

DEVELOPING A GREEN INFRASTRUCTURE POLICY FOR THE AUCKLAND COUNCIL STORMWATER UNIT

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ABSTRACT

Water Sensitive Design approaches, including the use of Green Infrastructure (GI), are increasingly accepted as best practice for land and infrastructure development in many circumstances because they support the protection and enhancement of freshwater and coastal water quality, can provide ecosystem, community and cultural benefits, may reduce risks, and may be more resilient and cost effective than traditional built infrastructure.

While the use of GI, including natural assets, generally offers a wider range of benefits when compared to traditional built infrastructure, there are also circumstances where their use may not be appropriate due to case-specific constraints or where whole of life costs and operational implications are too high compared to the benefits. Guidance is required to direct the Stormwater Unit's (SWU) operational activities in encouraging and providing for GI where appropriate, in order to achieve clear, equitable, cost effective and regionally consistent stormwater management.

To address this, the SWU commissioned the development of a Green Infrastructure Policy (GI Policy or Policy) to provide operational guidance on the use and management of GI. The purpose of the Policy is to:

- Direct the SWU's approach to use and management of GI in undertaking its functions;
- Encourage the use of GI for stormwater management in public and private development where stormwater infrastructure is to be vested in/managed by Council; and
- Guide SWU involvement in wider Council planning and management programmes for GI.

The Policy establishes overarching objectives and policies in respect of the use and management of GI and provides more specific guidance as to the circumstances where GI will be utilised or encouraged in preference to traditional stormwater management approaches.

This paper outlines the development and approach of the Policy and provides an insight into implementation of it.

KEYWORDS

Green infrastructure, natural assets, water sensitive design, stormwater management.

PRESENTER PROFILES

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Ian has spent 25 years' in local government and consultancy roles and has extensive experience in water resource management, stormwater and contaminant discharges, policy and plan development and consent acquisition. Ian utilises his science background and resource management experience to integrate complex technical information into consent and policy projects.

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Wolfgang Kanz graduated with a Masters in Applied Environmental Science, and has 15 years' experience in the public and private sector. His training and experience is in natural resource management, in particular anthropogenic impacts on the natural environment. Wolfgang is responsible for development of tools, models and policies to benefit stormwater management, applying a strategic lens to stormwater management, and providing specialist ecological advice within the Auckland Council.

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1 INTRODUCTION

The Auckland Plan includes a vision for Auckland to become “the world’s most liveable city”. It establishes aspirational outcomes, transformational shifts and strategic directions for Auckland’s people, economy, built and natural environment, arts, culture, heritage and social and physical infrastructure. The Auckland Plan envisages managing urban growth pressures through a mixture of urban expansion and urban infill and redevelopment.

A “green Auckland” is a key outcome sought by the Auckland Plan and, in order to achieve this, it recognises the need for a transformational shift to “strongly commit to environmental action and green growth”. It identifies the need to address existing problems and issues, including flooding, water quality degradation and the effects of discharges on ecosystems and biodiversity. Integrated management within whole catchments is a primary approach to achieve these multiple outcomes and to sequence infrastructure provision and upgrading to meet growth needs together with a focus on avoiding, minimising and reducing adverse effects through water sensitive design in both new and re-development.

National freshwater policy direction, as expressed in the National Policy Statement on Freshwater Management, 2014 (NPSFM), seeks to (amongst other matters):

- Safeguard the life-supporting capacity, ecosystem processes and indigenous species of fresh water and the health of people and communities in sustainably managing the use and development of land and discharges of contaminants (Objective A1);
- Maintain or improve the overall quality of freshwater, while protecting the significant values of outstanding freshwater bodies and wetlands and improving the quality of water bodies that have been degraded by human activities to the point of being “over allocated”¹ (Objective A2).
- Improve integrated management of fresh water and the use and development of land in whole catchments, including the interactions between fresh water, land, associated ecosystems and the coastal environment (Objective C1).

A primary method of achieving these objectives set down in the NPSFM is to establish freshwater objectives based on the wide range of values associated with water bodies, and set limits in order to achieve those objectives. While these values, objectives and limits have yet to be developed for Auckland, Auckland Council has proposed comprehensive, integrated land development and water management provisions in its Proposed Auckland Unitary Plan (PAUP) to work towards the NPSFM objectives. In respect of urban development and the impact on freshwater systems and coastal areas, a focus of the provisions is on the use of water sensitive design and the management of hydrology, including the retention and enhancement of natural freshwater systems as far as possible, to minimise the adverse effects of new development and progressively reduce existing adverse effects where possible.

¹ In this context, over allocated means where an identified freshwater objective is not being met.

In alignment with the Auckland Plan, and reflecting the direction provided by the NPSFM and the PAUP, Auckland Council's SWU has adopted a vision of a "Water Sensitive Community". From a stormwater perspective, the concept of a water sensitive community recognises the value of stormwater, its close interrelationship with natural freshwater systems and cultural values, and how it can enhance the liveability of Auckland.

A water sensitive community will:

- Value stormwater as an essential part of our built environment and our freshwater system.
- Commit to water sensitive design during new development and redevelopment of land which promote at source treatment and mimic predevelopment hydrology.
- Maintain and enhance the health of streams, groundwater and coastal waters.
- Manage and build resilience to flood hazards with a risk based approach to flood protection and control through the retention of flood plains, overland flow paths, and appropriate land use.
- Embrace the Maori cultural and spiritual significance of water and value the mauri of water, as well as the amenity, open space and community values.
- Contribute to the integration and interaction of communities with their streams and coastal areas.
- Explore use and reuse of stormwater as part of total water cycle management, including harvesting, cleaning and reusing stormwater in public open spaces.
- Contribute to biodiversity, carbon footprint reduction and reduction of urban heat island effects through use of green infrastructure and natural systems.

The evolution to a water sensitive community is a significant shift from the past stormwater management approach of removing and disposing of stormwater as fast as possible via built infrastructure.

Built infrastructure has always been, and always will be, a primary component of Auckland's network and its on-going efficient and effective development, operation and renewal is fundamental to sustainable stormwater management. However, the SWU recognised that it needed to drive its activities towards the transformational shifts sought by the Auckland Plan and SWU vision, including the use of GI in recognition of the additional environmental, social, and cultural values and potentially higher resilience and sustainability that it can provide compared with conventional built infrastructure. As a result, the SWU commissioned the development of a GI Policy to encourage and provide for the use of GI consistent with Auckland's strategic direction, while at the same time achieving clear, equitable, cost effective and regionally consistent stormwater management.

The Policy is being developed in three phases:

1. Scoping of the issues and options;
2. Drafting of the initial policy and decision support tools;
3. Implementation and review.

This paper describes the development and content of the Policy and an introduction to its implementation.

2 DEVELOPMENT OF THE GI POLICY

2.1 GI DEFINITION

A range of terms and definitions for green infrastructure are used nationally and internationally. For the purposes of the SWU's GI Policy, green infrastructure was defined as:

***Green Infrastructure:** Products, technologies, and practices that use natural systems, or engineered systems that mimic natural processes, to maintain or enhance overall community and environmental values and provide utility services for stormwater management. This includes both built infrastructure (green devices) and non-built GI (such as plantings).*

GI includes built infrastructure such as rain gardens, swales, and constructed stormwater wetlands. Importantly, GI also includes natural assets (NA) being utilised for stormwater management such as natural overland flow paths; the beds, banks, riparian margins, flood plains and waters of rivers, natural lakes and wetlands; and groundwater systems; together with their natural functioning, interconnections and ecosystem services.

2.2 GREEN INFRASTRUCTURE CONTINUUM

The concept of GI traverses a wide range of constructed and natural infrastructure and assets. This can be viewed as a continuum from constructed "green" devices, which are typically constructed to achieve specific stormwater management outcomes (e.g. raingardens), through to natural resources/assets such as streams and wetlands that convey and manage stormwater, in addition to the wide ecosystem, community, cultural and other values they provide.

At the end of the continuum, these natural resources/assets may include groundwater aquifers or streams that lie on private land that play an essential role in stormwater conveyance and disposal, and therefore need to be managed. This has been depicted in Figure 1 with some examples of the type of infrastructure/asset along that continuum.



Figure 1: The GI Continuum

In developing the GI Policy, it was considered that at the “device” end of the continuum, the issues are similar to those of other built infrastructure. That is, the devices are designed and constructed for a specific purpose. Capital, maintenance and whole of life costs can be developed consistent with normal asset management practices (albeit that maintenance requirements and costs may be different to more traditional network infrastructure). The main issues were considered to relate to:

1. The circumstances in which green devices would be preferred over more traditional infrastructure due to the (typically wider) benefits they provide; and
2. The circumstances where they may not be suitable or preferred (for example from a life cycle cost, operational or site constraints perspective).

These devices may be constructed by Council or private developers, with subsequent vesting in Council or retention in private ownership depending on the circumstances.

At the other end of the GI continuum, NA such as natural streams, wetlands, floodplains and aquifers play an essential role in the effective management of urban stormwater. However, they are also subject to a much wider range of considerations and constraints that make their management as “assets” significantly more complex. Complexities include determining their values (tangible and intrinsic), management responsibilities (both public and private), other (than stormwater) management considerations (e.g. their contribution to amenity or open space values), and a wide range of legal matters. These matters become particularly pertinent when contemplating watercourses (and other NA) through private property as part of the stormwater network - when assessing

the various opportunities and constraints in respect of NA it is important to consider a range of potentially challenging legal issues.

2.3 SCOPING THE GI POLICY

2.3.1 APPROACH

As an operational policy that would affect a wide range of SWU and wider Council activities and processes, it was important that there was a high level of involvement and buy-in from the SWU and other key Council stakeholders. Accordingly, an inclusive approach within Council was utilised to scope the potential extent of the GI Policy. This included:

1. Confirmation of the scope and aspirations for the Policy with the SWU;
2. Workshops with key internal stakeholders, including staff from other Council sections to further explore aspirations for the Policy, including opportunities, barriers, issues and linkages with other programmes;
3. Assessment of:
 - a. National and regional policy direction that may influence the use of GI;
 - b. National and international approaches to GI and/or NA management;
 - c. The range of values, benefits and constraints of GI including from ecological, economic and engineering perspectives; and
 - d. Legal aspects associated primarily with NA.

This process was consolidated in to an “Issues, Options and Recommendations” report, to guide the development of the Policy, which summarised the results of the literature reviews and other research including:

- Key policy initiatives that may support or constrain the Policy and possible future direction that may influence the Policy;
- Methods of valuing GI, particularly NA and their relevance to the Policy;
- Cost and benefit comparisons between constructed GI and NA;
- Key ecological considerations, in particular those that may constrain or guide where GI methods are appropriate and beneficial;
- Engineering considerations, particularly in respect of the suitability of GI in certain circumstances – recognising that the Policy needs to address routine operational considerations as well as the significant policy matters;
- An overview of likely cultural considerations, recognising that these are generally in support of the use of more natural systems; and
- The range of legal issues that need to be considered, particularly in respect of private streams that form part of the stormwater network.

2.3.2 INITIAL FINDINGS AND RECOMMENDATIONS

Policy Direction

The scoping assessment confirmed that national and regional policy and strategic direction provides a basis for adopting a GI Policy to encourage greater use and implementation of GI. Such high level policy is not explicit in directing GI. However, in the context of Auckland's significant projected urban growth and the nature and current state of its receiving environments, the ability to achieve a wider spectrum of ecological and community benefits while at the same time effectively managing stormwater is consistent with this high level policy and direction, key points of which can be generally summarised as:

1. Maintain or improve the overall quality of freshwater resources and maintain the life supporting capacity of freshwater and coastal resources by maintaining (and enhancing) where values are high, and enhancing/restoring where they are degraded;
2. Integrate land use with freshwater and coastal management in whole catchments;
3. Manage freshwater and coastal receiving environments for multiple values including ecological social, economic and cultural;
4. Apply Water Sensitive Design (WSD) approaches (which include use of GI and retention of NA) and at source controls to new development, and where possible in redevelopment;
5. Ensure efficient, effective delivery of good quality infrastructure and services, providing for present and future needs, and prioritising investment to achieve best outcomes at an affordable cost.

A challenge for the SWU lies in interpreting and giving effect to this strategic direction through the Policy in a way that is appropriate to the scope and functions of the SWU.

National and International Approaches

A review of selected national and international GI and NA policies showed that the use of GI and management of NA is gaining acceptance internationally and nationally in recognition of the multiple benefits they provide and potential cost savings for public assets. Importantly, most cities with well-developed GI programmes have clear and proactive objectives, which seek benefits across a range of values (ecological, social, cultural and economic) over varying scales and timeframes, and apply a comprehensive range of tools to achieve this. Consideration needs to be given to how the range of values, benefits and other factors associated with GI will influence decision making.

Key Considerations

For constructed GI, the key factors to be considered include whole of life costs, engineering constraints and opportunities (associated, for example with site characteristics, degree of experience with design options) ecological, cultural, social and wider ecosystem service benefits. At the NA end of the continuum, the key factors to be considered (from a stormwater perspective) include the importance of the NA for the efficient function of the stormwater system, risk associated with managing or not managing them, as well as degree of legal responsibility for the NA (particularly on private land). Resilience and risk apply equally to both GI and NA, and ecological, cultural and social values and ecosystem service potential are also likely to influence outcomes (and future objectives established through the NPSFM).

There is significant difficulty in weighing up direct and measurable costs and benefits against indirect costs and benefits, particularly for ecosystem services as a result of the use of GI. A range of evaluation tools and methods are available, varying from simple through to complex. For example, at the simple end, indicators of ecological, cultural and social state and change resulting from use of GI could be applied and then scored and weighted relative to each other, and the option with the least cost for the greatest benefits selected.

More complex approaches include various economic valuation and multi-criteria evaluation methods. These are heavily dependent on the underlying values and assumptions applied and so should only be decision support tools to support structured and informed decision making. Ecosystem service valuation methods are still being developed and challenged internationally. However, they tend to consistently indicate that freshwater systems provide relatively high ecosystem services value.

GI methods are not appropriate in all circumstances, particularly when there are significant site or engineering conditions or constraints. This is an important counter-balancing consideration for a policy that seeks to facilitate or encourage wider use of GI. Durability of stormwater management solutions and reasonable operation and maintenance costs are important considerations for long term stormwater assets.

Recommended Approach

In order to develop a useful and practical operational policy, the following approach was recommended:

- Establish a strong purpose – clear drivers and outcomes, who/what the Policy seeks to direct and influence and whether the Policy extends beyond the functions of the SWU;
- Commit to considering use of GI for all capital works projects subject to assessment of constraints, costs and benefits;
- Initially use simple methods and decision support tools to assess the ecosystem and other benefits of using GI, particularly for smaller scale projects, to enable efficient implementation of the Policy;
- Commit to using GI in all cases where cost, engineering and risk criteria are met and the stormwater management outcomes are comparable to, or better than, other options;
- Develop a consistent policy for SWU intervention in NA issues/problems, covering when SWU will intervene, nature of intervention, and approach to asset recording and protection;
- Adopt a staged approach – focus on the responsibilities and functions of the SWU at this stage, with a view to expanding the influence of the Policy, potentially to other Council functions and activities, over time;
- Undertake additional work to determine the economic and benefit evaluation methodology that will be used to support decision making re GI for major projects in the future.

2.4 FORM AND CONTENT OF THE GI POLICY

The GI Policy was prepared following consideration of the Issues and Options paper and discussions on the scope and applicability. An overview of the content of the Policy is provided below.

2.4.1 PURPOSE

The purpose of the GI Policy is threefold, being to:

- Direct the SWU's approach to the use and management of GI in undertaking its functions;
- Encourage the use of GI for stormwater management in public and private development where stormwater infrastructure is to be vested in/managed by Council; and
- Guide SWU involvement in wider Council planning and management programmes for GI.

2.4.2 OBJECTIVES AND POLICIES

The Policy establishes three objectives and a range of policies that direct SWU actions to deliver them.

The overarching objective seeks to utilise GI to deliver *core stormwater management functions*² wherever *practicable* and cost effective in recognition of the additional environmental, social, and cultural values, and higher resilience and sustainability that GI can provide compared with *conventional built infrastructure*. The two other objectives relate to the management and protection of GI, where it is essential to the stormwater network, particularly where it is managed or funded by the SWU.

Numerous policies guide how these objectives will be achieved at an operation level. For example, policies establish that for all capital works projects, the SWU will assess at least one GI alternative (where one is available) and adopt GI where it will deliver the *core stormwater management functions* required, is cost effective, sustainable and resilient, it can be delivered in the required timeframe (recognising that some projects are urgent) free of major engineering and other constraints and there are no unmanageable risks. Simple decision support tools, such as assessment tables and process flow diagrams are used to assist in guiding these decisions.

Other policies guide actions in respect of:

- The SWU's response to issues or problems, particularly those on private land, and cost sharing where appropriate;
- The circumstances and requirements for GI assets to be vested in Council;
- Appropriate protection of GI to ensure its long term functioning and efficient operation and maintenance;
- Strategic planning for GI and its integration with other Council activities and functions; and
- Methods of monitoring and assessing the effectiveness of the Policy.

² *Italicised* terms are defined in the policy to assist in consistent interpretation and implementation.

2.4.3 ASSESSMENT FRAMEWORK AND GUIDANCE

Consistent with the recommendations, the Policy has adopted a tiered assessment framework for the implementation of GI in its capital works programme.

The level of assessment is aligned to the scale (defined by lifecycle cost) of the stormwater works and the additional cost (if any) that the use of GI imposes on the project. For example³:

- For all capital works projects, it is expected that a GI option will be used where it is cost neutral or better;
- For small to moderate size capital works projects an additional cost for the GI option of 10% is considered acceptable, to reflect the wider benefits of GI, without the need for a benefits assessment to be undertaken;
- For larger projects a more detailed benefits assessment is required. A scoring table has been developed to provide a quantitative estimate of the additional benefits provided by the GI option for large projects; and
- For major projects, a more detailed multi-criteria cost/benefit assessment is required.

Importantly, the level of assessment that is required depends on the cost of the project. In all cases, the GI option is expected to be adopted where benefits are assessed as sufficiently exceeding those of a more traditional approach. Whilst discretion is available for large and major projects, the level of discretion for smaller projects is limited.

Tables are provided to assist in implementing the Policy and assessments consistently. These include:

- Guidance on the SWU's general preferences, when selecting between different GI options;
- A benefits assessment table that allows stormwater management benefits to be scored to provide a quantitative basis for comparison of options; and
- Guidance on the assessment process.

The assessment framework provides direction on when and how the SWU will intervene on private and public issues related to GI. This includes a range of options from proactive compliance monitoring through to reactive capital works.

3 POLICY IMPLEMENTATION

The draft Policy was circulated to all SWU teams for review. This led to refinement of the Policy, particularly practical amendments to address issues and concerns that became apparent when the Policy provisions were viewed through a day-to-day operational lens.

The Policy will be integrated into all decision-making processes within the SWU, informing how the SWU carries out its works at all levels. Key areas of implementation include business case considerations, project prioritisation, renewal processes, and reactive decision-making within operations. Relevant teams will report on progress against key performance indicators included in the Policy, which will foster an awareness and GI

³ In all cases, there is a fundamental requirement that the GI option meets the policy requirements of being "fit for purpose"

focus, and drive the operational activities of the SWU towards the transformational shifts described in this paper.

The adopted Policy will be subject to an initial 12 month review and update to cater for the expected uncertainty inherent within any new/innovative management approach. This may result in changes to policy wordings, key thresholds (such as the 10% threshold, and project values for small, moderate, large and major projects), and processes that enable simpler decision-making.

A number of supporting documents are in the process of being developed, including improved cost-benefit tools and Mauri decision making frameworks. Until these are developed, the best available existing tools will be used.

4 CONCLUSIONS

The SWU has produced a workable operational GI Policy, which takes into account the significant challenges of implementing and managing GI within a complex financial and legal context.

Recognising the intrinsic and wide-ranging benefits of GI, and the direction provided by national and regional policy, the Policy makes a significant commitment to the use of GI in preference to more traditional built infrastructure, provided that it is feasible and cost effective. The Policy provides clear direction in respect of the circumstances where the use of GI is preferred.

From the initial scoping assessment, it is recognised that there are circumstances where GI may not be an appropriate solution. However, the Policy includes a commitment to consider at least one GI option to avoid defaulting to more traditional infrastructure. Over time, a body of knowledge and experience on GI solutions and applications (and non-applications) will be built up to further facilitate and refine the use of GI where it is feasible and appropriate. Such an approach will assist in driving a change in perception and practice and a greater acceptance of GI.

In light of the significant body of information on the wider benefits of GI, and particularly the use and enhancement of NA and the difficulties of valuing the benefits and GI, the Policy has adopted a simplified assessment process to determine where these benefits outweigh the additional costs (if any) of utilising a GI option. This involves a tiered approach depending on the scale of the project. For small to moderate projects, an additional cost percentage (of up to 10%) has been determined as a conservative estimate of the additional benefits of GI. For larger and major projects, a more detailed assessment is required to better define the specific benefits associated with a project to determine whether these benefits are sufficient to justify any additional cost.

The assessment framework recognises that the SWU has multiple options for responding to GI and particularly NA issues, ranging from reactive capital works through to proactive compliance monitoring. The assessment also places in context the SWU's responsibility in respect of private parties and within the broader Council structure, promoting private and cross-Council collaboration, as well as cost-sharing in resolving issues.

The Policy also clearly directs SWU strategic planning towards a 'greener' network approach, alignment with regional and national objectives, a collaborative way of working across Council, and being proactive.

Lastly, the Policy sets in place a review process and identifies performance indicators against which the SWU can measure its effectiveness and support continual improvement.

ACKNOWLEDGEMENTS

The authors acknowledge Roger Seyb, Pattle Delamore Partners; Catherine Murray, Market Economics; Keren Bennett and Jerome Wyeth, 4Sight Consulting; and Gerald Lanning, Simpson Grierson for their contributions to the issues and options assessment. Staff from a wide range of Auckland Council departments also contributed to workshops to scope the extent of the GI Policy.

The role of the SWU staff and management in adopting a bold and innovative approach to achieving Auckland's growth needs while meeting the other aspirations of the Auckland Plan is also recognised.