entire catchment where none currently exist.

Action S1A includes the water quality improvements within the lower Browns Creek catchment. The locations of stormwater treatment systems will consider land availability, the range of pollutants and land use within the sub-catchments. The existing sediment weir near the Bat Cave is constructed within a deep gully that is not accessible for maintenance (I11) and therefore a treatment system further upstream (Little Keen Street)

is considered to be more appropriate. This would be combined with centralised treatment of the hospital precinct sub-catchment.

Action S1A also includes improved conveyance of stormwater flows in the drain between Dawson Street and the Bat Cave. The drainage channel from Dawson Street to the Bat Cave (I16) is downstream of the proposed Browns Creek naturalisation area. Trunk drainage from Dawson Street to the Bat Cave would improve conveyance of flows and allow provision of additional parking areas. Modification of road culverts including the RMS culvert under Dawson Street may also be required. The Bat Cave provides a roosting area for bats (including the vulnerable Little Bentwing-bat) and any design would need to consider the impacts on bat habitat. Alternatives to trunk drainage include removal of weeds and debris to improve conveyance. Similarly, Action S1B provides for rehabilitation of the drainage line between Zadoc Street and the Bat Cave to improve flow conveyance, stormwater treatment and access for ongoing maintenance.

Figure 7: Browns Creek near the Bat Cave

The proposed catchment approach for the lower (northern) Browns Creek catchment is shown on Figure 9.

The upper Browns Creek catchment (southern section) includes East Lismore residential areas, the Lismore Workers golf course and Wyrallah Road industrial, commercial and residential areas. Stormwater from the East Lismore ridge and the golf course is not adequately detained and localised flooding occurs on the floodplain at Barnes truss factory on Wyrallah Road. This could be addressed through additional detention systems within the golf course area as there is minimal potential for widening of the channel downstream of Wyrallah Road (S1C). Liaison with the golf course will be required.

The proposed development of the East Lismore infill area provides an opportunity to incorporate additional on-site detention for this development, Stormwater detention, larger than that required by the DCP, could be implemented at the development site to assist with resolving the flooding issue at the Barnes factory. A detention system in the lower golf course would be more effective as a greater proportion of the catchment (Figure 10) could be treated. As an alternative, Council may liaise with owners of the factory regarding potential property modifications.

Figure 8: Golf course drainage and rear of Barnes factory

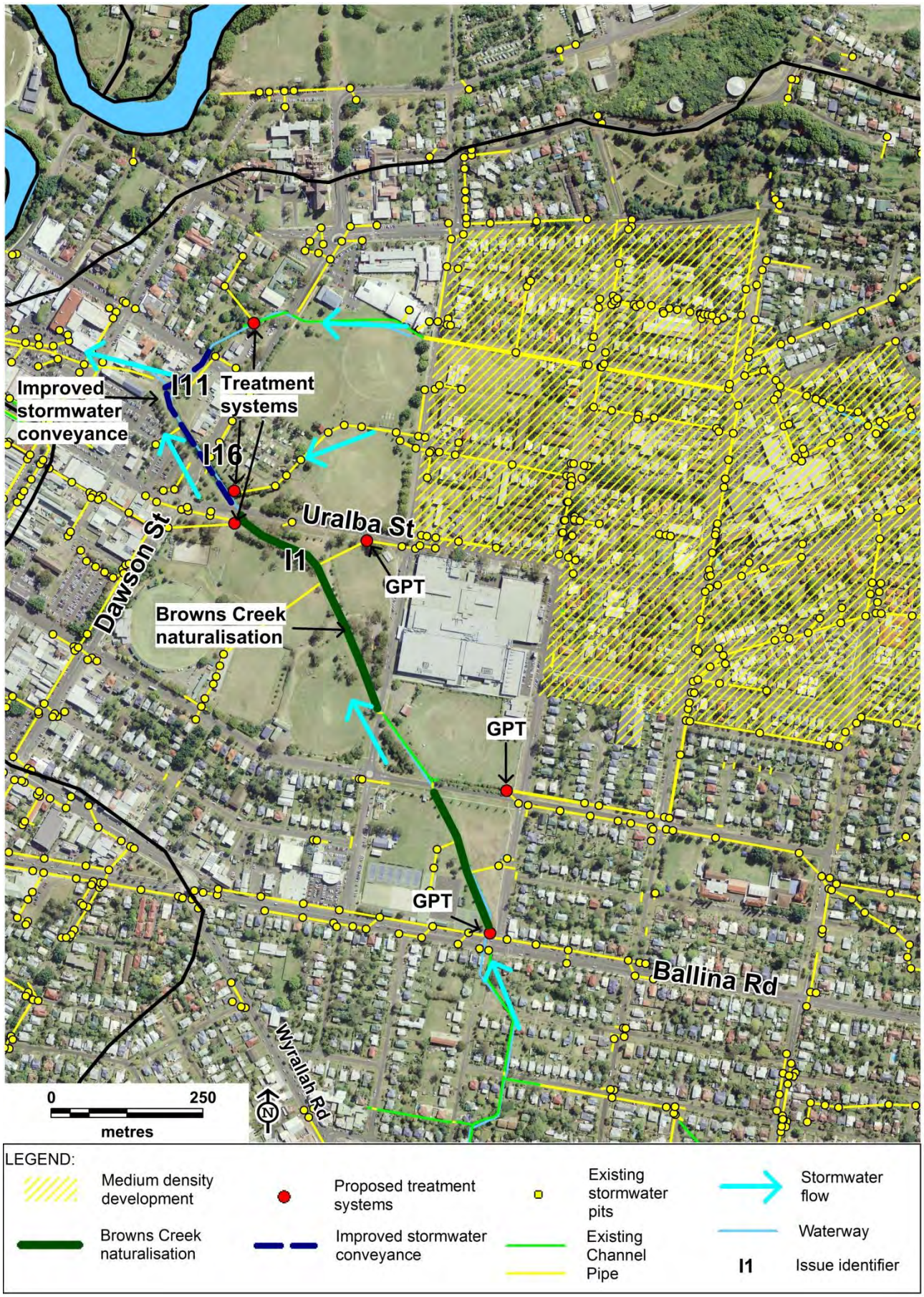


Figure 9: Browns Creek catchment actions (lower)

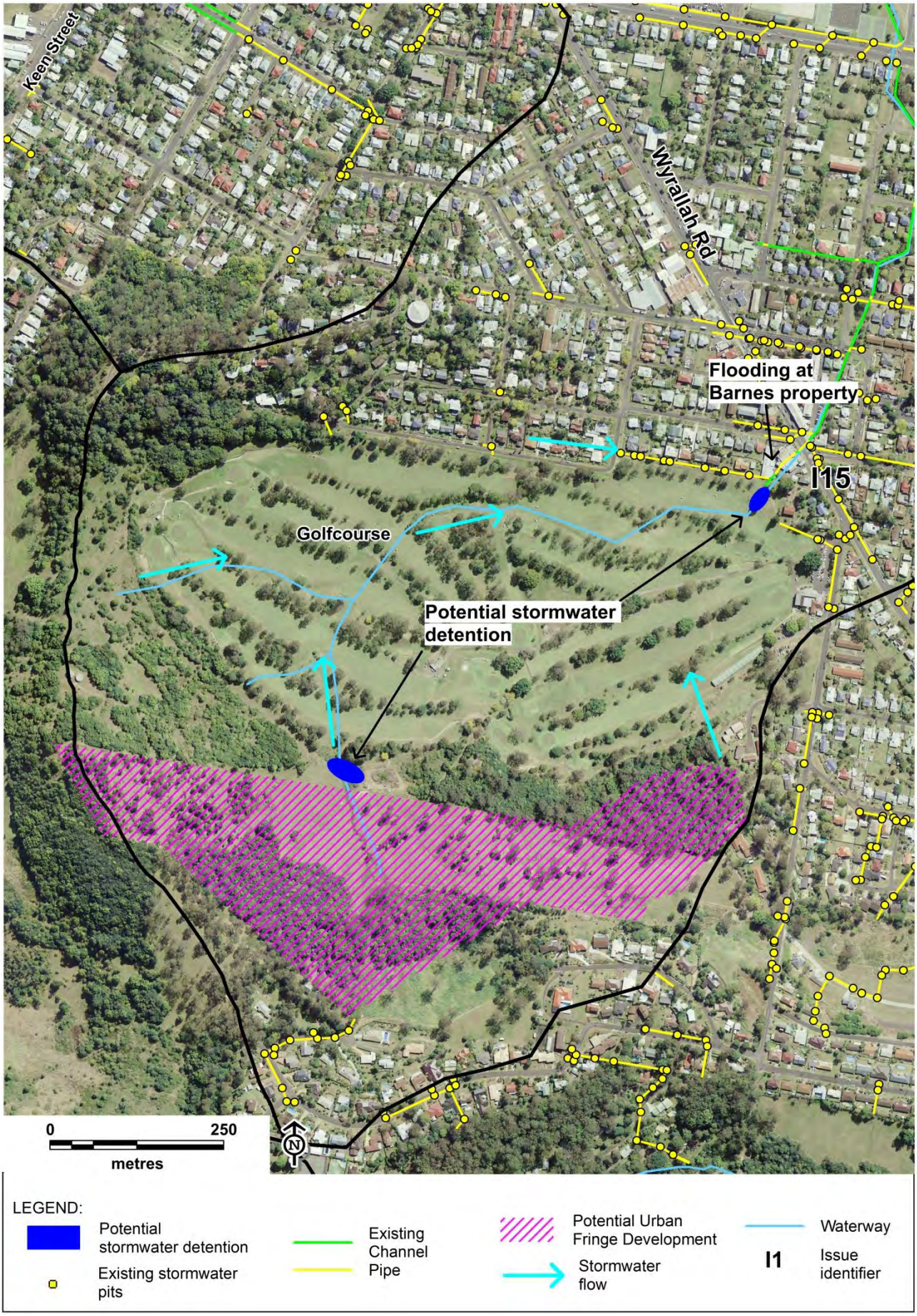


Figure 10: Browns Creek catchment actions (upper)

7.2 Monaltrie Creek Catchment

ACTIONS S2A, S2B, S2C

Most of East Lismore and a section of Goonellabah west from Rous Road, drain to Monaltrie Creek via unnamed tributaries. Some tributaries, particularly those in Goonellabah are ephemeral gullies, while those in East Lismore have been modified (2.5 km of concreted and straightened drains). The remainder of the drainage infrastructure is kerb and gutter with pipes and pits as well as inter-allotment drainage.

Issues within the Monaltrie Creek catchment are:

- I13 - Localised flooding of Industry Drive storage sheds and surrounding area;
- I14 - Localised flooding adjacent to Wade Park and East Lismore Community Preschool; and
- I31 - East Lismore grass swales (Monaltrie Creek) do not provide adequate stormwater conveyance.

Sediment has collected along the drainage line at the rear of the storage sheds causing a build-up of weeds and restriction in flow (I13). The drainage line has three 90 degree bends upstream along the open channel and culvert under Industry Drive. This culvert becomes blocked with debris, further restricting the flow. There is a large amount of siltation and weed growth resulting in flow diversions and scouring of banks. Some stilling ponds exist behind Martin Drive properties although they appear too small to be effective in normal flows.

Figure 11: Drains in the vicinity of Industry Drive storage sheds blocked with weeds, sediment and debris

The source of sediment appears to be the gully adjacent to Cynthia Wilson Drive, commencing at Fig Tree Drive. Stormwater from the Fig Tree Drive residential area flows through the steep gully which is unstable until it reaches thicker forest approximately 50 m downhill. Trees are largely cleared after this point and the creek is channelised through a section of concrete lined bed with rock inlaid. There is a large deposition of rock and soil at the base of the gully and the creek flows into the stormwater system at the rear of Martin Drive (Figure 12). A soil bed replaces the concrete and is eroded in parts prior to exposure of bedrock just upstream of the Martin Drive culvert. Downstream of the culvert, pronounced gully erosion is evident but the creek transitions to a narrow flat channel with extensive weed cover behind the industrial sheds.

To address the source of the sediment, it is proposed to construct a series of sediment containment structures (at the top of the gully and at the rear of the Martin Drive properties). The top of the gully at the intersection of Fig Tree and Cynthia Wilson Drives is located close to power infrastructure with limited space for a sediment basin. Other potential locations include adjacent to 1 Fig Tree Drive or in the park off Cynthia Wilson Drive. The sediment basins would include rock infiltration at the inlet, grass swale with rock batter, subsoil drainage and a semi-permeable spillway at the outlet (Action S2A).

Figure 12: Drainage line behind Martin Drive residences

Ongoing maintenance and rehabilitation of the drainage lines is required to remove sediment and weeds and clear culvert blockages (Action S2B). Access to the drainage line at the rear of the industrial sheds (either though private property or the Airforce land) will be required.

Conditional consent has been provided for a subdivision to create 13 new lots on Airforce Road. This could potentially exacerbate the sediment deposition and flooding problem. Depending on the status of the development application, stormwater works for the subdivision may incorporate components of these works.

The high sediment load also causes localised flooding adjacent to Wade Park and East Lismore Community Preschool (I14). Sediment accumulates at the end of the open concrete channel. Approximately 80 m^3 of sediment is excavated from the area every 18 months. Access to the area is difficult due to the wet surface and access arrangements through the pre-school. Works could include the construction of a sediment collection system and wetland system at the end of the concrete channel designed to reduce turbidity and other contaminants. An alternative is a system constructed lower in the catchment to treat the entire Monaltrie Creek sub-catchment (Action S2C). This could also tie-in with the development of Crawford land and the concrete channels in the trunk drainage program (I31 - not currently funded within this USMP). Sediment capture systems are also required in upper areas of the catchment to capture the large sediment load as discussed above.

Figure 13: Monaltrie Creek channel near Wade Park during high rainfall (May 2015)

The proposed catchment approach for the northern Monaltrie Creek catchment is shown on Figure 14.

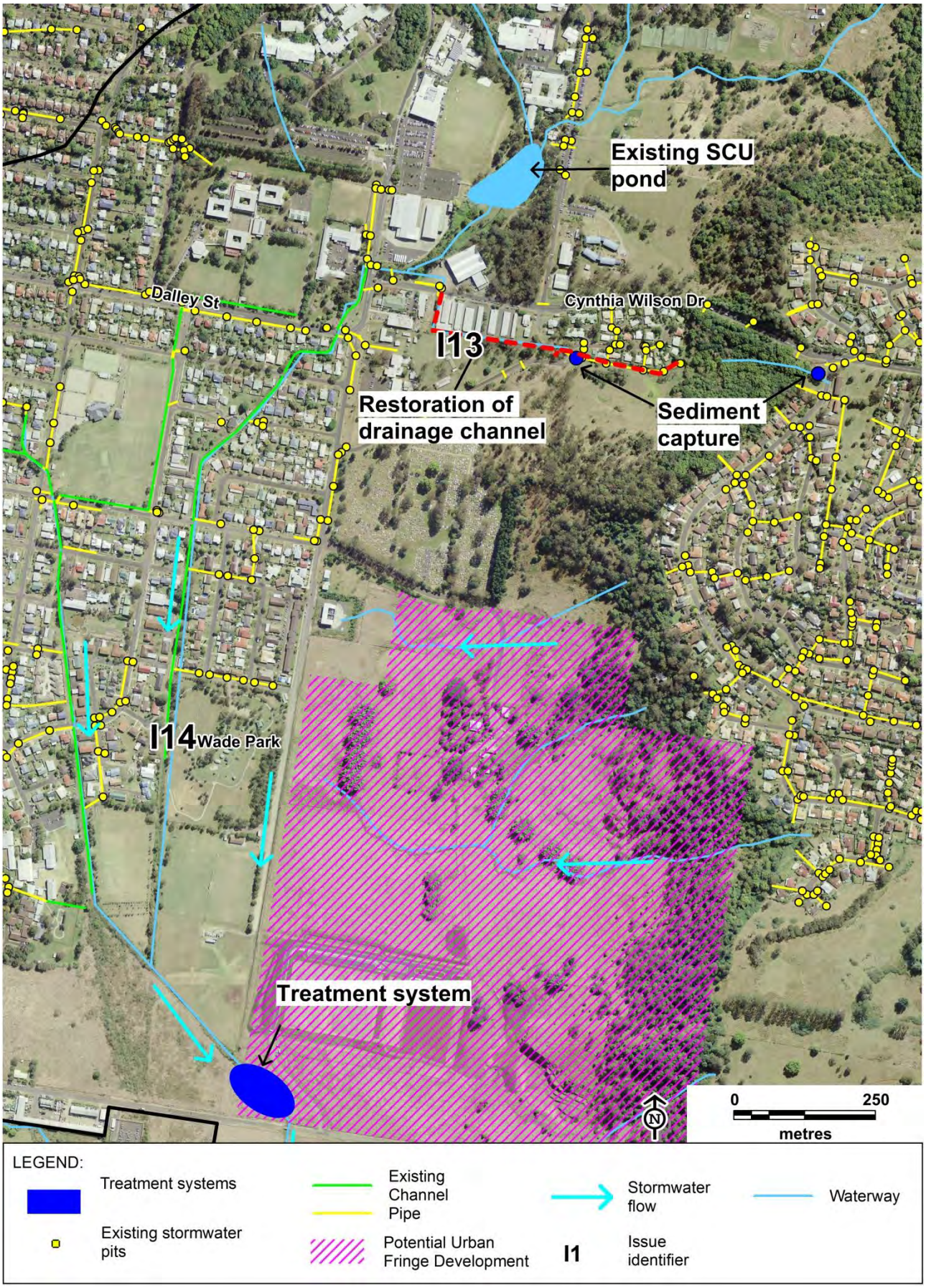


Figure 14: Monaltrie Creek Catchment Actions

7.3 Localised Flooding

The risk of flooding associated with inadequate stormwater drainage is a recurring issue in Lismore's urban areas. This risk is increased with inadequate maintenance of drains and will be exacerbated by climate change, particularly increased rainfall/storminess.

Management of stormwater in low-lying flat land is not straightforward and deserves specific attention. Traditional approaches to stormwater management are less effective in flat areas and there are numerous existing examples of stormwater related inundation of low-lying urban land within the study area. Ideally, urban development is not undertaken in such areas as it is difficult to meet the expectations of stakeholders in terms of level of service whilst striving to meet environmental performance objectives within economic constraints.

In addition to the localised flooding sites within Browns Creek and Monaltrie Creek catchments, sites with localised flooding addressed in this Plan are:

- I17 – Union Street, South Lismore;
- I18 – Snow Street, South Lismore;
- I19 – Terania Street, North Lismore;
- I20 – Trinity Drive, Goonellabah;
- I21 - Larkin Lane, CBD
- I22 – South Lismore Public School
- I23 – Cathcart Street, Girards Hill
- I24 – Casino Street, South Lismore

The course of action at each site should consist of initial inspection, maintenance and potentially monitoring to determine whether downstream conveyance issues are a result of poor asset condition, upstream or downstream influences or the design/configuration of the asset itself. After such investigations it may be necessary to upgrade the asset taking into account all the factors contributing to the localised flooding issue.

There are many other examples of poor site drainage which require rectification on a priority basis. It is recommended that a targeted program of asset renewal is developed based on condition assessments and asset management planning utilising Council's asset management systems. This is a key subset of the asset renewal program discussed in Section 6.1.2 (Action NS3).

7.3.1 Union Street, South Lismore (I17)

ACTION S3

The existing drainage system on Union Street does not extend to the intersection of Elliot Road and Union Street. There is also a very low longitudinal grade in the Union Street kerb and gutter. Council has recently inspected the downstream stormwater system and cleaned out tree roots and debris (along laneway off Union Street). Flooding of the street parking area and shopfronts occurs during heavy rainfall.

Figure 15: Flooding outside of Butchers on Union Street, May 2015

Maintenance (clearing of tree roots) is expected to be required on an ongoing basis. Potential longer-term solutions include lining of the drainage pipes, replacement of the pipes in the vicinity of the trees and/or extension of the drainage system. Another pit could be installed in front of the shop with an efficient inlet grate (class D - traffic loading) and an oversize pipe discharging to the existing pit. The extended drainage system may hold excess water below ground rather than ponding outside the shop, but relies on all downstream pits and pipes being clear of sediment / obstructions. An alternative is to construct a raingarden (to promote sub-surface infiltration) at the intersection with Elliot Road without impeding pedestrian access and existing parking bays on Union Street, although soil types in the area may not be appropriate for sub-surface infiltration.

Figure 16: Union Street Drainage Improvements

7.3.2 Snow Street, South Lismore (I18)

ACTION S4

The pipes draining the Snow Street industrial properties flow into a stormwater pipe which discharges to a flood diversion channel with a flood gate. A stormwater channel receives runoff from the Snow Street intersection as well as providing relief for surcharge flows. Due to the standing water level in the levee channel, the flood gate may not fully open even in dry times and during wet periods the discharge through the gate is further compromised by high tailwater levels. Under wet conditions the pipe surcharges and overflows from the pit into the stormwater channel. Excessive weed growth limits the capacity for detention in the stormwater channel when the pipe is surcharging.

Figure 17: Inundation of Snow Street drainage channel (February 2015, Photo D. Baldwin) and Flood gate at stormwater outlet to levee (July 2015)

The proposed solution involves ongoing channel maintenance to remove weeds, enlargement and reshaping of the channel to provide temporary storage of overflows and allow continued conveyance from the upstream system. Works should extend west as far as possible beyond the surcharge pit.

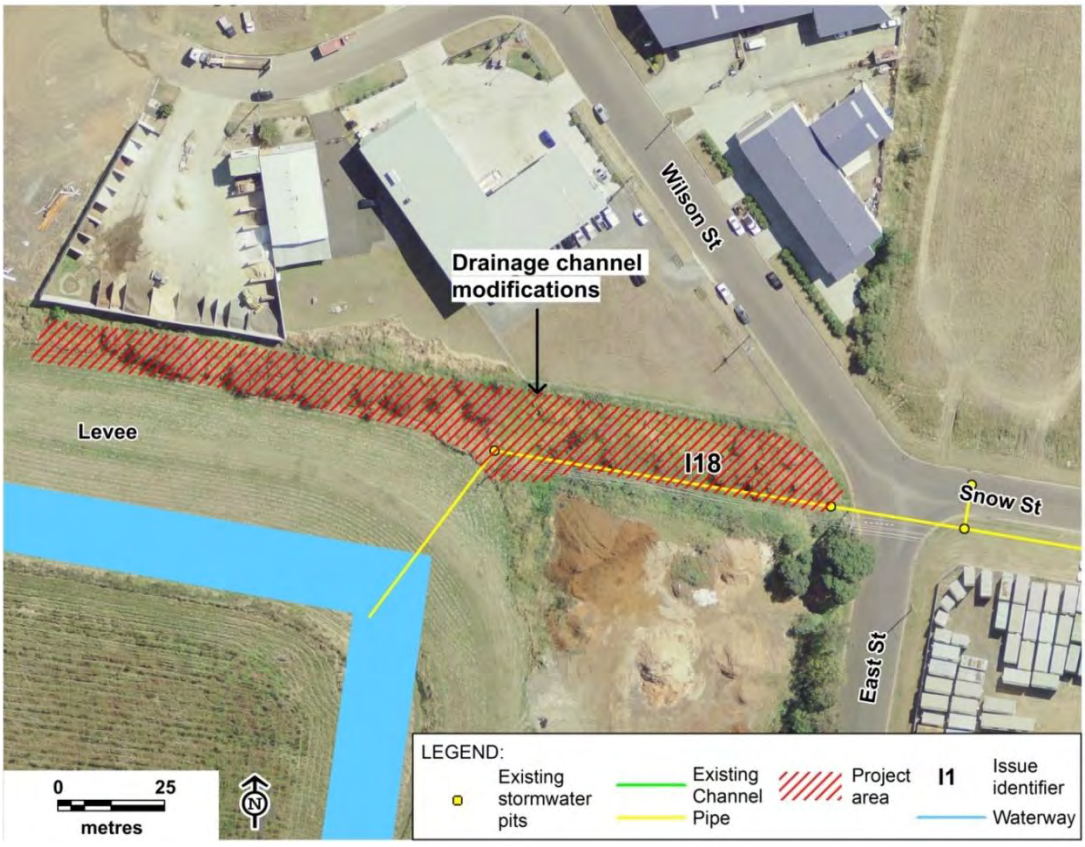


Figure 18: Snow Street Drainage Improvements

7.3.3 Terania Street, North Lismore (I19)

ACTION S5

The existing drainage system around the Terania Street railway underpass consists of grass swales, piped under Terania and Peate Streets and discharging into an adjacent paddock. This appears to be part of the original drainage line to Slaters Creek. The area is flat and low in the catchment, the grass swales are not adequate to convey high flows and the discharge location (on private land) is overgrown. The headwalls at the road crossings are also blocked with weeds.

Figure 19: Flooding of Terania Street near railway underpass (May 2015) and discharge at headwall in paddock on Peate Street

A potential solution involves a pipe system below the existing swales. The original drainage line appears to extend across Bray Street and Pine Street to a watercourse. The trunk drainage would extend from Terania Street, crossing Peate Street and along a new easement to Bray Street then to Pine Street.

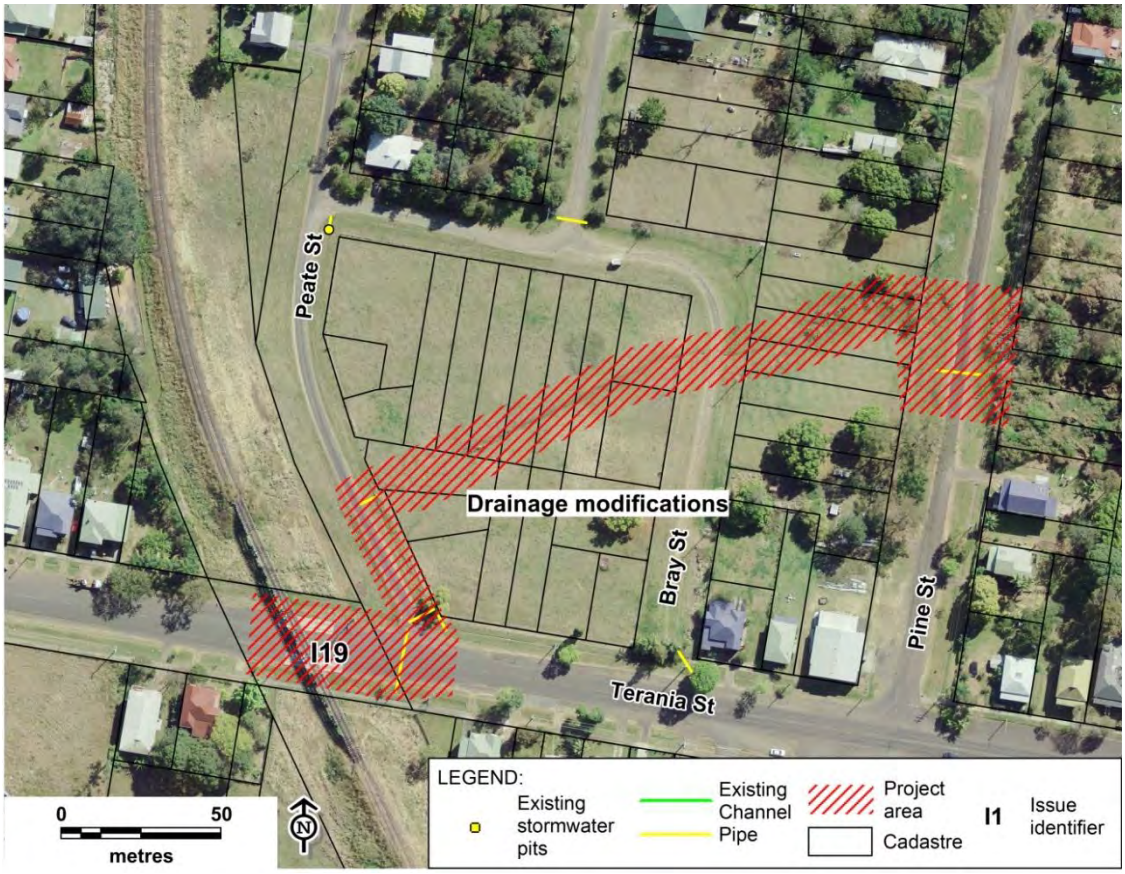


Figure 20: Terania Street Drainage Improvements

7.3.4 Trinity Drive, Goonellabah (I20)

ACTIONS S6A, S6B

The catchment for this location commences on the top side of the Bruxner Highway, includes properties in Bruxner Crescent and the Neighbourhood Park and discharges to the open drain to the Trinity Drive road crossing. During rainfall, a large amount of water flows to the headwall at the Trinity Drive road crossing leading to surcharge flows over the road and into the opposite residential property. The pipe outlet is blocked with weeds and rubbish, however the culvert and stormwater outlet may also be undersized for the flows.

Figure 21: Trinity Drive stormwater inlet (draining ridge line from south)

The proposed action includes inspection of the collection pit on Trinity Drive to ensure no blockages and maintenance of the outlet drain (weed, silt and rubbish removal, Action S6A). If the pit and pipes are clear, an enlargement/additional pipeline within the road crossing or box culvert combined with regarding and scour control at the outlet may be required if the issue continues (Action S6B).

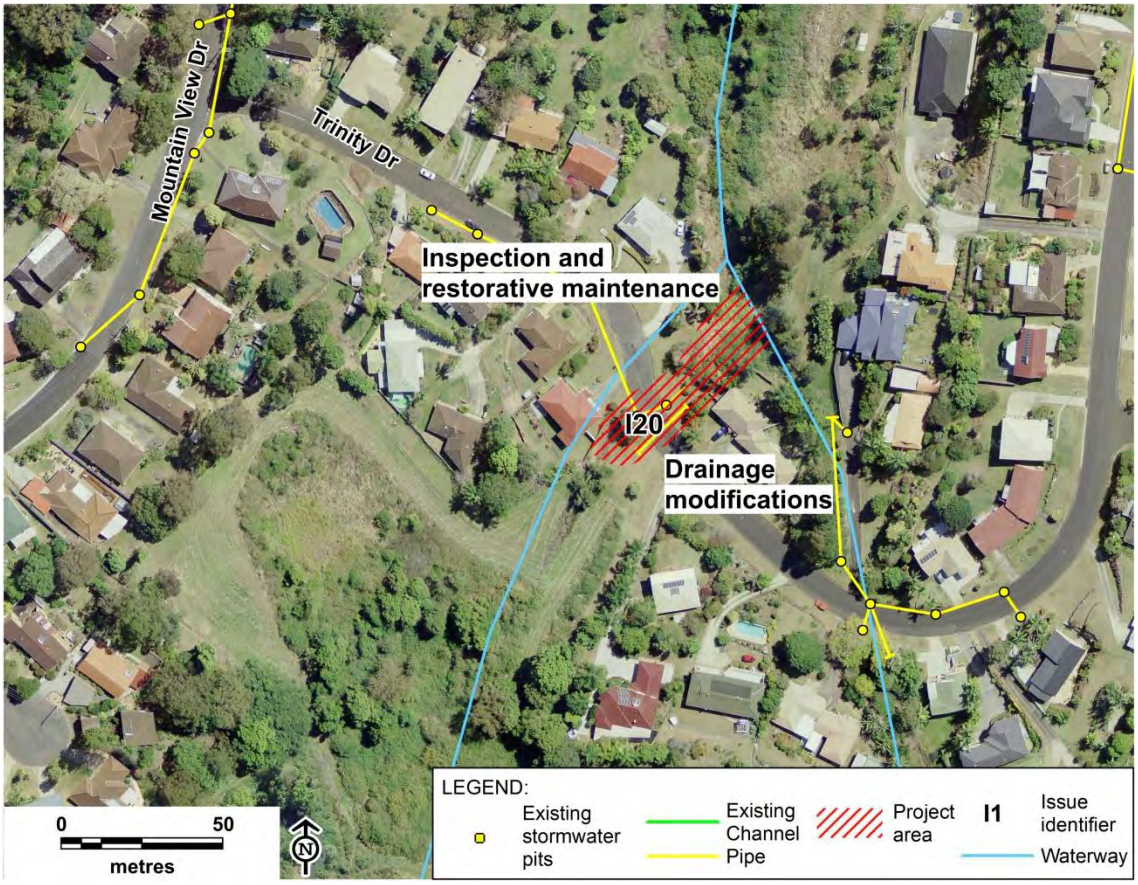


Figure 22: Trinity Drive Drainage Improvements

7.3.5 Larkin Lane, CBD (I21)

ACTION S7

The road surface in Larkin Lane is a patchwork of surfaces and levels which may contribute to ponding/flooding of shop fronts and alleyway. Access ramps to shops restrict flows in gutters. There is also a large amount of sediment and debris in the drains.

Figure 23: Larkin Lane is inundated during heavy rainfall, drainage is half full of sediment

The drains should be cleared of sediment and debris to improve conveyance. If flooding still occurs, the crossfall of the road could be regraded away from the shops (not currently funded in the USMP).

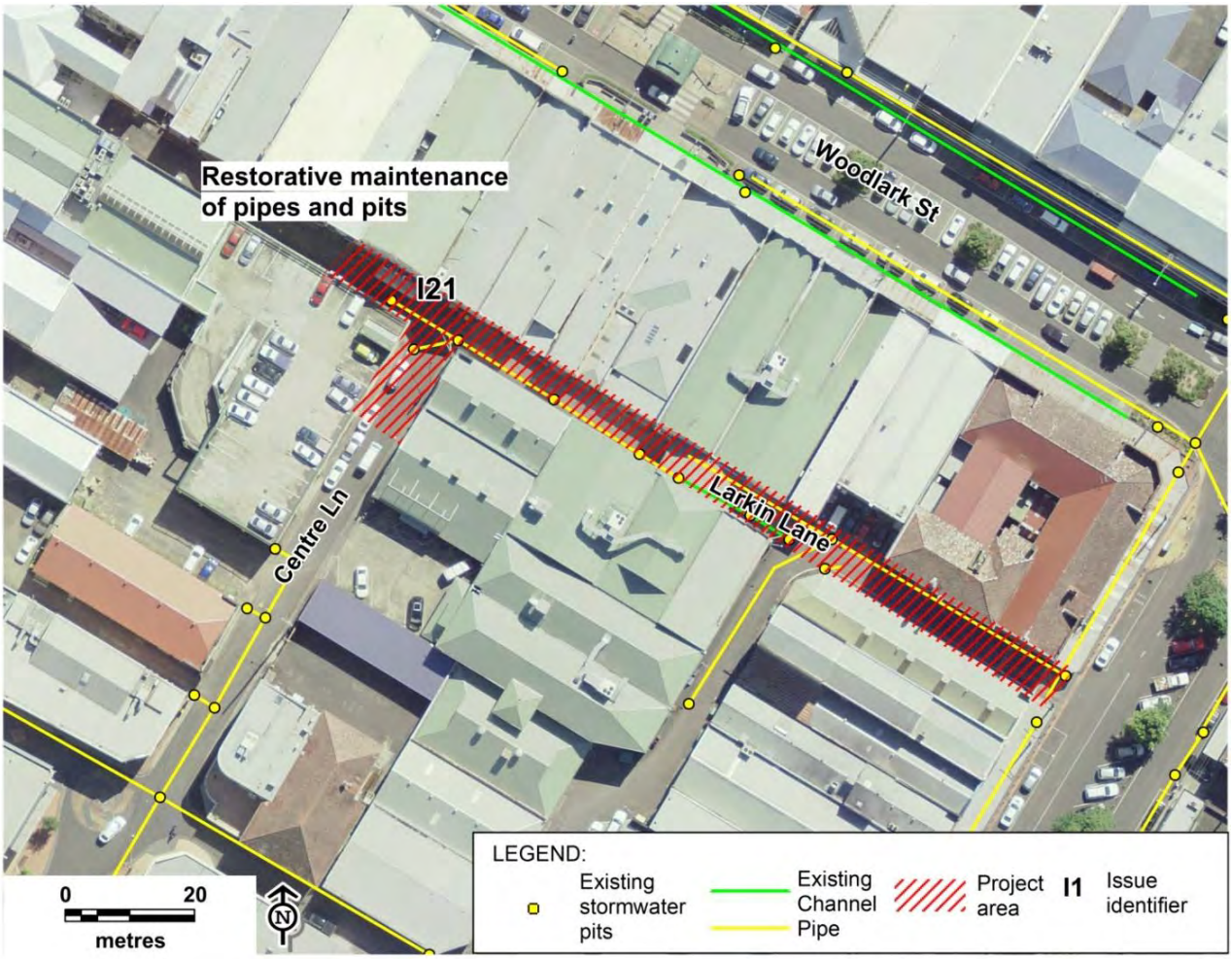


Figure 24: Larkin Lane Drainage Improvements

7.3.6 Cathcart Street, Girards Hill (I23)

ACTION S8

The houses in this section of Cathcart Street are below the level of the road. Localised flooding of 37-41 Cathcart Street is exacerbated by inadequate upstream drainage (blocked pipes and sediment in swales). Runoff appears to flow from the road to the pathway in front of 41 Cathcart Street and drains to Ballina Road along the footpath. The swale drain along Cathcart Street is full of sediment and debris and the capacity of culvert inlet is reduced due to tree roots and debris.

Figure 25: Cathcart Street drainage

Removal of sediment and debris from the swale and culverts is required initially. Potential drainage modifications include piping of stormwater from the front of the properties to the rear or enlargement of the Cathcart Street culvert entry swale and realignment of driveway crossing (no. 41) combined with enlargement of road culvert to the east side of Cathcart Street.

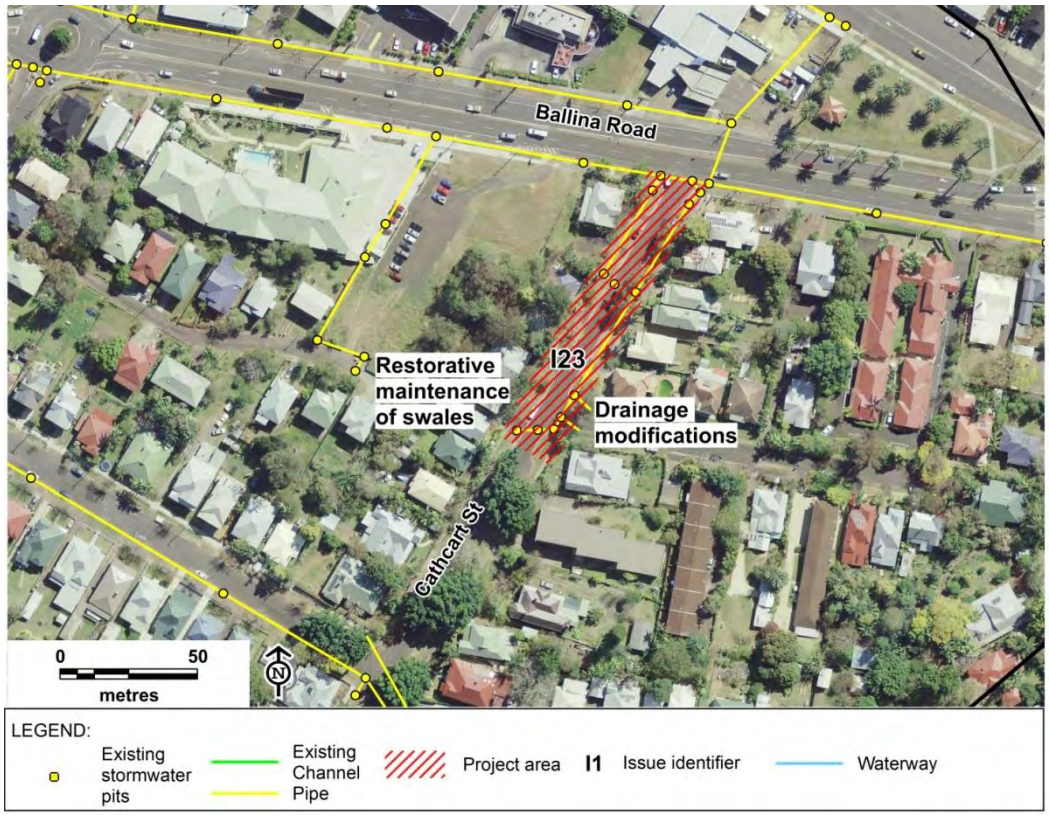


Figure 26: Cathcart Street Drainage Improvements

7.3.7 South Lismore Public School (I22)

ACTION NS10

Stormwater from the South Lismore Public School is designed to flow west along the swale adjacent to the railway corridor.

Figure 27: South Lismore Public School and Drainage Swale (Photo: A. Nguyen)

During 2015, Council replaced five metres of drainage pipe and unblocked the culvert that runs under Caniaba Street, north of the railway crossing. This is expected to resolve this issue but ongoing monitoring and maintenance of the drainage swale is required.

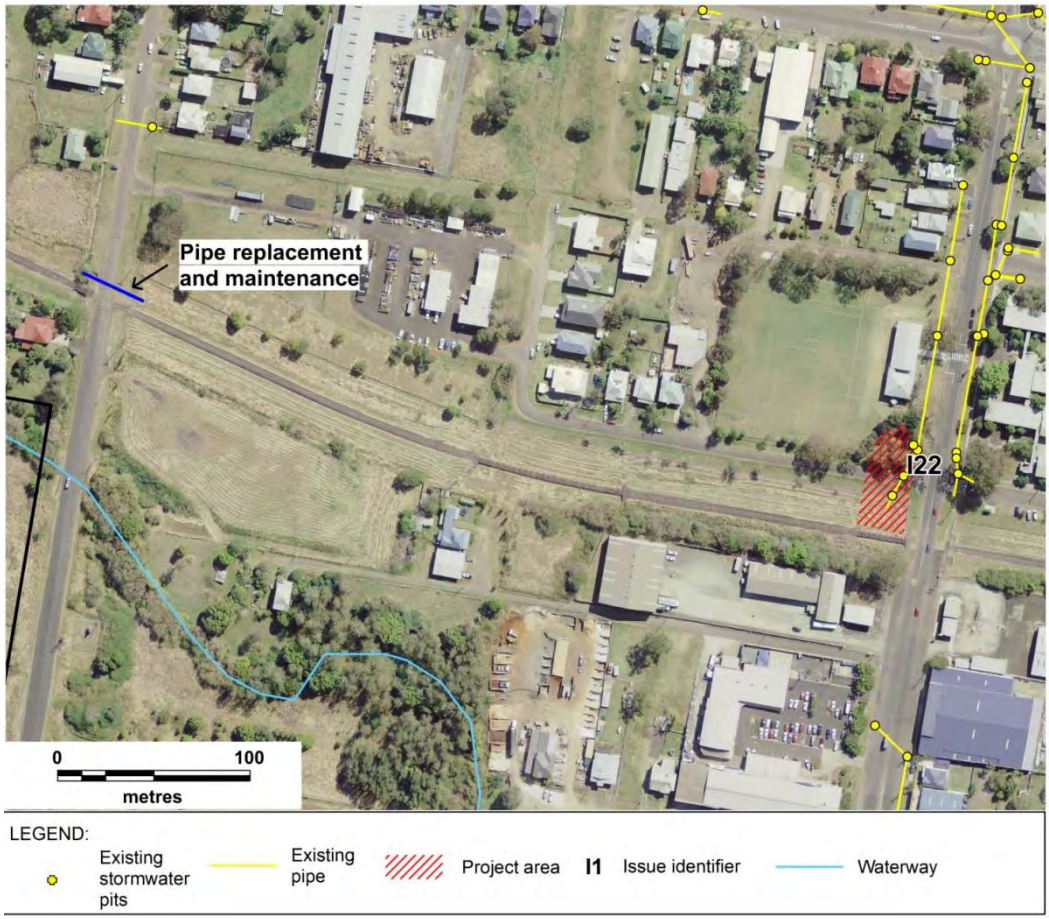


Figure 28: South Lismore Public School - Caniaba Street Drainage Improvements

7.3.8 Casino Street, South Lismore (I24)

ACTION NS10

Localised flooding of residences on Casino Street is potentially caused by inadequate swale drainage (low grade, overgrown swales) and blocked pipes crossing to the east side of Caniaba Street.

Figure 29: Localised flooding along Casino Street, South Lismore (18 Sept. 2015, Photo A. Nguyen)

During 2015/16, Council will rehabilitate this section of Casino Street and will include new culvert road crossings from Casino Street to Hanlon Street and Caniaba Street. This site should be regularly maintained and monitored to determine if additional modifications are required.

Figure 30: Casino Street Drainage Improvements

7.4 Restorative Maintenance of Existing Stormwater Systems

The maintenance of some existing stormwater systems has been problematic due to a lack of maintenance access, lack of resources or a lack of understanding of maintenance requirements. The site-based issues are:

- I6 - Camilla Place retention basin is silted up and ineffective;
- I12 – Joy Street sediment basin is silted up reducing capacity and effectiveness; and
- I16 - The northern section of Browns Creek channel is overgrown with weeds, restricting conveyance of flows to the Bat Cave (refer Section 7.1).

7.4.1 Camilla Place Retention Basin (I6)

ACTION S9

The retention basin is silted up and ineffective, with suspected tertiary pollutants (hydrocarbons, nutrients) entering Tucki Tucki Creek. The upper bank has bare soil and rocks are being undermined.

Figure 31: Camilla Place retention basin

Maintenance activities should include excavation of silt, re-contouring of the basin, reinstatement of subsoil drainage and re-vegetation.

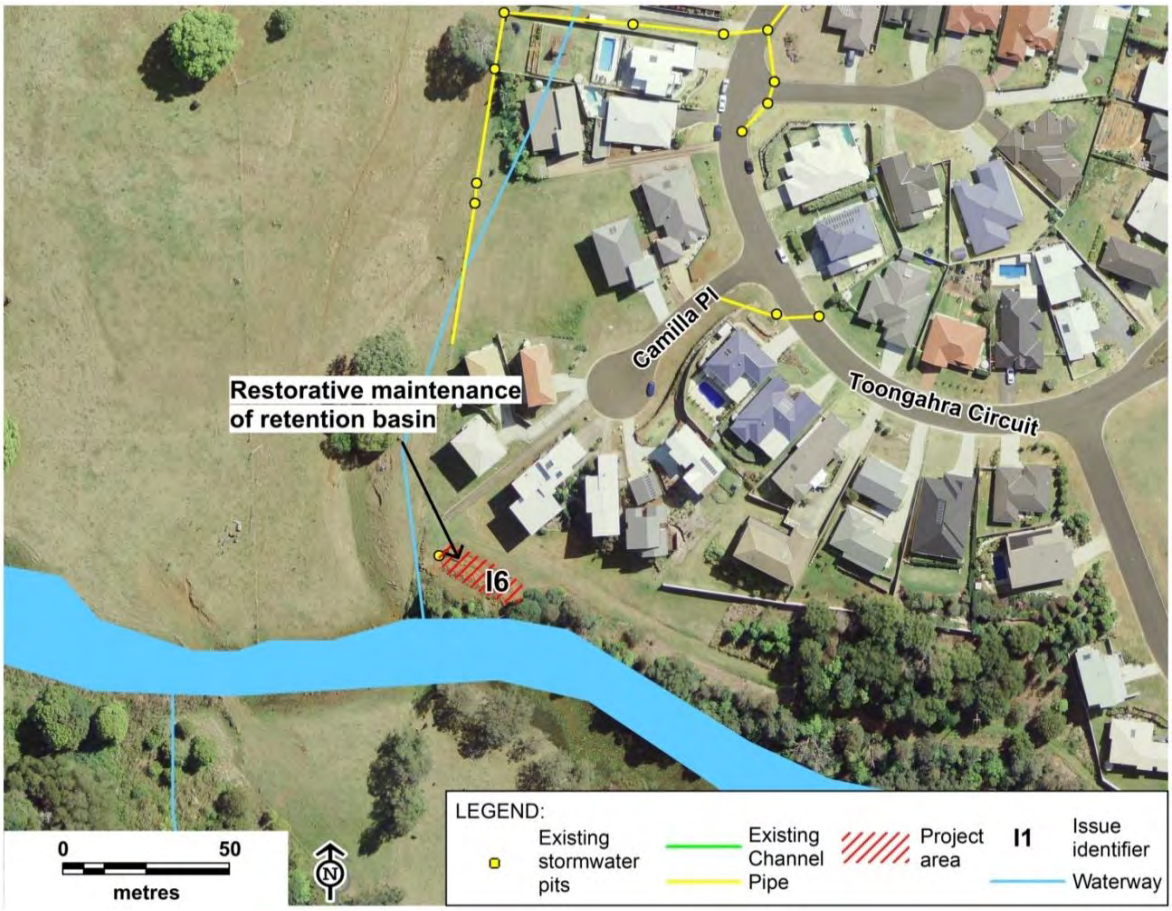


Figure 32: Camilla Place Retention Basin

7.4.2 Joy Street Sediment Basin (I12)

ACTION S10

The sediment basin is silted up reducing capacity and effectiveness of the system. Sediment is bypassing the system and dispersing downstream to Tucki Tucki Creek during high flows. The structure is difficult to access due to surrounding vegetation.

Figure 33: Joy Street sediment basin (Photo: A. Nguyen)

Maintenance activities should include removal of accumulated sediment by excavation. Several trees would need to be removed to allow access. The vegetation on the site should be restored allowing for permanent maintenance access.

Figure 34: Joy Street Sediment Basin

7.5 Upgrade of Existing Stormwater Treatment Systems

Many of the existing stormwater treatment systems have been inherited by Council from developers of subdivisions. Some systems were designed for sediment capture during the construction phase and are not appropriate for operational phase stormwater treatment due to design or poor condition (refer Section 9.1.3, Volume 2). Many have also not been adequately maintained. Some natural drainage lines are part of the downstream stormwater system but are not adequately vegetated or maintained causing siltation and weed growth.

The site-based issues are:

- I5 - Gasworks Creek detention pond is silted up reducing capacity and effectiveness;
- I7 - Kookaburra Terrace sedimentation basin (#1) is waterlogged and provides low water quality improvement;
- I8 - Kookaburra Terrace sedimentation basin (#2) is waterlogged and provides low water quality improvement;
- I9 - Kookaburra Terrace sedimentation basin (#3) is waterlogged and provides low water quality improvement;
- I10 - Large amounts of silt in Just Street bioretention basin; and
- I4 - Poor condition of riparian vegetation along Leycester Creek

7.5.1 Gasworks Creek (I5)

ACTION S11

The Gasworks Creek detention pond is silted up reducing capacity and effectiveness. Coral trees are present and the area is difficult to maintain and generally aesthetically displeasing.

Figure 35: Gasworks Creek Channel

Recommended works would include desilting of the sediment pond, re-contouring of the channel and banks and revegetation similar to the rehabilitated upstream section of Gasworks Creek. This project would complete restoration and stormwater treatment for Gasworks Creek.

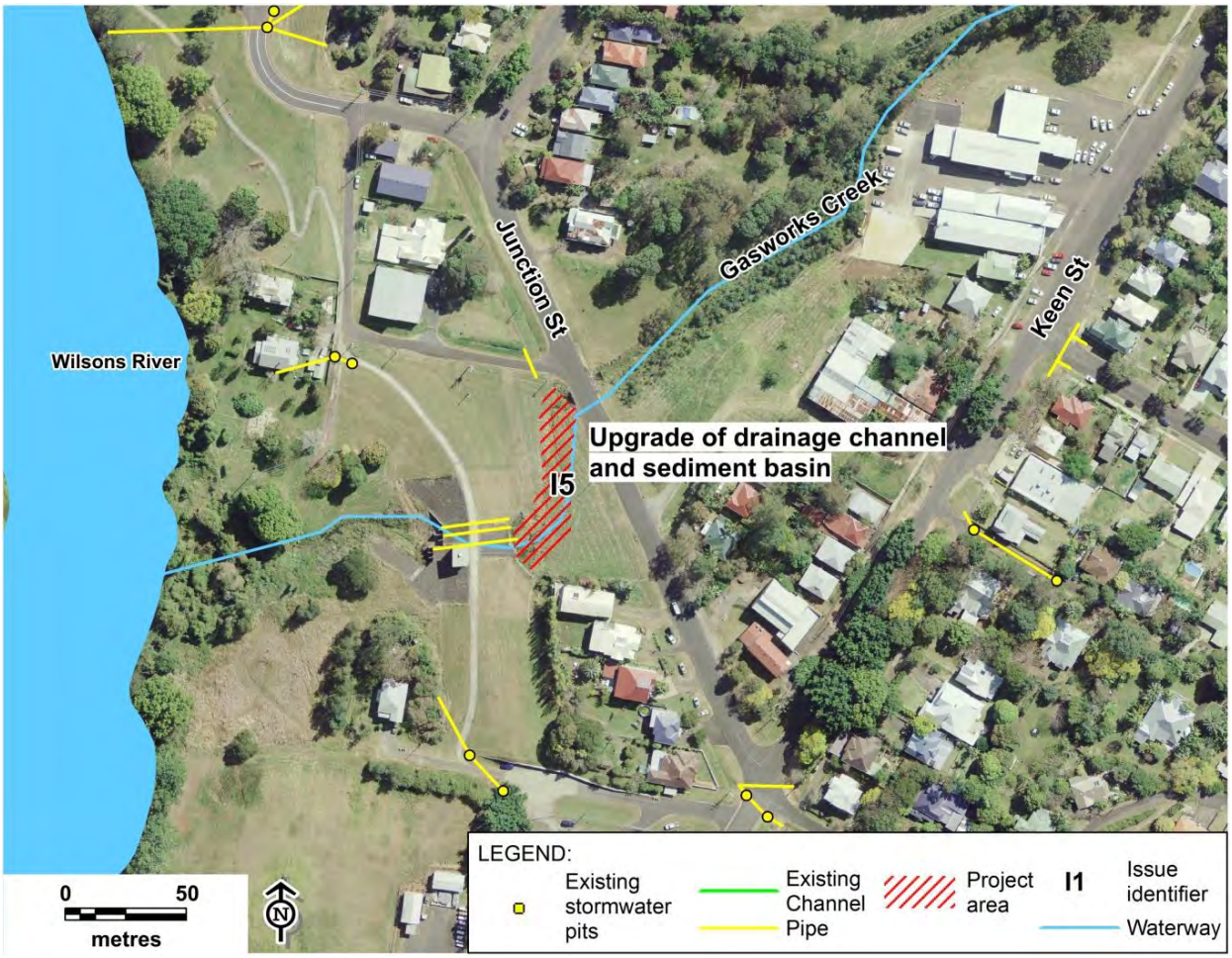


Figure 36: Gasworks Creek Restoration

7.5.2 Kookaburra Terrace sedimentation basins (I7, I8, I9)

ACTIONS S12, S13, S14

The sedimentation basins within the Koobaurra Terrace (Goonellabah) subdivision require regular maintenance, are very damp and provide low water quality improvement. It appears that basins 1 and 2 operate as sediment basins with no subsoil drainage or low flow discharge. There is also a risk of flooding of the neighbouring property/backyard near basin 1 due to the high level of the surcharge pit. The upgrades would include excavation for subsoil drainage and modification of the surcharge pit (basins 1 and 2), scour control at the headwall, re-vegetation with suitable species to increase water quality improvement, increase general amenity of the area and reduce long-term maintenance.

Figure 37: Kookaburra Terrace sediment basins (#1, #2, #3)

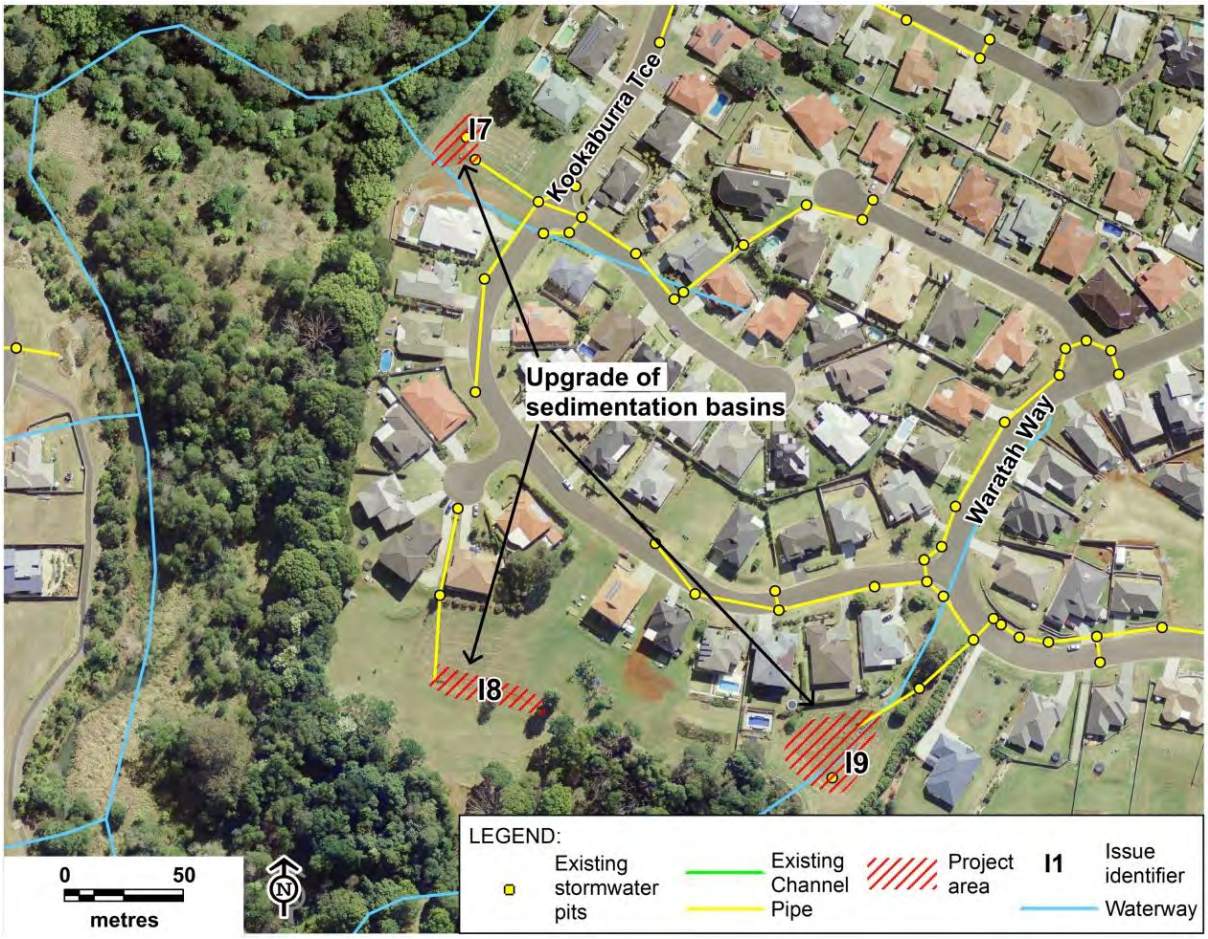


Figure 38: Kookaburra Terrace Sedimentation Basins

7.5.3 Just Street bioretention system (I10)

ACTION S15

The bioretention basin in the Just Street (Goonellabah) subdivision was inherited by Council as part of earlier stages of this large subdivision. Large amounts of silt from construction site runoff have accumulated in the basin, reducing capacity and function.

Figure 39: Just Street bioretention basin

Works would include excavation of silt and re-instatement as a bioretention system to provide tertiary treatment. This would require revegetation and may need replacement of filter media. Improved sediment and erosion controls during subdivision construction are also required (refer Section 6.3.5).

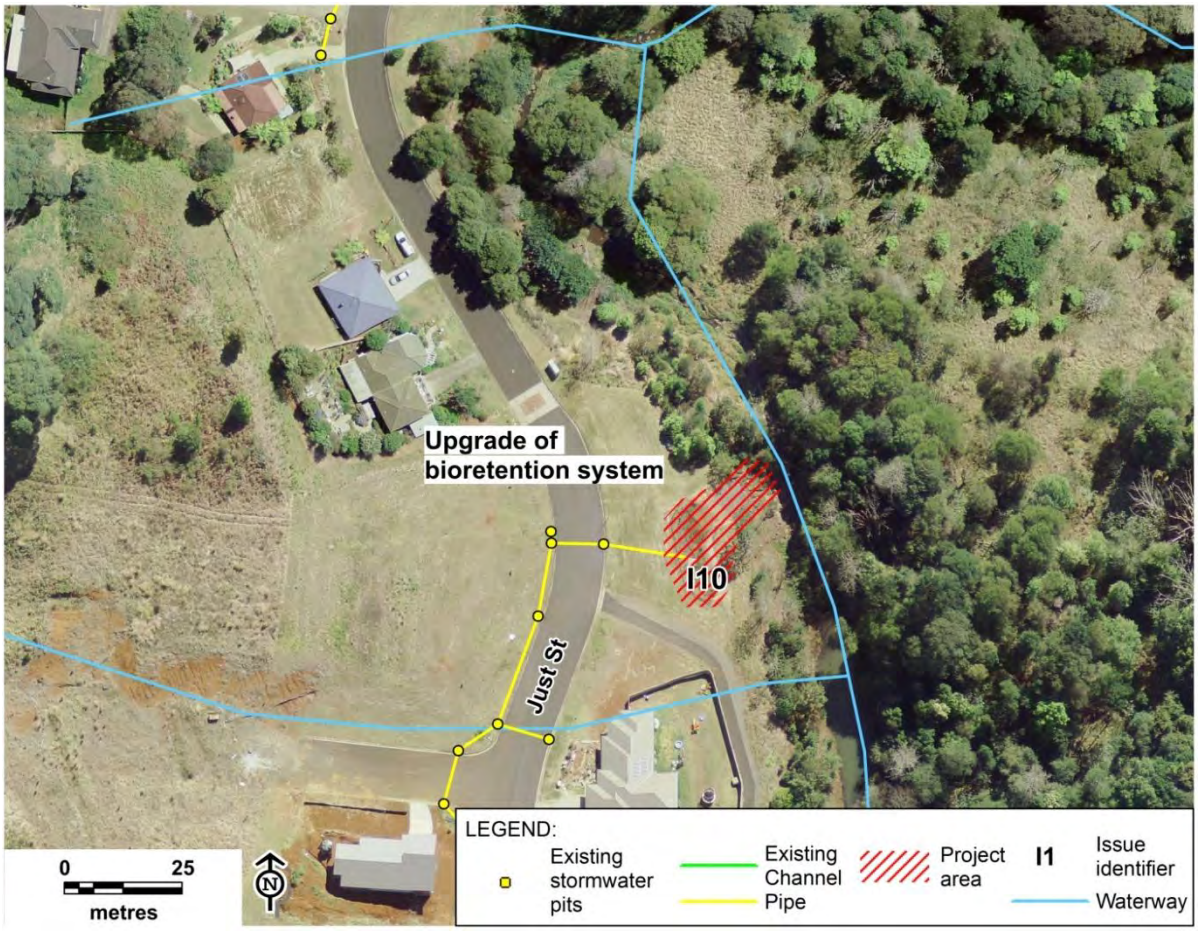


Figure 40: Just Street Bioretention System

7.5.4 Riparian condition (I4)

ACTION S16

There are many locations where stormwater runoff discharges to waterways via natural drainage lines. Due to the high level of nutrients in the runoff, the presence of weeds and lack of maintenance, the condition of the riparian vegetation is poor which can affect the conveyance of flows as well as the level of treatment provided. As an example, the small parcel of Council land adjacent to the Leycester Creek bank (downstream of the duck pond) is in poor condition. The majority of the 'duck pond' is on private land which is currently being rehabilitated by a local Landcare group. Council manages a parcel of land adjacent to the river bank where rehabilitation works could be undertaken. Works would include revegetation of the riparian zone along the small stream from the duck pond to Leycester Creek (40m within Council land). As there is a need for ongoing maintenance and there are other sites that also require rehabilitation, ongoing expenditure for riparian restoration is included in this USMP.

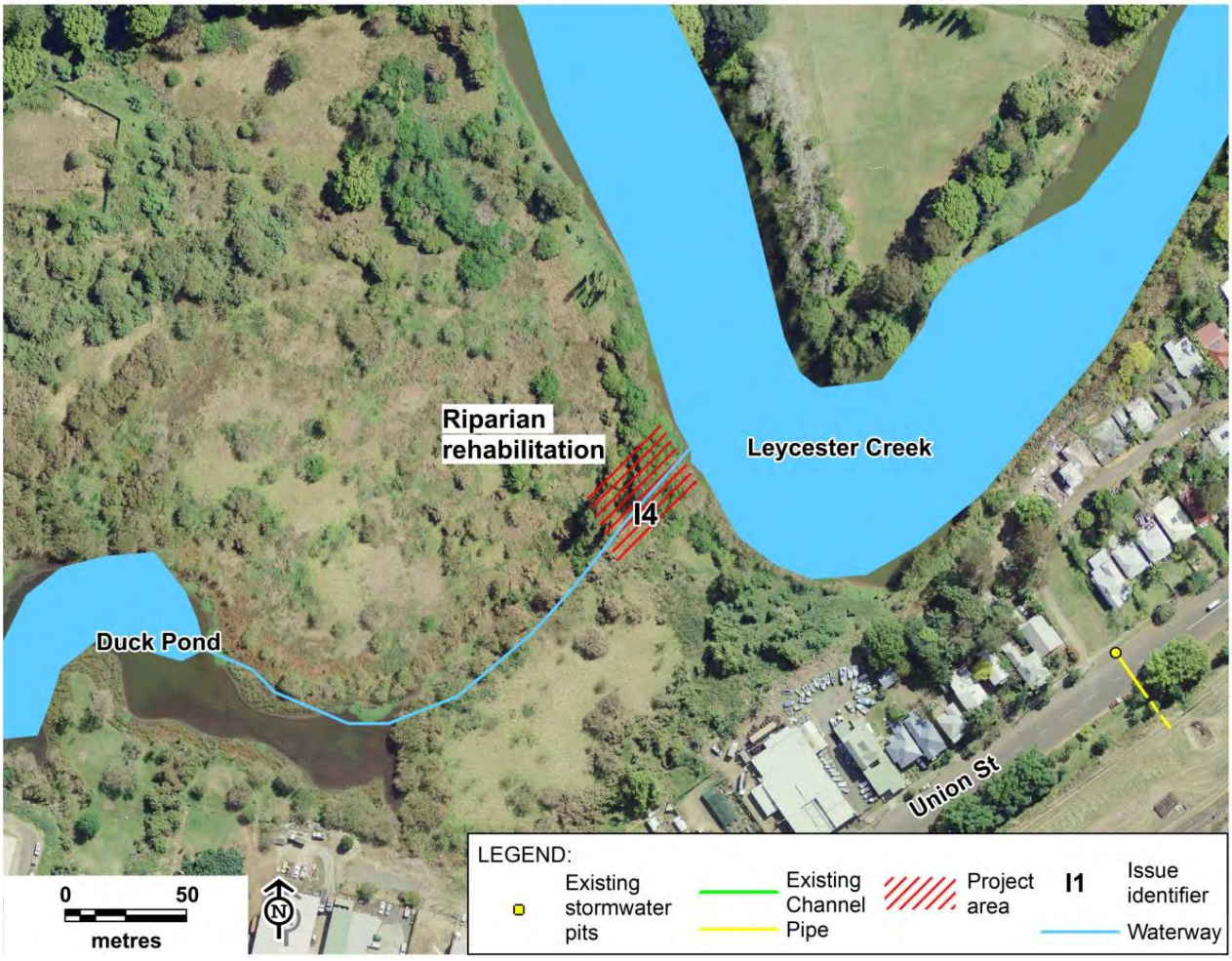


Figure 41: Leycester Creek Riparian Restoration

7.6 Other New Treatment Systems

In addition to the new treatment systems proposed for Browns Creek and Monaltrie Creek catchments, there is a need for new treatment systems to be constructed within other catchments to maximise the extent of treatment provided throughout the urban area as well as address issues with poor performance of the existing stormwater system.

7.6.1 Waterlogging of Newbridge Street swale (I3)

ACTION S17

This swale is downstream of the residential and industrial areas of South Lismore and discharges into Hollingworth Creek. The swale is difficult to maintain as it is waterlogged and weed growth inhibits stormwater conveyance. Proposed works include construction of a treatment system to replace the swale with site re-contouring and grading, a sediment collection system, establishment of a wetland or bioretention system and vegetation of the banks. This is an alternative to the 525 mm diameter pipeline between Newbridge Street and Elliot Road included in the trunk drainage program (refer Section 7.8).

Figure 42: Newbridge Street Swale

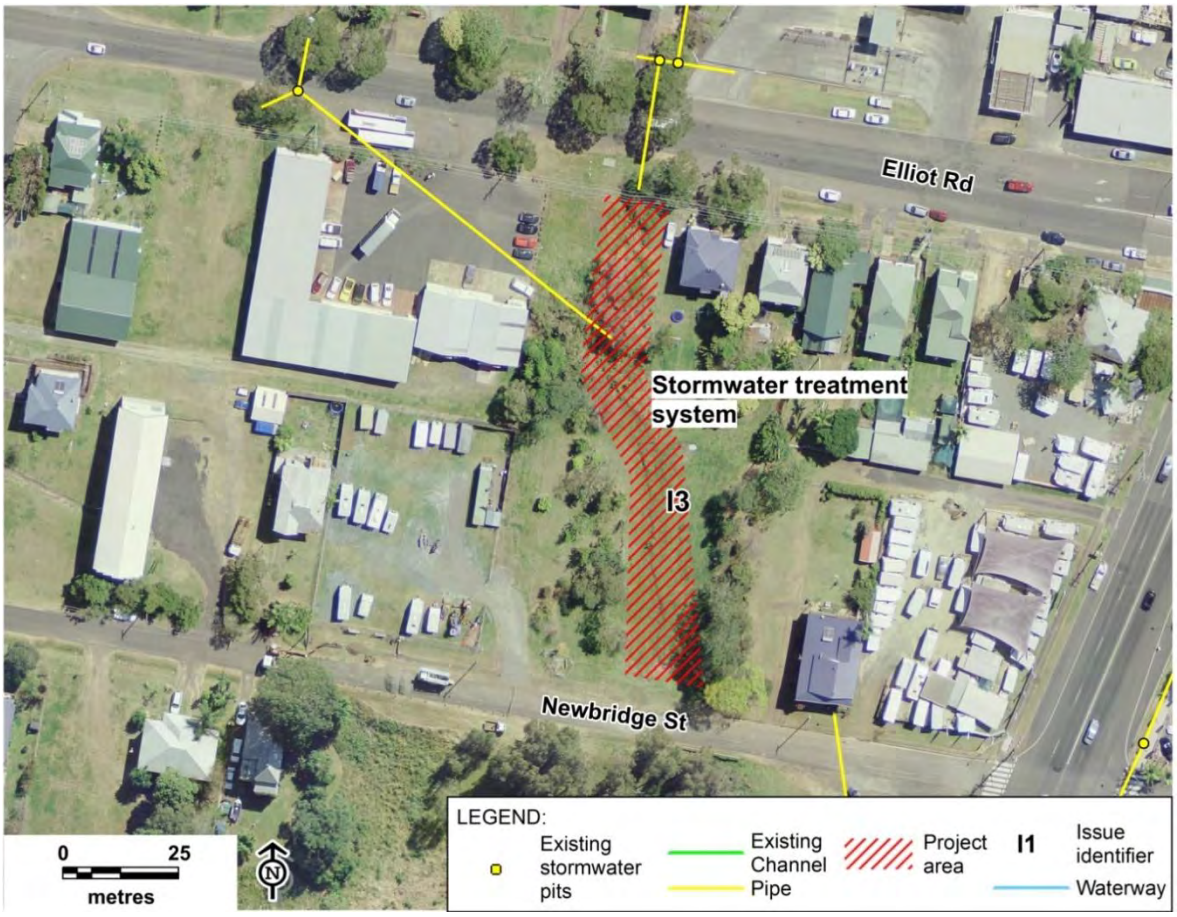


Figure 43: Newbridge Street stormwater treatment system

7.6.2 Stormwater treatment as part of roadworks

ACTION S18

Council has developed a forward works program for sealed road rehabilitation. Further information on the road rehabilitation program is provided in Section 10.4 of Volume 2. This provides an opportunity to incorporate stormwater treatment into the road corridor. The following considerations would apply:

- Priority should be given to the treatment of road runoff from areas where there is a high concentration of vehicle braking and turning (i.e. roundabouts, intersections and off-ramps);
- Incorporation of water treatment systems such as bio-retention filters in traffic calming devices and roadway features where feasible;
- Incorporation of litter collection systems into the car parks and surrounding roadways of shopping centres, takeaway food centres, community areas, entertainment facilities and sporting fields; and
- Incorporation of public education messages onto the face of stormwater inlet lintels (e.g. PROTECT OUR WATERWAYS – FLOWS TO CREEK).

Ongoing expenditure for stormwater treatment as part of roadworks is included in this USMP.

7.7 Asset Renewals

ACTIONS S19

Limited rectification of poorly performing or ageing assets has occurred due to limited funding and renewals planning. A cost-effective renewal program relies on accurate asset condition data and review of functional needs (NS1). There is a need to develop a prioritised renewal program to confirm expenditure requirements (NS3) and while funding is not available in this USMP for asset renewals, a prioritised renewal program may be funded in the longer term.

The forward works program for sealed road rehabilitation also provides an opportunity to renew existing trunk drainage assets at the time of roadworks. The prioritised renewal program for stormwater assets should inform the road rehabilitation program and confirm expenditure requirements and timing. Ongoing expenditure for stormwater drainage upgrades as part of roadworks is included in this USMP (Action S19).

7.8 Trunk Drainage Upgrades

ACTION S20

LCC commenced planning for upgrades to trunk drainage in 2009/10. At the time, a priority rating system was developed to help prioritise this work and a $250,000 loan serviced through the SMS Charge was used to fund upgrades in Webster Street, Phyllis Street and Brewster Street, South Lismore. The repayments for this loan will continue until 2030 (Action S20). Since then, no funding has been made available for the trunk drainage program.

Many of the proposed trunk drainage upgrades and some of the site-based issues are located in the same locations as the road rehabilitation program (refer Section 10.4 of Volume 2). There is an opportunity to construct new trunk drainage at the time of road rehabilitation although this USMP has not identified a funding source for this work.

Details of the proposed trunk drainage program that is not funded as part of this USMP are included in Volume 2 and summarised in Appendix 1.

8. MONITORING, EVALUATION AND REPORTING

The management objectives defined in Section 2 are aspirational in that they are high-level goals that may not be achievable within the life of this plan. However, they remain as long-term desires held by Council and the community. Continuous improvement towards these objectives across the full range of issues should be seen as the first measure of success.

An effective monitoring and reporting system is regarded as a key component of the USMP. Identification of asset management issues and environmental impacts will ensure Council provides cost-effective actions and directs effort where it is most needed. Obtaining feedback on the success of management initiatives is also a critical aspect of effective management. Monitoring of asset and receiving environment condition, as well as community opinions should be undertaken to provide a solid information base for future decision making.

The ability to achieve the USMP management objectives will be determined through the success of the management actions. This will require coordinated monitoring as well as on-going review of performance against defined targets. Ongoing reporting of progress of the USMP will be undertaken on an annual basis as part of budgeting processes. A major 10-year review of the USMP is also required.

The substantial implementation of measures to address the root cause of urban stormwater issues, as well as conclusive documentation of the effectiveness of such measures is required. Success of the USMP will be gauged by:

- Stakeholder acceptance;
- Incorporation of the USMP actions into Council business planning;
- Securing sufficient funds to implement the actions;
- Implementation of actions in an efficient and timely manner;
- Uptake of actions by stakeholders and others; and
- Positive stakeholder feedback on improvements.

The USMP and the specified management actions should be reviewed to ensure they are being achieved and are resulting in the desired outcomes. A ten year review (or earlier if warranted by legislative or management changes or improved scientific understanding) of the USMP is required to consider:

- Any additional funding sources;
- Any new management issues;
- Any change to the prioritisation of issues;
- Any barriers identified to the effective implementation of actions or overall success of actions;
- Any new or updated scientific knowledge;
- Data provided by the monitoring programs and asset management processes; and
- Prevailing community attitudes, government policy, strategic planning and stormwater management issues.

9. IMPLEMENTATION PROGRAM

The management actions have been compiled into a ten year implementation program (Table 4) with responsibilities and indicative costs estimated over the ten year implementation period. The total cost of the USMP implementation is estimated to be $9.583 million over ten years which is made up of $380,000 p.a. income from the stormwater management service charge, $469,000 p.a. from Council's general fund and $1.100 million in reserves.

The actions will be delivered through a combination of the SMS charge, Council's general fund, developer contributions (to be determined), grant funding (where available) and partnerships with other organisations. The delivery of the actions may be influenced by the availability of this funding as well as human resources.

The projects that are not considered to be affordable in the next 10 years within the current budget are listed in Appendix 1. Council will continue to review the priority of each action and allocate funding to these actions if additional internal and/or external funds are identified.

Table 4: USMP Implementation Program

Actions	USMP Ten Year Implementation Program (2015 $ '000)	Location[1]	Responsibility	10 year total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
					2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Operations														
NS22	Contributions Plan	Urban area	Manager Development and Compliance	20	20									
NS13, NS14, NS15, NS16	Community Education	Urban area	Manager Integrated Planning	75		15		15		15		15		15
NS4	Staff Training	Urban area	Manager Integrated Planning, Manager Works, Manager Assets, Manager Development and Compliance, Manager Civic Pride	75	15		15		15		15		15	
NS21	Project Management/Delivery	Urban area	Manager Assets	80		20	20	20				10	10	
NS9, NS23	Compliance	Urban area	Manager Development and Compliance	20	20									
Conduits and Pits														
NS1, NS2, NS3	Asset Management	Urban area	Manager Assets	417	50	50	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.6
NS18	Survey and Design - internal	Urban area	Manager Assets	308	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8
NS6, NS10, NS11, NS19	Administration and management	Urban area	Manager Works, Manager Assets, Manager Civic Pride	943	94.3	94.3	94.3	94.3	94.3	94.3	94.3	94.3	94.3	94.3
Stormwater Treatment														
NS1, NS2, NS3	Asset Management	Urban area	Manager Assets	206	50	50	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2
NS18	Survey and Design - internal	Urban area	Manager Assets	308	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8
NS5, NS6, NS7, NS8, NS12, NS19	Administration and management - stormwater treatment	Urban area	Manager Integrated Planning	913	91.3	91.3	91.3	91.3	91.3	91.3	91.3	91.3	91.3	91.3
NS17	Monitoring	Urban area	Manager Integrated Planning	100	10	10	10	10	10	10	10	10	10	10
Maintenance														
Conduits and Pits														
	Programmed drainage maintenance	Urban area	Manager Works	1,305	118.8	131.8	131.8	131.8	131.8	131.8	131.8	131.8	131.8	131.8
S8	27-41 Cathcart Street restorative maintenance	12 - Gasworks Creek	Manager Works	5	5									
S7	Larkin Lane restorative maintenance	14 - CBD	Manager Works	5	5									
S6A	Trinity Drive inspection and restorative maintenance	6 – Howards Grass	Manager Works	3	3									
	Reactive drainage maintenance	Urban area	Manager Works	565	56.5	56.5	56.5	56.5	56.5	56.5	56.5	56.5	56.5	56.5
Stormwater Treatment														
	Routine treatment system maintenance	Urban area	Manager Integrated Planning	450	46.2	34.2	46.2	46.2	46.2	46.2	46.2	46.2	46.2	46.2
S9	Camilla Place retention basin restorative maintenance	9 – Tucki Tucki	Manager Integrated Planning	6		6								

Actions	USMP Ten Year Implementation Program (2015 $ '000)	Location[1]	Responsibility	10 year total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
					2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
S10	Joy Street sedimentation basin restorative maintenance	9 – Tucki Tucki	Manager Integrated Planning	6		6								
Asset Upgrade														
Conduits and Pits														
S19	Trunk drainage upgrades as part of roadworks	Urban area	Manager Assets	439		48.8	48.8	48.8	48.8	48.8	48.8	48.8	48.8	48.8
S1B	Drain rehabilitation - Zadoc Street to bat cave	1 – Browns Creek	Manager Assets	38				20	3	3	3	3	3	3
S3	Union Street stormwater upgrade	15 – South Lismore/ Hollingworth Creek	Manager Assets	19				19						
S4	Reshaping/enlargement of Snow Street channel	16 – South Lismore/ Airport	Manager Assets	5						5				
S5	Terania Street stormwater upgrade	2 – Slaters Creek	Manager Assets	141								141		
S6B	Trinity Drive drainage modifications	6 – Howards Grass	Manager Assets	35						35				
S8	27-41 Cathcart Street drainage modifications	12 – Gasworks Creek	Manager Assets	70		70								
Stormwater Treatment														
S12	Kookaburra Terrace sedimentation basin (#3)	9 – Tucki Tucki	Manager Integrated Planning	7						7				
S13	Kookaburra Terrace sedimentation basin (#2)	9 – Tucki Tucki	Manager Integrated Planning	3						3				
S14	Kookaburra Terrace sedimentation basin (#1)	9 – Tucki Tucki	Manager Integrated Planning	8				8						
S2B	Monaltrie Creek - rehabilitation of drainage/creeks	10 - Monaltrie Creek	Manager Integrated Planning	74				48		10		10		6
S11	Gasworks Creek detention basin/channel vegetation	12 – Gasworks Creek	Manager Integrated Planning	27									27	
S15	Just Street bioretention basin	9 – Tucki Tucki	Manager Integrated Planning	8			8							
S16	Riparian rehabilitation	Urban area	Manager Integrated Planning	40		10		10		10		10		
New Assets														
Conduits and Pits														
S20	2009/10 trunk drainage program loan repayment	15 - South Lismore/ Hollingworth Creek	Manager Integrated Planning	302	30	30	30	30	30	30	30	30	30	30
S1C	Lismore Workers golf course detention basin/s	1 – Browns Creek	Manager Integrated Planning, Manager Assets	92	10	62	5		5		5		5	
Stormwater Treatment														
S1A	Browns Creek catchment water quality/flooding improvements	1 – Browns Creek	Manager Integrated Planning, Manager Assets	1,620	80	500	500	300	50	50	50	30	30	30

Actions	USMP Ten Year Implementation Program (2015 $ '000)	Location[1]	Responsibility	10 year total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
					2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
S2A	Upper Monaltrie Creek sediment containment structures	10 - Monaltrie Creek	Manager Integrated Planning, Manager Assets	55			26	5	3	5	3	5	3	5
S2C	Monaltrie Creek catchment stormwater treatment system	10 - Monaltrie Creek	Manager Integrated Planning, Manager Assets	523							80	200	176	67
S17	Newbridge St stormwater treatment system	15 - South Lismore/ Hollingworth Creek	Manager Integrated Planning, Manager Assets	100										100
S18	Treatment systems as part of roadworks	Urban area	Manager Integrated Planning, Manager Assets	175	25	25	25	25	25	25	25			
			Total Funded Program (including Reserves)	**9,590**	**792**	**1,373**	**1,222**	**1,093**	**724**	**791**	**804**	**1,047**	**892**	**849**
			Available funding - General Fund	*4,690*	*469*	*469*	*469*	*469*	*469*	*469*	*469*	*469*	*469*	*469*
			Available funding - SMS Charge	*3,800*	*380*	*380*	*380*	*380*	*380*	*380*	*380*	*380*	*380*	*380*
			Opening Reserve		*1,100*	*1,157*	*633*	*260*	*16*	*140*	*198*	*242*	*44*	*0*

1. Refers to the entire urban area or a specific Management Area.

2. Year refers to the financial year. 2017 is the 2016/17 financial year, commencing 1 July 2016.

Appendix 1: Projects that are not funded in the USMP

Table 5: Projects that are not funded in the USMP

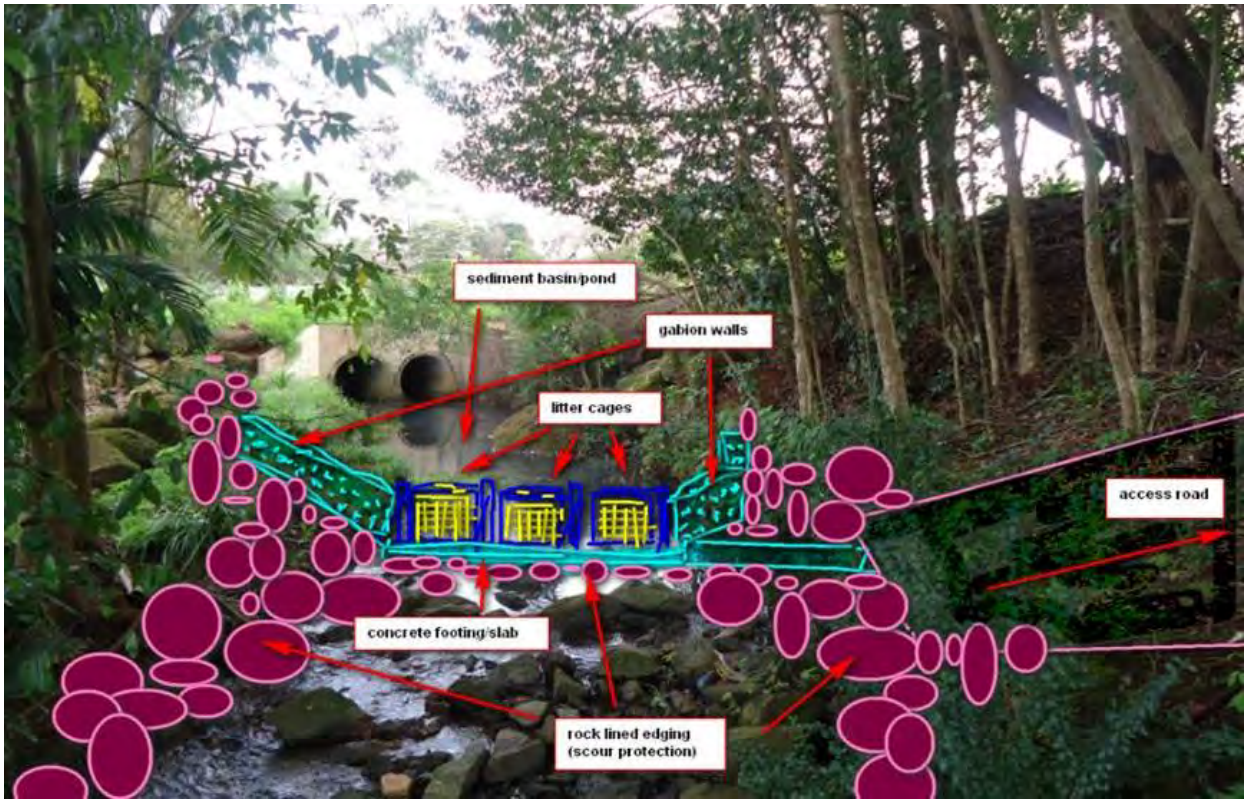
Issue	Ten Year Cost Estimate (2015 $ '000)	10 year total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Trunk Drainage Program (refer Section 10.3 And Appendix 9, Volume 2)												
I25	TD1 - Webster Street	**1,073**	1,073	Ongoing maintenance is not estimated								
I25	TD2 – Edward Street	**733**	733									
I25	TD3 - Phyllis Street	**922**	922									
I25	TD4 – Caniaba Street	**859**	859									
I25	TD5 - Elliott Road	**974**	974									
I25	TD6 – Cook Street	**770**	770									
I25	TD9 - Casino Street	**861**	861									
I26	TD10 – Terania Street	**602**	602									
I26	TD11 - Bridge Street	**698**	698									
I27	TD12 – Winterton Parade	**709**	709									
I29	TD13 - Diadem Street	**1,791**	1,791									
I29	TD14 – Keen Street	**661**	661									
I25	TD15 - Union Street	**446**	446									
I29	TD16 – Brewster Street	**2,760**	2,760									
I30	TD17 - Dawson Street	**2,020**	2,020									
I29	TD18 – Clarice Street	**1,685**	1,685									
I29	TD19 - Dibbs Street	**1,784**	1,784									
I31	TD20 – Wyrallah Road	**1,559**	1,559									
I31	TD21 - East Lismore Catchment	**4,009**	4,009									

Issue	Ten Year Cost Estimate (2015 $ '000)	10 year total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
New Assets												
I2	Gordon Blair Drive GPT (refer below)	**295**	205	10	10	10	10	10	10	10	10	10
Renewals												
-	Conduits and pits (renewal program to be developed) [1]	**8,650**	865	865	865	865	865	865	865	865	865	865
-	Treatment systems (renewal program to be developed)	**500**	50	50	50	50	50	50	50	50	50	50
Total Unfunded Projects		**34,359**	26,034	925	925	925	925	925	925	925	925	925

1. The Asset Management Plan estimates the required expenditure for renewal of conduits and pits to be $865,000 p.a.

Gordon Blair Drive GPT – not funded

Council has developed an initial concept for the Gordon Blair Drive GPT and access road to combine with the downstream vegetated channel.



Appendix 2: Issues and Management Approaches