



# **Tweed - Kenya Mentoring Program**

## **Safe Water Project: Obambo-Kadenge**



**Village girl and brother collecting turbid and contaminated water from dam**

## 1.0 Objective

The project objective is to provide an accessible and hygienic drinking water supply for a community in Kenya, that currently extracts untreated drinking water from a contaminated source.

This will be achieved by installing a SkyJuice™ SkyStation in a village identified through the Tweed - Kenya Mentoring Project.

The project will be facilitated by a volunteer Tweed Shire Council staff member, travelling to Kenya to deliver and assist in commissioning the equipment.

## 2.0 Background

### 2.1 Mentoring Program

The Tweed Shire Council – Kenya Mentoring Program is a relationship between a local government in Northern NSW and an NGO, Gallamoro Network, in the impoverished people settlements of Nairobi, Kenya. This program was initiated after a meeting between representatives of these organisations and the 3<sup>rd</sup> World Water Forum in Kyoto. The program seeks to increase the capacity of Kenyan communities to effect water sanitation and environmental education actions, through assistance with funding and technical exchange.

The project has evolved through 3 stages involving visits between Australia and Kenya by staff from both organisations. The 4<sup>th</sup> stage, represented by this project plan, is the first occasion where infrastructure works will be initiated.

### 2.2 Community Need

Many Kenyans especially in the rural areas have limited access to quality water. They walk for long distances in search of this precious commodity and use it raw and untreated from rivers, lakes and dams. The untreated water is not only turbid, but also contain disease causing bacteria and in some cases chemicals. In Kenya, it is common for water borne disease outbreaks particularly cholera, typhoid and dysentery that results in high mortality rates especially amongst infants.

*“Water is essential to sustain life and a satisfactory (adequate, safe and accessible) supply must be available to all. Improving access to safe drinking water can result in tangible benefits to health. Every effort should be made to achieve a drinking water quality as safe as practicable”.* World Health Organisation: Guidelines for Drinking Water Quality.

### 2.3 SkyJuice Foundation

The SkyJuice™ Foundation is a non-profit venture founded by the Chairman, Rhett Butler. They provide partnered global assistance to provide access to reliable and safe quality potable water to meet the real needs of developing nations.

SkyJuice utilises a unique, world-validated and proven Australian technology that ensures safe and integral potable water which is completely sustainable. Their

primary target groups are communities and families who do not presently have access to reticulated clean water. The secondary target groups are persons and/or communities affected by natural disasters who require immediate clean and safe potable water.

The core filtration unit is called a Skyhydrant. It uses a Memcor membrane microfiltration unit. Memcor is a product of USFilter, which is a Siemens business. The SkyStation is one configuration that is a stand-alone system including, solar powered pump header and storage tanks and Skyhydrant filtration unit. The filter uses a membrane technology that will exceed the World Health Organisation requirements for potable water. The core filtration unit can be used in many configurations to suit a variety of field applications.

**SkyJuice™ – Skyhydrant**



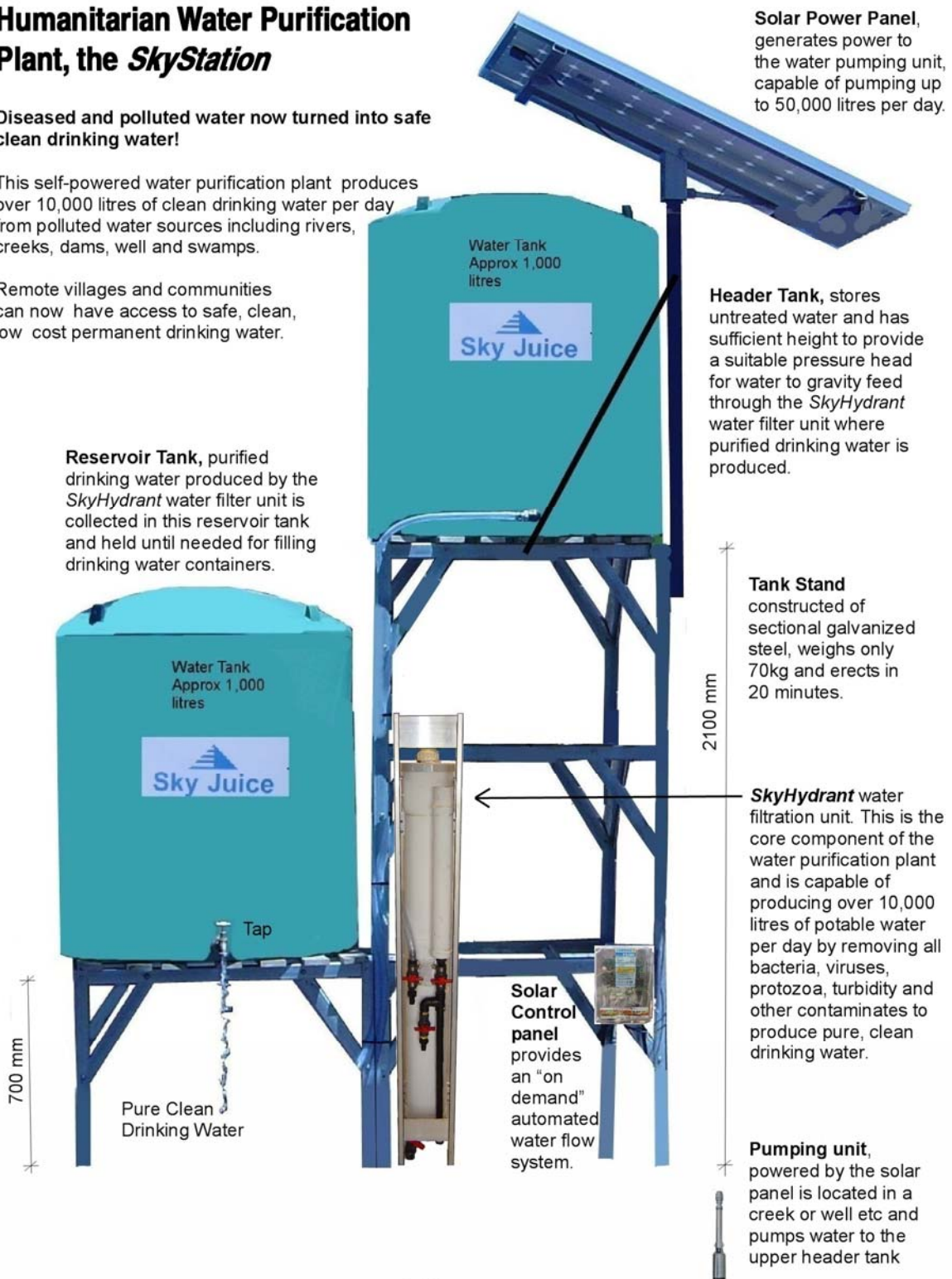
# SkyJuice™ - SkyStation

## Humanitarian Water Purification Plant, the *SkyStation*

Diseased and polluted water now turned into safe clean drinking water!

This self-powered water purification plant produces over 10,000 litres of clean drinking water per day from polluted water sources including rivers, creeks, dams, well and swamps.

Remote villages and communities can now have access to safe, clean, low cost permanent drinking water.



## Examples of Skyhydrant Applications



### SkyJuice brings safe water to thousands.

How the SkyJuice water filtration system is using the latest in proven micro filtration technology to remove waterborne diseases (including viruses) and other contaminants greater than 0.1 micron making safe drinking water for thousands in humanitarian operations.



#### 525 people now safe

Another Skyhydrant for World Vision at Kalawankerny Vivekananda in Sri Lanka where 95 families totalling 525 people now have safe drinking water.



#### Community water plant

located in southern Sri Lanka uses two Skyhydrants to supply clean drinking water to the local community



#### Zero plate count in India

Drinking water is produced from the Ganges River in India where coliform readings of 79,000cfu/100ml were reduced to zero cfu/100ml after filtration through the Skyhydrant. This equates to a log 6 removal compared to a log 1-2 for sand filtration.



From this to this



Using the Skyhydrant water filter.



#### Bulk water supply plant

Operated by Oxfam at Ampara in Sri Lanka. Poor quality river water is filtered through inline Skyhydrants to road tankers supplying drinking water to thousands of displaced persons living in local IDC camps after the tsunami.



#### Skyhydrant Water Filter.

The Skyhydrant water filter unit forms the basis of numerous configurations that can be utilised to produce pure clean drinking water for humanitarian needs in a variety of situations. This freestanding model (pictured), with retractable legs, is transportable for field operations and is capable of supplying over 10,000 litres of drinking water each day.



#### Health clinic rests easy

The 300 staff & patients at the Vavuniya unit 2 health care clinic in Sri Lanka now enjoy peace of mind with disease free drinking water thanks to the Skyhydrant water filter.



#### Solar water plant for Aceh

An automated solar pumping system integrated with a Skyhydrant filter supplies clean drinking water all year long to the Ujong Tanjong School in Aceh Indonesia from a contaminated well (pictured).

#### Clean drinking water for tanks

Water pumped from a local contaminated stream to the elevated header tank, is then gravity feed down through the 2 Skyhydrant filters (pictured) to produce clean drinking water in the 2 lower tanks for the people of Batticaloa in Sri Lanka.



#### Sennigeema

Located in southern Sri Lanka and home to the Rainbow Children's Centre where safe clean drinking water is now available to the school children & their local community thanks to the team from Australia who have installed a Skyhydrant water filter into the existing water tank supply system.



[www.skyjuice.com.au](http://www.skyjuice.com.au)

**Examples of SkyStation Applications**



**Sky Juice**  
water filtration  
system, as  
installed in  
various  
countries  
around  
the world.



**Safe, Pure  
Water  
every day!**



### **3.0 Project Partners**

The following entities are cooperating to enable this project:

#### **Tweed Shire Council Staff - Kenya Contributions Scheme**

- A group of TSC staff members have initiated a voluntary wage deduction for the purposes of assisting the Kenya Mentoring Project. These staff have identified the Skyhydrant project as a valuable extension of the Mentoring Program, with tangible outcomes for Kenyan communities.

#### **International River Foundation**

- The International River Foundation (IRF) was established in 2003 to advocate the protection and restoration of the world's rivers and waterways for future generations. The IRF aims to network among world experts to encourage long term relationships between developing and developed countries in the area of river management, in particular within Asia and Africa.

#### **SkyJuice Foundation**

- See section 2.3

#### **Tweed - Kenya Mentoring Program**

- See section 2.2

#### **Local community support – Murwillumbah Seventh-Day Adventist Church**

- The Mentoring Program has been promoted to the Tweed community, and donations have been made by many individuals and organisations, including in this case the Murwillumbah Seventh-Day Adventist Church.

## **4.0 Outputs**

### **4.1 Water Quality Management Plan**

The World Health Organisation provides an international standard for managing drinking water quality, including criteria for microbial and chemical concentrations in safe drinking water. Also relevant to this project is the Safe Water Guide for the Australian Aid Program (Australian Government, AusAID). These documents are being used to guide the Safe Water Project: Obambo-Kadenge. The following steps have been identified as critical to a successful Safe Water Project.

- Step 1. Understand the relevant water policies, guidelines and government agencies.
- Step 2. Assess water quality issues and current supply situation.
- Step 3. Develop a Water Quality Management Plan including a system design.
- Step 4. Monitor and evaluate water quality management.



Critical components of the Water Quality Management Plan are:

1. Community education of water quality issues and clarification of ownership and responsibility issues.
2. Assessment of the current drinking water system.
3. Identification of risks and security issues.
4. Design of the new system and preventative measures for maintaining water quality.
5. Operational procedures and maintenance.
6. Verification of drinking water quality.
7. Ongoing management and project review.

## 4.2 Safe Drinking Water

A single Skyhydrant will purify a minimum of 10,000 L/day, or more typically 20,000 L/day, depending on raw water turbidity. This is adequate for a population of 200 based on a daily use of 50L per person. The output of the Skyhydrant will be site dependent. Assuming feed waters with high turbidity (>300 NTU), high suspended solids (>500 mg/L) and high bacterial (>10<sup>6</sup> cfu) and algal loadings the performance of the unit will normally be:

Water Quality Parameter	Skyhydrant
Colour	Usually < 10HU
Suspended Solids	<0.1 mg/L
Turbidity	<0.1 NTU
Giardia lamblia cyst removal	>log 4
Cryptosporidium Oocysts removal	>log 4
Bacterial loads	<10cfu/100mL
Algae	<1cell/mL

## 4.2 Opportunities to Strengthen the Tweed - Kenya Mentoring Project

The Safe Water Project will be officially launched at the International Riversymposium, Brisbane. This will give the project broad national and international exposure and provide opportunities for the Mentoring Program and Safe Water Project to be modelled by other agencies. The Project will then be launched for the Tweed Community at the Tweed Shire Council offices on Thursday 7 September. This will give the Project local exposure and increase the existing support from Council staff and the community. The Council Staff Contribution Scheme will be given greater exposure and promoted to all staff. The intention is for the Safe Water Project to be ongoing with at least one SkyJuice filtration unit being provided for a rural/remote community each year.

Overall benefits:

- Increase the profile of the Mentoring Program in both Tweed Shire and Kenya, creating opportunities to attract additional sponsors and community support.
- Increased awareness of water quality issues within both communities.
- Provide ongoing support for Kenyan staff and volunteers.
- Vocational training and experience for Tweed Staff.
- Exposure to technical water quality solutions for Kenyan staff and target community.
- Provide a model of for other agencies and communities to develop mentoring programs.

## 5.0 Design and Materials

### 5.1 Community Requirements and Existing Water Supply

#### Village of Obambo-Kadenge

Obambo is a sub-location with scattered population of several thousands people in South Central Alego location. The village is situated 11 km west of Siaya town along a dirt road served by bicycle taxis “border-border” and impassable by motor vehicles after rains, about 8 km from Lake Kanyaboli and 16 km from river Yala. Lake Victoria is about 24 km away. There is little paid employment and the vast majority of people live on less than 1 US dollar a day. HIV/aids, exacerbated by local customs of wife-inheritance is a major issue and there area large number of orphaned children being cared for by surviving relatives with minimum resources. Subsistence agriculture is the main activity. Maize and beans are the staple crops and fishing and small scale livestock rearing are practiced. Most households have a plot of an acre average with several cows, goats and sheep. These animals are crazed at the communal grazing land and where the dam water source is located

**Rainfall** – annual rainfall is approximately 1200mm concentrated in two rainy seasons, march to June and October to December. The rate of evaporation is very high.

**Sanitation** – most households have rudimentary latrines with thatched roofs. There are almost no ventilated pit latrines. There is no reasonable understanding of hygiene behavior, and many still dispose of feacal matter in the open field near the watering dam. Thus there are major water related health problems include lameness through collecting water, eye problems and loss of sight, ring worms (children heads), jiggers (feet), sores in the feet, diarrhea

**Sources of water** – the main source of water for people is several dams dug between 1940-1952 that collect surface water run-off from the shallow valley which Obambo is situated. The run-off passes through shambas (cultivated plots) and homes, the dams are highly silted, lack protection from soil erosion or animals and are often close to pit latrines. The water is highly turbid and polluted and completely undrinkable in its raw state. Gona Dam has been identified by the community as the ideal place for the Safe water project.

## **5.2 SkyJuice™ Water Filter.**


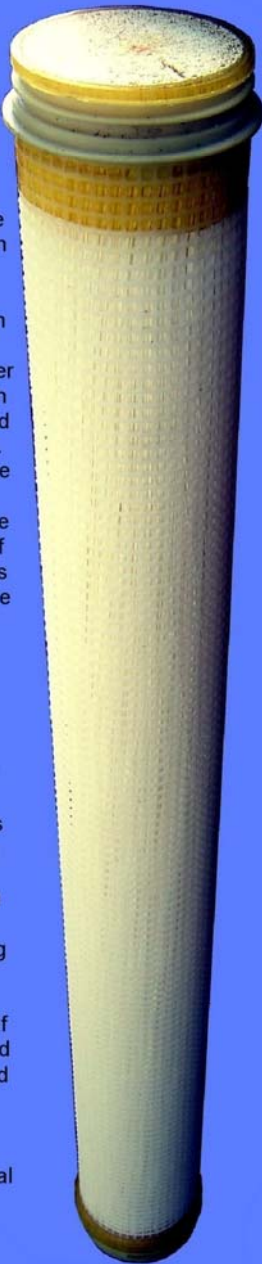
The SkyJuice™ water filter, or Skyhydrant, uses a Memcor membrane filtration unit. It is intended for use in remote locations or disaster relief applications for production of potable water. It operates under as little as one metre gravity head without the need for an electrical power supply. The Skyhydrant combines microfiltration for primary disinfection and particulate removal with chlorine disinfection to produce safe water from the majority of non-saline surface and ground waters. The internal filter is robust, cleanable and long lasting. All operating and membrane cleaning functions are simple and manual. It provides filtration down to 0.1 microns which is sufficient to separate out virtually all solids and bacteria and significantly reduces virus levels. The Memcor filter consists of banks of vertically suspended tubular filter modules containing thousands of hollow microporous fibers. Unfiltered water enters the module under low pressure, surrounding the outside surfaces of the fibers. It passes through the fibers' porous walls, depositing suspended solids and microorganisms on their outside surface. Filtered water flows through the inside of the hollow fibers and exits at each end of the module.

## SkyJuice Water Filter Module

The inner workings of the SkyJuice water filtration module for humanitarian use.


### How The Filter Works

When operational, the SkyJuice water filtration module (pictured) is housed within a protective tubular canister through which untreated feed water enters. From there the feed water permeates the outer walls of the thousands of fibres where the filtration procedure occurs. Bacteria, protozoa, viruses (pathogens) & other contaminants greater than 0.1 micron are removed and crystal clean drinking water is produced. The filter itself is not intended to be replaced but simply recleaned periodically using a manual cleaning procedure.




### 10,000 Fibres

Overhead view of the Skyhydrant water filter module where thousands of micro fibres are clustered to produce pure drinking water. Produced of a PVdF material, these filter membranes are of a similar material used in worldwide commercial plants.




### Hollow Ends

Each fibre is like a tiny hollow straw through which pure clean water passes after being filtered of impurities while permeating the outer membrane of the fibre. The filtered water trickles from the hollow tube ends to produce thousands of litres each day.



### Trapped Bacteria

Bacteria trapped on the outer surface of a single filtration fibre, unable to penetrate through the 0.1 micron perforated membrane of the fibre leaving only pure clean water to pass through to the inner hollow section of the fibre .



### Individual Fibres

Just some of the more than 10,000 individual micro fibres, each slightly larger than a piece of cotton, that go to make up a SkyJuice water filter module. The fibres which span the entire length of the 1.2 metre long filter module are permanently mounted at each end using a special formulated sealing compound.

### **5.3 System Design and Ancillary Equipment**

The core filtration module can be operated under gravity or coupled with a low ampere feed pump. The unit can be effectively coupled with additional modules. The Skyhydrant incorporates a simple manual backwash mechanism to ensure sustained output and reliable performance. SkyJuice offers partners a variety of standard items that can be ordered and assembled to construct a site-specific installation for emergency or permanent water supply. SkyStation systems are a fully integrated solar community plant.

### **5.4 Operation and Maintenance**

SkyJuice recommend that the Skyhydrant should be operated as part of an integrated system. This includes good overall hygiene and operational practices which include post-chlorination, regular cleaning and monitoring, as well as local custodianship. The unit is not a set-and-forget solution. The efficient operation of the unit and ongoing maintenance of the project will be outlined in the Water Quality Management Plan. SkyJuice provide a Operation and Maintenance Manual which details the use of the Skyhydrant unit. They also provide a setup guide and simple cleaning instructions designed for local operators.

## 6.0 Budget

<b>Safe Water Project: Obambo-Kadenge</b>	
<b>Income</b>	
Tweed Shire Council Staff Contribution Scheme (current)	1420
Martin Albrecht (International Riverfoundation)	1500
Siemens - SkyJuice Foundation	1500
Tweed Community – Murwillumbah SDA Church, Murwillumbah Central Rotary, John Tyman, Pottsville Community Group, Staff donations	3300
Income committed	<b><u>\$7,720</u></b>
Tweed Shire Council Staff Contribution Scheme and Tweed Community (next 6 months)	<b><u>\$7,780</u></b>
	<b><u>\$15,500</u></b>
<b>Expenses</b>	
SkyStation with two skyhydrants	11500
Air fare, insurance, visa, medical	3500
In country expenses	500
	<b><u>\$15,500</u></b>

## 7.0 Timeline

The site assessment will be completed in September. The details of the project design and a Water Quality Management Plan will then be completed by the end of September. The installation time will be determined on completion of the project design. A tentative date for installation is November 2006. It is envisaged that Tweed Shire Council will send a Project Officer to Kenya for approximately 3 weeks to manage the on-site works.

## 8.0 Resources

1. Skyjuice Foundation: <http://www.skyjuice.com.au/>
2. Skyjuice Operational Manual
2. Skyjuice Setup guide
3. Skyjuice Cleaning Instructions
4. Memcor Filtration Unit:  
[http://www.usfilter.com/en/product+lines/Memcor\\_Products/](http://www.usfilter.com/en/product+lines/Memcor_Products/)
5. Guidelines for Drinking Water Quality (World Health Organisation)
6. Safe Water Guide for the Australian Aid Program: A framework and guidance for managing water quality (Australian Government, AusAID)