

# **WATER SENSITIVE PROJECTS; EDUCATING A COMMUNITY: THE IMPORTANCE OF STORMWATER MANAGEMENT AND LOW IMPACT DESIGN**

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## **ABSTRACT**

An initiative led by Auckland Council and funded by Local Boards has been created to provide education and awareness of the impacts we all have on water quality. In particular the quality of the receiving environment.

The project is based on the themes of:

**Restore:** taking action, including ecological restoration

**Connect:** making people aware of their impacts on water quality

**Celebrate:** engaging the community and raising awareness

The primary focus of the project is to educate through consultation and demonstration of potential small scale interventions to improve visibility of water and to connect people with water in the urban environment.

The initial project entailed locating a community with a willingness to take part. Then identifying issues through education of potential possibilities, and implementation of small scale retrofits of low impact options such as alternative downpipes, stormwater planters and rain barrels.

This paper presents several projects from the inception, through to the installation and follows up with the community as to the actual benefits of the project from a community perspective.

## **KEYWORDS**

**Low impact design, community involvement, sustainable values, stormwater management design, collaboration, ecological benefits**

## **PRESENTER PROFILE**

Kellie Whisker has worked in a variety of capacities within Stormwater Solutions over the past ten years. She is responsible for environmental assessments, stormwater management assessment and design for residential properties, as well as green and brown field developments. She specialises in innovative design for unusual and complicated site scenarios.

She has a Bachelor of Science (Biological/Earth Sciences) from Waikato University and a Post Graduate Diploma in Environmental Science from Auckland University (completed 2010).

## 1. INTRODUCTION

The Water Sensitive Projects are a Local Board funded and Auckland Council led series of projects. The aim of the projects is to educate the public on the importance of water and to highlight the 'Journey of Water' in the urban environment.

The project is based on the themes of:

**Restore:** taking action, including ecological restoration

**Connect:** making people aware of their impacts on water quality

**Celebrate:** engaging the community and raising awareness

The vision of the project is to select groups of people who are open to the idea of taking part in a community initiative based on education, water quality and community involvement. This entails running consultation and demonstration sessions, with outcomes including the introduction of small scale retrofits to existing private stormwater infrastructure. This project's aim is to make water visible and make people think about where water comes from and what happens to it when it has left their site, in terms of water quality and downstream effects.

The identification of prospective communities and community based organisations has been orchestrated by Auckland Council Environmental Programmes and Partnerships department.

The projects to date have been:

- Water Sensitive Panmure
  - Funded by the Tamaki-Maungakiekie Local Board
- Kakano Child Care Centre
  - Funded with regional funding
- Te Puea Marae
  - Funded by Mangere-Otahuhu Local Board
- Water Sensitive Onehunga
  - Funded by the Tamaki-Maungakiekie Local Board
- A Glen Innes School
  - Funded by the Tamaki-Maungakiekie Local Board

The initial projects are residential based but future projects are more likely to focus on community organizations as these will have a larger base of people and more visibility for the wider communities.

## 2. THE PROJECT TEAM

The project team is made up of representatives from:

### Local Boards:

- Funding

### Auckland Council:

- Initiation of project
- Identification of communities
- Project management

- Consultation with the Local Boards to identify areas and projects
- Reporting to Local Boards

**Morphum Environmental:**

- Community liason and communication

**Roots Creative Entrepreneurs:**

- Liason and education Glen Innes School

**Stormwater Solutions:**

- Education of Stormwater management
- Importance of low impact design
- Present available viable options
- Liason with home owners and construction company
- Design of Low Impact solutions in conjunction with home owner requirements

**Topline Trade Services:**

- Consultation and construction of chosen options

**3. EDUCATING THE COMMUNITY: REUSE AND VISIBILITY OF STORMWATER OPTIONS**

Making it easy for communities to engage and embrace Water Sensitive Design (WSD) is one of the goals for this project. Group meetings are organised to introduce the ideas and demonstrate the options available. Using Stormwater Solutions engineering skills the team developed a way to communicate with the communities and help them understand the benefits of WSD.

Stormwater Solutins designed and constructed a physical model consisting of a roof, gutters and water sensitive devices to demonstrate the options that could be considered for each home owner. The model is a great success as the groups can instantly see the various ways that the rainfall can be utilized for their family and community.

The aim of the model is to demonstrate what happens to the Stormwater runoff from the roof to the discharge point from the site and options for use in between. The model consists of the following components:

- Alternative downpipes, such as chains and cascades
- Planter box with inflow, erosion protection,plants, filter media and an outlet
- Downpipe diverter
- Attenuation/reuse tank with a pump
- Discharge into a tank with outlets set at different levels for attenuation and reuse, and with a pump to illustrate water pressures possible
- The model is collapsible for ease of transport



**Photo 1: The Stormwater Solutions Demonstration Model**

Changing of downpipe options was a huge hit, garnering a lot of interest and discussion. The planter box and addition of water drip lines for the gardens an instant connection for some of the households.

Demonstrations using the model also provided a start of water sensitive conversation for the communities who had not necessarily engaged with engineers before. It was also an avenue to start dialogue with council staff in the way that hadn't been given or utilized previously.

#### **4. CONSULTATION AND OPTIONS PRESENTED**

Following the group demonstrations, individual meetings are held with each of the participating households. The meetings were attended by Stormwater Solutions and Top Line Services.

The aim was to discuss each individual household/community facilities current set up, and which practical options the owners would like to pursue for their properties.

Investigation of the current stormwater management for each site was vital. Auckland Council site file checks were carried out to ensure that any consent conditions were not breached. It was also important to ensure that sealed systems are not unsealed thus removing the functionality of siphons.

The feasible options presented to the groups were:

- Alternative downpipes
  - Chain
  - Cascade
- Stormwater planter box, or planter box tank
- Raintank
  - Garden watering, car washing, water play
  - Set up for future non potable internal house usage
  - Attenuation of peak flows
- Optimisation of existing tanks
- Installation of tanks where they are not already installed

## 5. INNOVATIVE DESIGN IDEAS

This project gave rise to the idea that we could combine the objectives of two devices into one with the invention of a garden bed that could have space for water storage beneath it.

We contacted TanksaLot, who are a local company who make bespoke corrugated iron tanks. They were keen to work together to create a tank garden bed. This would incorporate having a supported garden bed which is watered by a disconnected downpipe. Water percolates down through the soil and into the tank below. The pipework is internal for aesthetic reasons, and operates as a standard attenuation and/or retention tank, with the orifice located either just below the garden or at a height and size calculated for attenuation purposes. An overflow outlet located above the garden level will ensure excessive flows are routed back to the piped network.

The garden and tank are separated by a supported metal sheet punched with holes. A scoria filled geotextile mattress is laid on top of the metal sheet to prevent soil from migrating into the tank below. The garden is then filled and planted.



**Photo 2: Tank garden bed; installed and planted**

## 6. THE PROJECTS

### **6.1 WATER SENSITIVE PANMURE**

#### **LOCATION, HISTORY AND OBJECTIVE OF THE SITE**

The Tamaki-Maungakiekie Local Board has a focus to improving the water quality of the Panmure Basin. Therefore Panmure was the immediate location choice of the first Water Sensitive project.

This first project is based in Everton Place, Panmure, which is a recently built residential development, constructed 2010-2011. The building consent conditions for

some of the houses required the installation of individual attenuation tanks. Many lots had 4000L or 5000L rain tanks installed.

When the new residents moved in they were not given information on the reasons for the tanks being on site, nor were they given operation and maintenance instructions. This resulted in some owners having their tanks removed.

Many of the tanks were oversized for the required attenuation volume, and were not set up for optimal reuse volumes. Some tanks did not operate as designed, and in one case was leaning over causing concern for the residents and the engineers that visited the site for stability reasons..

### **Consultation**

Morphum Environmental are responsible for the consultation and community involvement aspects which entailed consultation with individual owners to ascertain willingness to take part in the programme. Eight households were interested parties.

A session was set up where interested parties could come to a demonstration evening at the home of the Everton Place project liaison person.

Stormwater Solutions provided a hands on demonstration utilising the model built for the demonstration purpose,, which provided education and options for small scale, low impact, retrofit designs. The evening was very successful and had other neighbours wandering along to have a look at the demonstration.

Seven of the households initially opted to take part in the retro fits, (although two more opted out later in the project for personal reasons).

### **CHOICES**

Whilst all owners were interested in the fun options such as disconnected downpipes and waterplay features, the sensible options won out with four of the final five households opted for tank(1000L) installation or optimisation of existing tanks with taps and drippers. One homeowner opted for the planter box tank.

**Table 1: Options adopted per household**

<b>House Hold</b>	<b>Options Chosen</b>
Household A	Alter existing tank pipework. Alter hose tap configuration for timer and irrigation dripper lines to the gardens
Household B	Alter tank pipework. Alter hose tap configuration for timer and irrigation dripper lines to the gardens
Household C	Install a stormwater planter box/tank and alter pipework configuration to allow downpipe connections. Tank set up as an attenuation tank with orifice located at base of tank
Household D	Alter tank pipework. Alter hose tap configuration for timer and irrigation dripper lines to the gardens
Household E	Install a 1000L harvesting tank with timer and dripper lines for garden watering

### **OUTCOMES**

## **Sustainable values**

The primary objective of this project is to ensure the sustainable values of a community are enhanced. The project had a great start with most of the households having a water tank, however without the knowledge of the purpose.

Re-aligning the tank configuration to provide greater harvesting volumes for non-potable purposes was a simple engineering solution that was easily adopted and understood by all parties of this project.

The low impact solution of combining planter box with attenuation elements provided a solution for one homeowner who did not have a water tank on site. This also provided a sustainable solution for the homeowner.

Connecting the naturally occurring rain event with the utilization of the harvested water by the home owners complimented the sustainable values of the community.

- Utilize harvested water for non-potable purposes
- Implementing the low impact principles
- Connecting the natural with built environment
- Educating the public and home owner to the benefits

## **Environmental enhancement**

The environment within the community of Everton Place has a strong focus on garden utilization, whether it be for food harvesting or beautification. The community is very proud of the need to provide a livable street and one that is enjoyable to reside in.

Once consultation took place one piece of knowledge that the community gained was that they would help to reduce the volume entering the public piped network. This aspect was embraced. The linkage to harvesting for non-potable purposes with improving the capacity issues of the system was understood together with the need to provide attenuation.

The introduction of the planter boxes helps with water quality for the downstream Panmure Basin. The little steps of this community will improve the quality of the water within the lagoon.

- Reduce the volume entering the public network and downstream environment
- Cleaner discharge water for receiving environment
- Utilization of collected water for harvesting purposes
- Existing infrastructure capacity issues are not exacerbated

The result is a community with a greater understanding of their own stormwater infrastructure, and of their impact on the receiving environment and the wider environment.

## **6.2 WATER SENSITIVE ONEHUNGA**

### **LOCATION AND OBJECTIVE OF THE SITE**

A community project is underway in Onehunga to restore a stream located on railway land in a block bordered by Quadrant Road, Arthur Street and Normans Hill Road. The area is an established housing area with houses of various ages. The properties surrounding the block of land discharge stormwater into the reserve, along with the upstream piped network.

In conjunction with the stream restoration project, this block was chosen to identify households that would like to take part in the water sensitive project and to receive low impact devices to highlight the water quality and uses.

The stream restoration project is to improve the riparian zones of the stream in the first instance with weeding and native planting. An additional portion of the project is to create edible community gardens in the space.

### **CONSULTATION**

Morphum Environmental are also responsible for the consultation and community involvement aspects for this project. This entailed consultation with individual owners to ascertain willingness to take part in the programme. Seven households were interested parties.

A workshop was held at one property with interested household representatives on a Saturday afternoon. Many of the attendees had not met before so it was a good community bonding experience.

Again the model was employed to demonstrate what happens when the rain falls on a roof, and the options available and an information flyer handed out.

For this session a 'before' survey on existing knowledge regarding stormwater, wastewater differences and similarities had to be completed by home owners taking part. The general knowledge level for the group was fairly high. A post installation survey will be compiled (not complete at the time of writing).

To avoid the opt out and to ensure people knew everything up front, a Memorandum of Understanding was developed which each homeowner signed for this project.

### **CHOICES**

Again the tank for garden watering option was the most popular choice with only one household opting for a planter box tank for the purposes of growing seedlings for the stream restoration project.

<b>Household</b>	<b>Options chosen</b>
Household A	1000L tank with tap
Household B	1000L tank with tap and dripper lines with timer
Household C	1000L tank with tap and dripper lines with timer
Household D	1000L tank with tap and dripper lines with timer
Household E	Looked at the possibility of a full harvesting solution using their portion of funding to partially fund this. Price was too prohibitive so opted for the 1000L tank with garden watering option
Household F	Divert one downpipe to planter box tank with tap and dripper lines
Household G	Had existing uninstalled 600L tank. Tank was connected with small water pump for garden watering.

### **OUTCOMES**

The primary objective of this project is to ensure the sustainable values of the neighbourhood are enhanced. As the majority of households back onto the railway reserve which is to be the focus of a stream restoration project, the small scale, low impact water sensitive devices link in particularly well.

The enthusiasm of some of the participants was encouraging with a thank you from one householder. At least two of the homeowners were encouraged to by the project to create additional gardens which were constructed in time for the dripper lines to be installed.

*"I just wanted to thank you for your organising the water tank installations. The guys that came and did the installation were great and we are looking forward to some rain to start making use of it. " Clare*

### **6.3 KAKANO CHILDCARE CENTRE**

#### **LOCATION, HISTORY AND OBJECTIVE OF THE SITE**

Kakano Childcare Centre is a part of the Taonga Group of Community facilities.

The centre was selected as it had several fundamental criteria that met the overall vision for the project, being; as it is in a low decile area, has a dedicated staff who are very interested in educating their children (and families) in life skills such as edible gardening, water use. The head teacher wanted to grow vegetables and herbs that could be sent home with the children with recipes to help the message get into the homes. There were already some gardens onsite being utilised for edible purposes.

#### **CONSULTATION**

Consultation was undertaken by Auckland Councils, Tessa Chilala, and the demonstration meeting conducted by Stormwater Solutions. The model was once again packed into the car and this time taken to Manurewa for a demonstration to the staff at the childcare centre. It took place after the children had been picked up by care givers to optimise the exposure to the childcare community.

The teachers and staff were very interested in the options available and asked very relevant questions. They were left with an information flyer to aid decision making at the conclusion of the consultation meeting and demonstration.

#### **CHOICES**

The response from the staff was that they would like a water tank for water play in the sand pit and garden watering for the edible gardens. She did not want an automated watering system as the children would enjoy carrying watering cans to the gardens (in the back yard of the centre).

A space was identified as the ideal space for a gutter garden and planter box which can be used for additional garden space. The space is visible to the street but behind a fence for security purposes. A downpipe was located next to it.

The gutter garden was constructed on a metal frame that can open like a gate for occasional access to the centre. A downpipe diverter was installed to direct water to the gutter garden. Water travels through the gardens and discharges to the lower gutter through a hole with a small chain downpipe. The gutter garden then discharges to a plumbed in TanksaLot planter box. The planter box discharges back to the piped network. Geotextile and a scoria layer ensure soil does not go to the stormwater network.

#### **OUTCOMES**

The gardens have become a talking point for the parents and the neighbourhood who have taken pride in the projects outcomes. The head teacher witnessed people taking photos of the gutter garden and planter box, so interest was high and the visibility means that the neighbourhood can potentially get ideas for their own houses.

The teacher emailed a few weeks later saying that they were eating some of the produce from the garden in the children's lunches.

*"Kellie, you will be pleased to know the children have been eating the ripe and delicious strawberries that have come to fruition... the peas we planted have sprouted and are doing really well. We're using some of the lettuce leaves for the children's sandwiches today!"*

The water play potential from the tank were exciting projects for the children and teachers alike.



**Photos 3 and 4: Rain Tank and Gutter garden/planter box at Kakano Childcare Centre**

#### **6.4 TE PUEA MARAE**

This project is still in the planning stages but is to run in conjunction with an upgrade of the Marae. It will potentially involve traditional medicinal gardens or edible gardens using a planter boxes.

#### **6.5 WATER SENSITIVE GELNN INNES – ST PIUS SCHOOL**

This project is also still in the planning stages but is to involve water sensitive lesson plans for the school, which will highlight the involvement of the community with the Omaru Creek, as well as art and decorative features. There will likely be a gutter garden and a tank for edible garden watering.

## **7.0 SUMMARY**

The Water Sensitive Projects are an initiative from the Auckland Council Environmental Programmes and Partnerships department which involves the Local Boards, Stormwater Solutions Consulting Ltd, Morphum Environmental and Topline Services. The aim has been to educate communities on Water Sensitive elements of Stormwater management and the benefits to not only the residents and communities but the receiving and built environments.

The projects involved community engagement through discussion groups, demonstration evenings, information packs and selecting best practical applications for the outcomes. Each project also enhanced the themes of Restore, Connect and Celebrate the naturally occurring rainfall events.

Several projects have been implemented which includes recently developed and well established residential communities as well as a child care centre. There are also several projects that are underway at the time of writing which include a Marae and school.

Simple and effective water collection solutions have been installed to provide water harvesting for the gardens in both the community projects. Whilst each project is different in their needs the water harvesting element is a strong feature and often the preferred option to implement. The success of the project can be measured by the feedback and to date it has been positive.

The childcare centre is enjoying the "fruits of the gutter garden" and have been proudly encouraging the community to join in on the edible outcomes of the projects.

## **ACKNOWLEDGEMENTS**

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