The Diepsloot Sanitation Project

Johannesburg, South Africa – Construction Report, March 2014

Healthabitat 2014

Background

In mid 2013, a submission assembled by Healthabitat, Sticky Situations and WASSUP was supported by the WorldSkills Foundation.
This support included funds for the upgrade and monitoring of 20 toilets and the assistance of two WorldSkills trades for 10 days during the construction phase of the project and a WorldSkill co-ordinator in Australia.

The work is also supported by the International Association of Plumbing and Mechanical Officials (IAPMO), RMIT (Royal Melbourne Institute of Technology - Australia) and the World Plumbing Council.

The project aims to improve the health of the residents and reduce the ongoing maintenance work for the local WASSUP team by upgrading 10 toilets, taps and drains and installing better hardware. Ten more toilets will be monitored to compare their performance to the improved toilets.

Using water use data to prove the effectiveness of the work, means future works can be extended to cover the 120 toilets currently maintained by WASSUP and then further work to other areas of Diepsloot.

Healthabitat's contribution to the project, so far, has included:

- December 2013- A Diepsloot Sanitation Workshop / walk around with WASSUP to document local knowledge and issues, to better understand the maintenance problems, the need to make simple reports for local government, design discussions to find better solutions developing the methods for ongoing evaluation and communication of work completed.

- February 2014 - The Diepsloot Sanitation Workshop was held in Sydney with 30 participants to test ideas developed during the December visit..

- March 2014 - Construction co-ordination of the on site works in Diepsloot.

Ongoing works will include:

- Data evaluation
- Communication ideas
- Ongoing technical support as required
- Project review in August 2014

The South African Bill of Rights and the Diepsloot Sanitation Project

The provision and ongoing maintenance of functioning toilets, water supply and the safe drainage of wastewater in Diepsloot links specifically to the following clauses of the South African Bill of Rights. *(left)*

HUMAN DIGNITY

Everyone has inherent **human dignity** which must be respected.

ENVIRONMENT

You have the right to live in a protected, **healthy environment**.

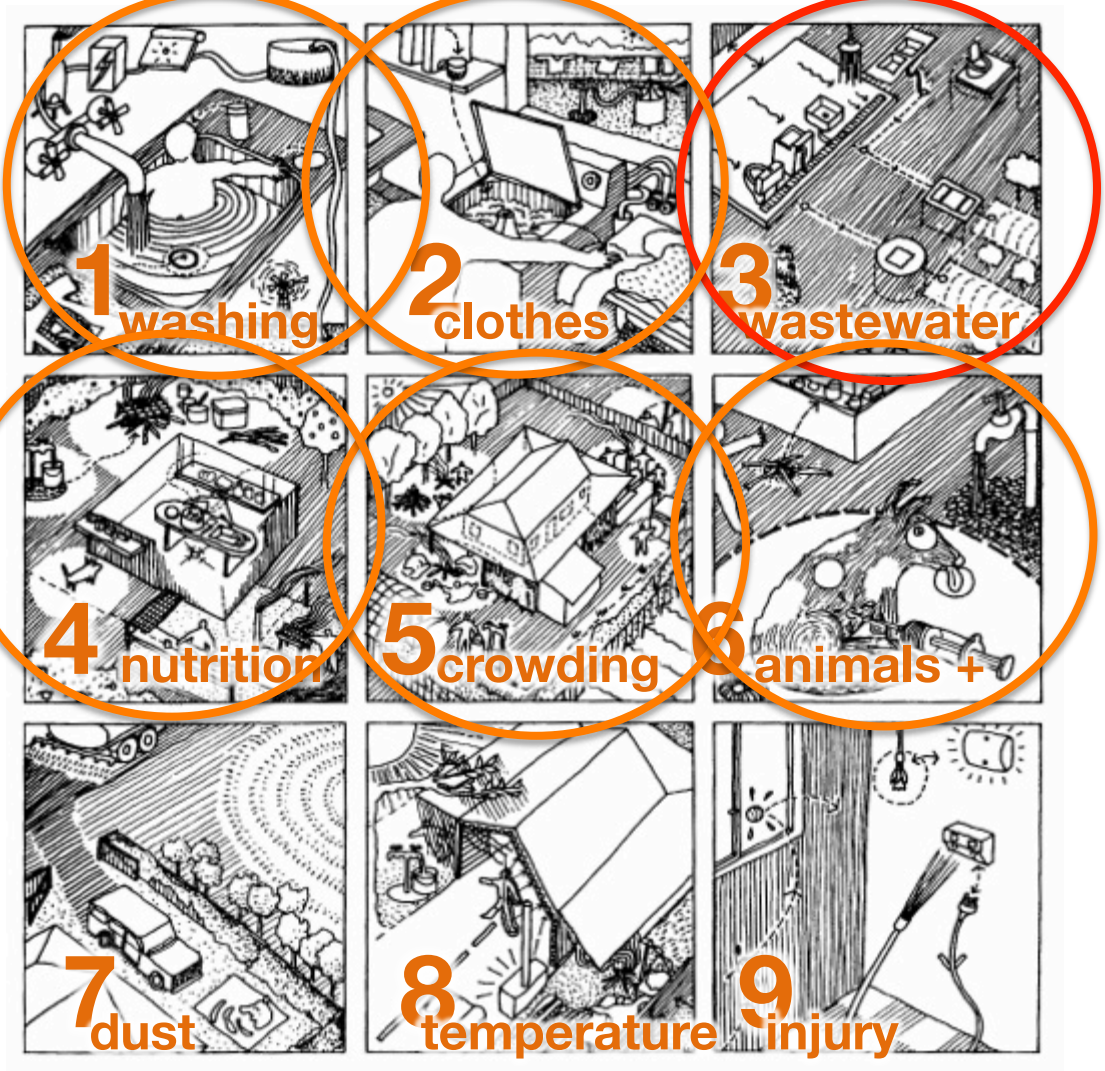
HOUSING

You have the right to have access to **adequate housing**.

HEALTH CARE, FOOD, WATER AND SOCIAL SECURITY

You have the right to have access to health care, adequate food **and water** and
social security.

The 9 Healthy Living Practices



Health and the Diepsloot Sanitation Project –

the construction phase , work plan and priority

The **Diepsloot Sanitation Project** aims to improve public health. Since 1985 Healthabitat has used the 9 Healthy Living Practices (HLPs) as the core principles of any project.

In this project 6 HLP improvements could be expected. Work on site was staged to reflect the HLP priority

1) Water in for washing (1), clothes washing in tubs (2), wastewater removal (3) and cooking (4). The crowded environment of Diepsloot made it essential to limit the 'down time' of any water supply, toilets or wastewater facilities. (5)
2) Waste water safely removed – drainage, checking of mains lines and remaking of drainage points. Better removal of wastewater from the dirt streets will reduce insects and vermin. (6)
3) Future works, already commenced, will address privacy and ease of cleaning.

Initial assessment and making a work plan

The high demand on the toilets and water points meant that the works had to be carefully planned to reduce ‘down-time’ of the facilities. Each toilet was numbered, photographed and assessed before the water to the general area was turned off on two consecutive days.

Side view

Front inside view

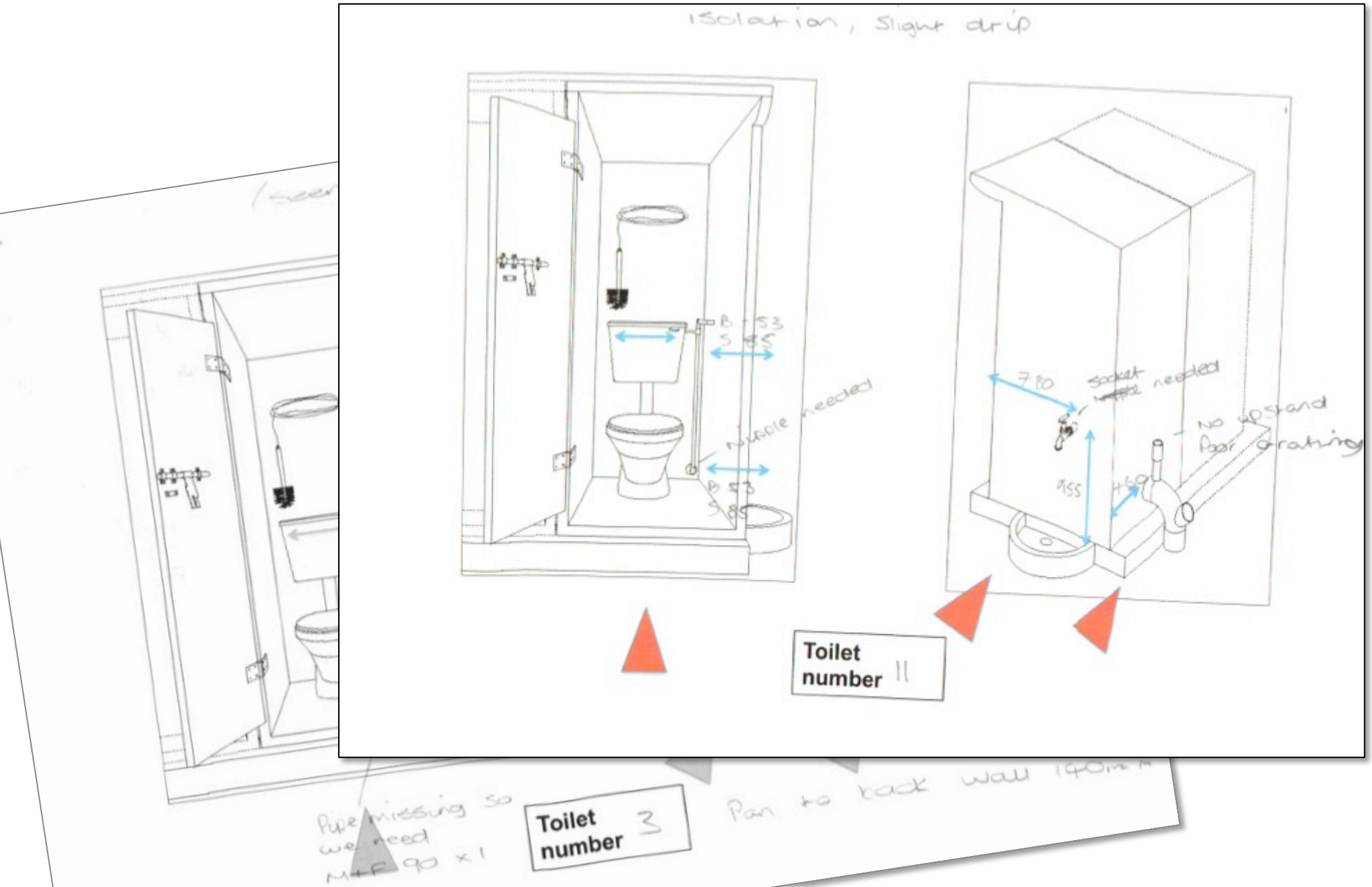
Rear view

Details of each toilet

Toilet 03

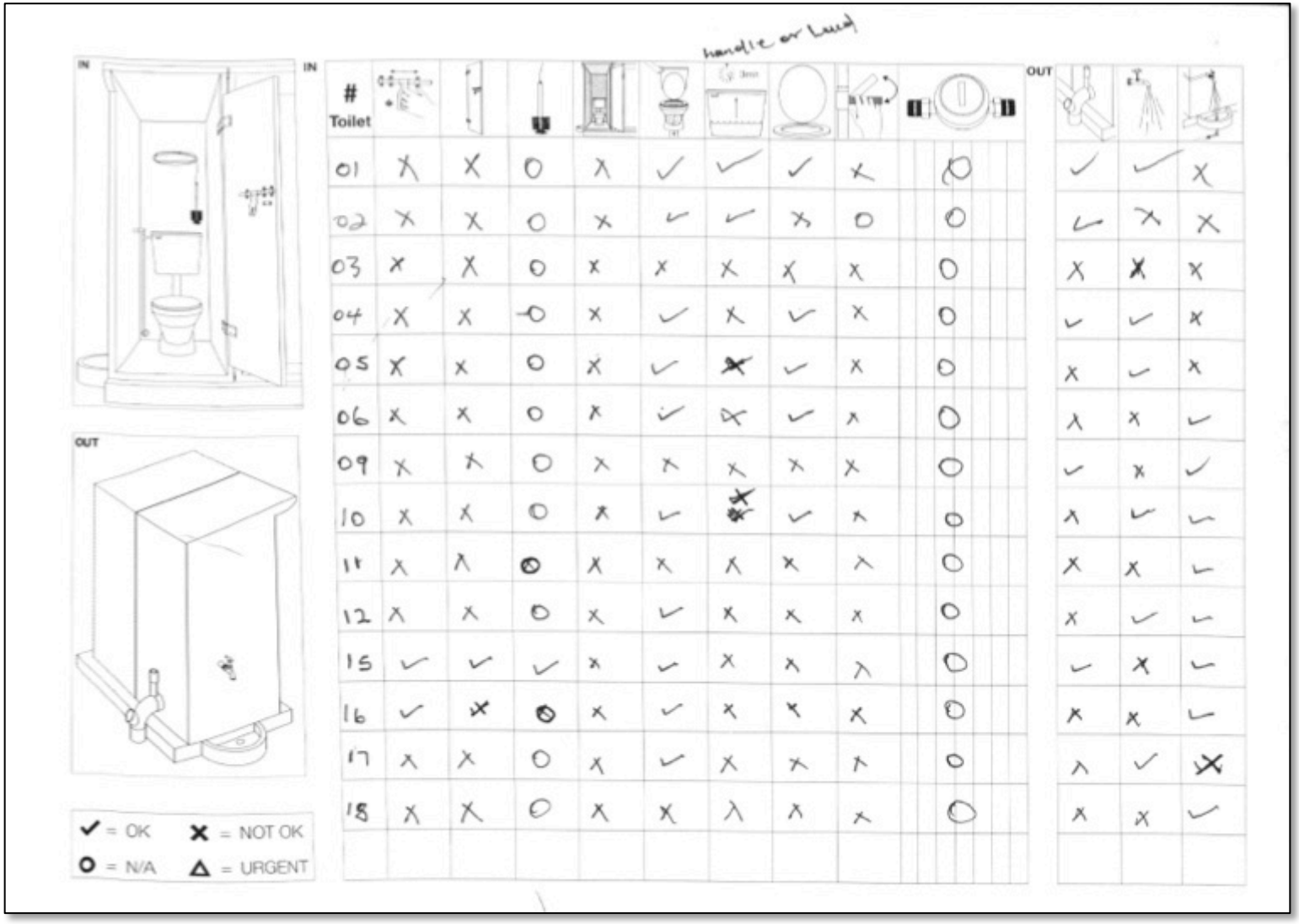
Initial assessment and making a work plan

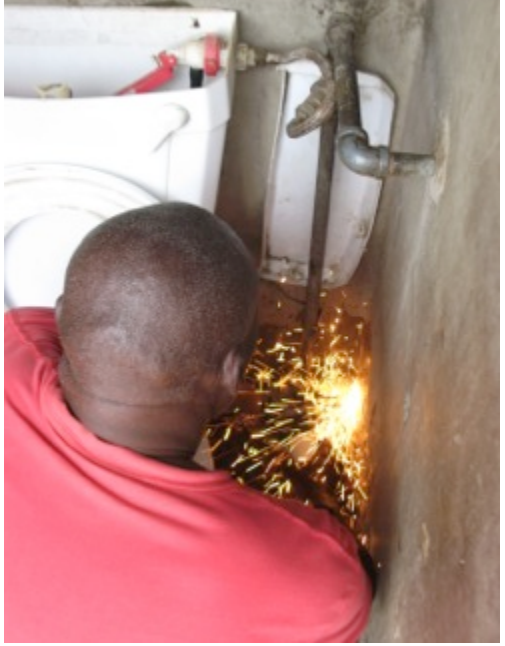
Notes and dimensions added by the WorldSkill plumbers



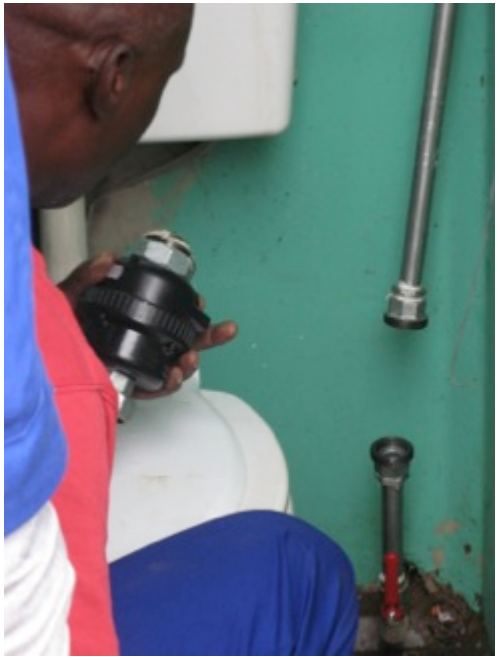
Initial assessment and making a work plan

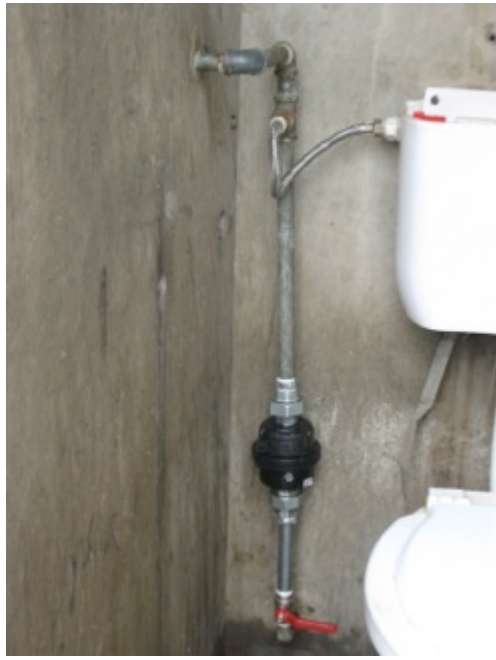
WASSUP requested HH help develop a method to assist maintaining the toilets, taps and drains and recording any work done by the team. The draft version (below) of the graphic assessment was developed by architecture students (at the Diepsloot Sanitation Workshop in Sydney) and trialed by the WASSUP team to record the initial conditions before construction works began. With some minor amendments this system will continue to be used by WASSUP.





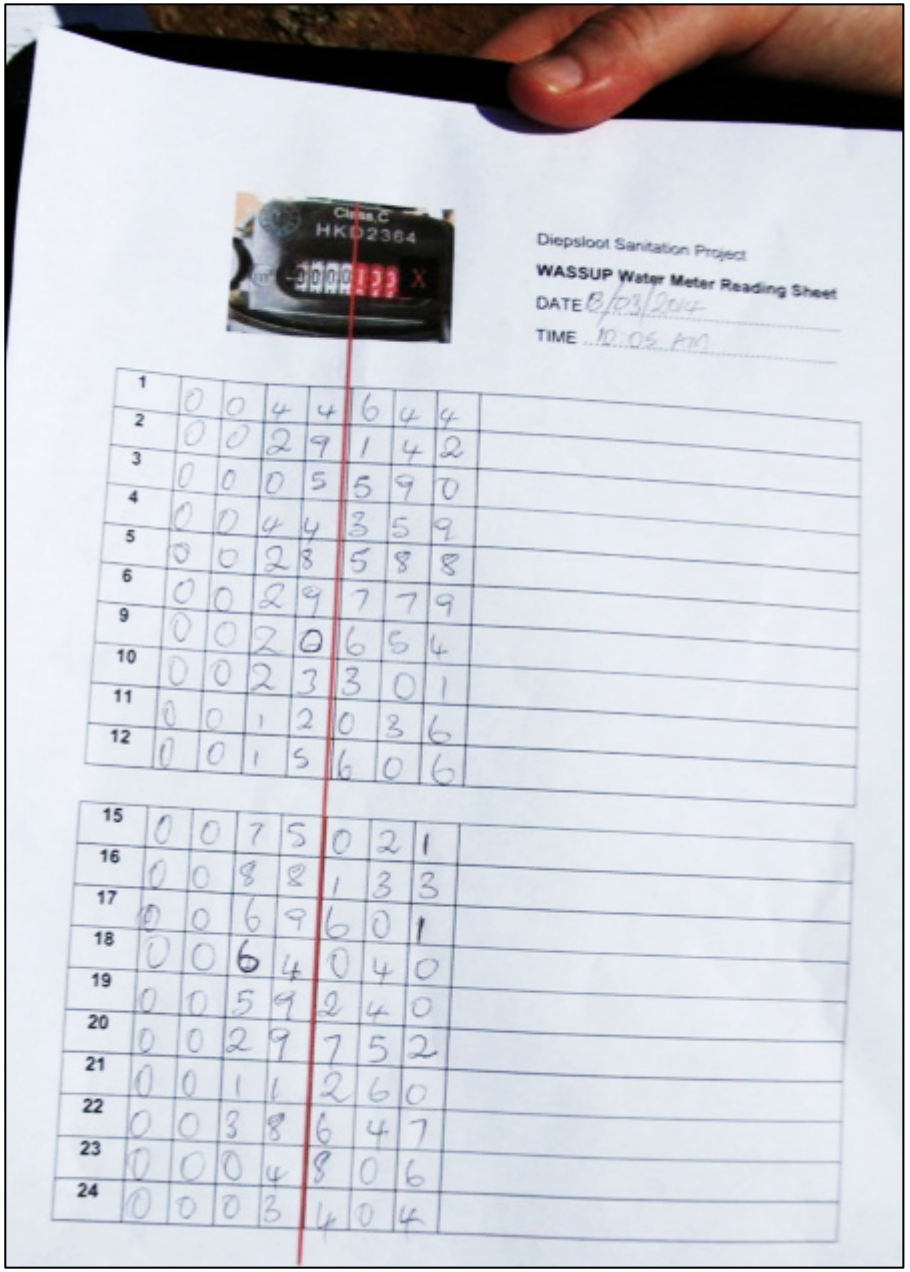




Water in – The water was turned off to the local area, the main water supply pipe to each toilet / tap was cut, new pipe and fittings were made to install an isolation valve for water control and a water meter to record use. Because of the high demand on each toilet, the existing toilet cistern was reconnected in the short term, and the mains water turned on to allow use.

LEFT pan awaiting new cistern, water shut off *CENTRE fitting the flush pipe and fixing brackets* *RIGHT completed install and water on*

Water in – Once the water could be turned off easily at each toilet and water point using the newly installed isolation valve, work proceeded to replace cisterns (and pans where required). This allowed the works to take only one toilet at a time out of service.



Water in

Regular meter reading by WASSUP will help provide information on:

- toilet use and overall water use per toilet
- tap point use
- mapping of toilets that have high and low use
- cyclical use trends
- leaks and failures of all parts of the system.

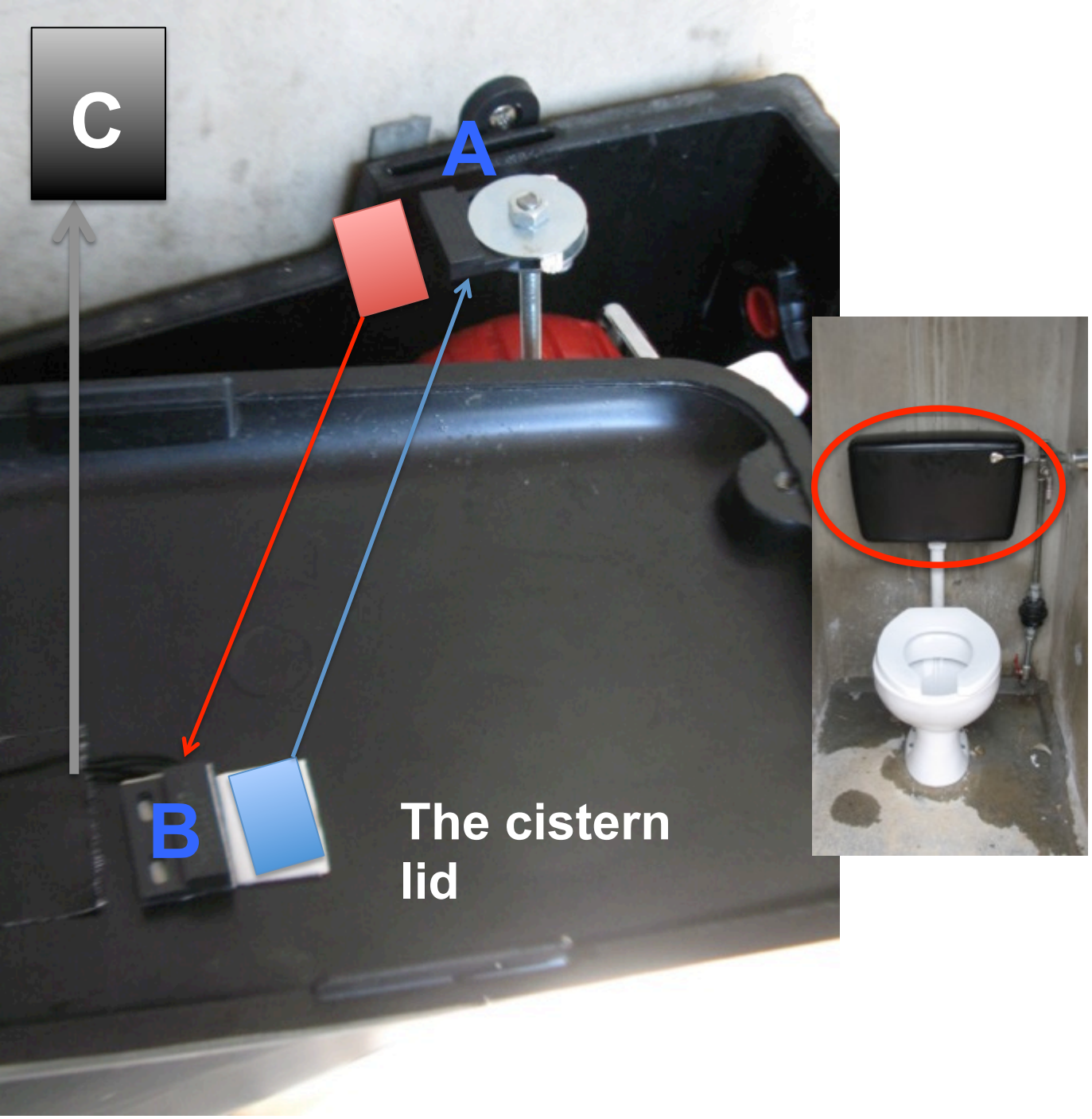
This in turn can lead to:

- the specifying of better hardware
- a better understanding of the loading placed on the wastewater system
- the ability to compare the performance of toilets and tap points with improved hardware to the unmodified toilets.

LEFT TOP the toilet, meter and isolation (stop) valve

LEFT LOWER the water meter

CENTRE a daily water meter reading sheet completed by WASSUP

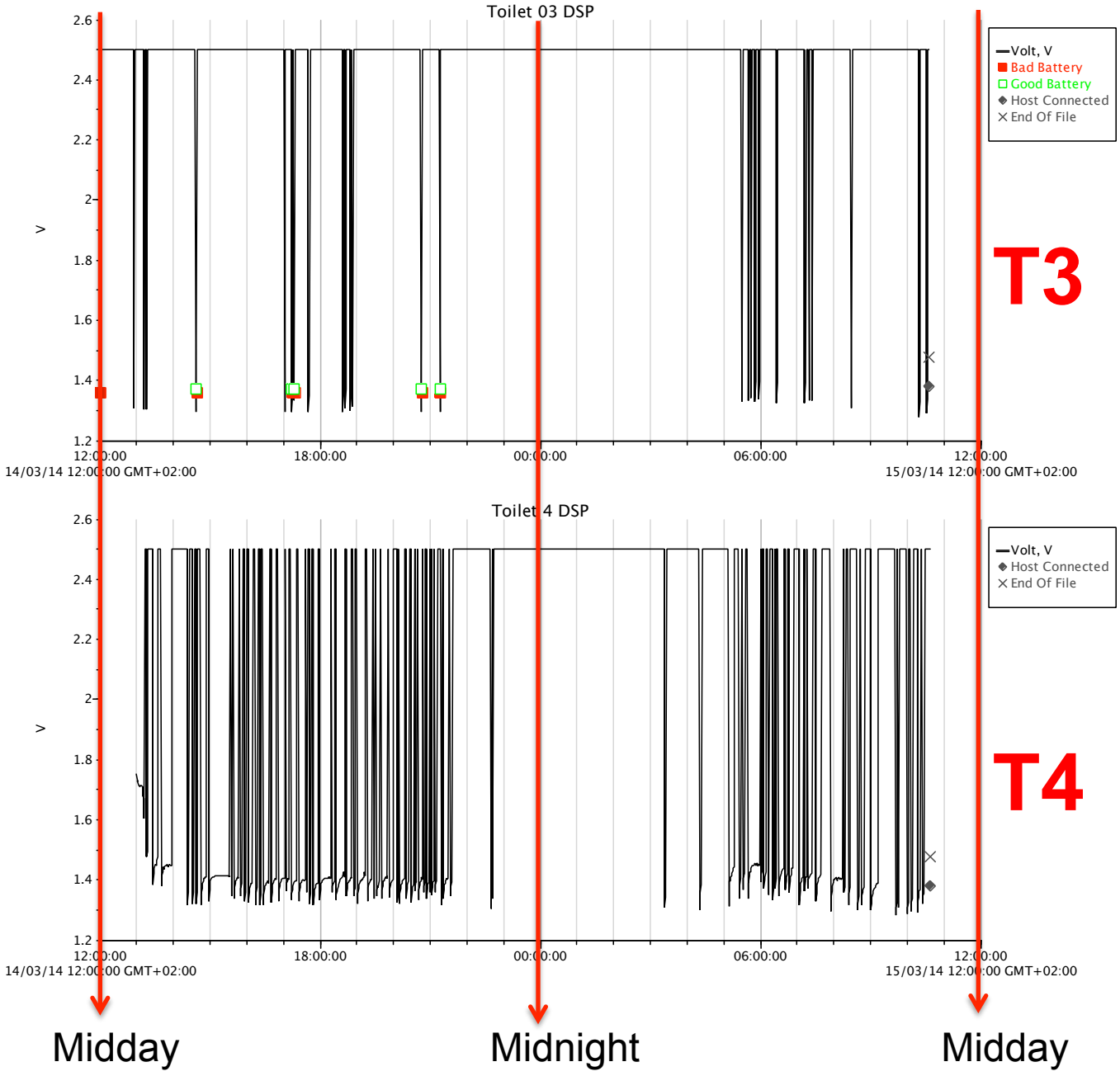


Measuring the number of toilet flushes

A magnet was secured to the toilet float valve (red in picture left) and when the toilet is flushed the float drops to the base of the cistern.
As the cistern fills the float rises and the magnet (A) is aligned with a corresponding magnet in the lid of the cistern (B). This connects a circuit. When the toilet is flushed and the float drops, the circuit is broken. This is recorded by a data logger (C) that checks every minute if the circuit is open or closed.
In this way each flush of the toilet is recorded.
There are many variables that make the measurement more complex. Refill times vary depending on the water pressure in Diepsloot generally and the local water pressure at the toilet, reduced by the use of the tap points.
This may mean the data logger records 4 or 5 minutes with the circuit is open, meaning a single flush and slow refill is in progress.
The data is cleaned to give a better estimate of overall toilet use.

By knowing the flush volume and number of flushes, combined with the water meter readings, the split between toilet water use and tap/tub water use can be determined.

A the magnet attached to the ball valve
B the magnet fixed under the cistern lid to make contact with magnet A
C the data logger was located under the toilet cistern and records the state of the magnet contact every minute for 30 days.



Measuring the number of toilet flushes

The ‘raw’ graphs of toilet flushes (each vertical line is a flush) show that despite a difference in the volume of use, the patterns of use are similar. The toilets are locked at night and have little use.

The door on Toilet 3 was in very poor condition, hard to open and not giving privacy and this meant people favoured the adjoining Toilet 4.

Improvement in the fabric of toilet T3 will help spread the load on both toilet cisterns.

Tap water use per day
T3 280 litres
T4 536 litres

Water use – where the water is used

The combination of data logger information and regular water meter readings allows the calculation of the split of water between water tap use and toilet flushing.

Two toilets (T3, T4) were used to trial the measurement.

Water meters for measurement will be fitted to 20 toilets and the data logger monitoring of cistern use will be placed on the flush mechanisms of 8 toilets.

Toilet 03 14-15 March 2014

Raw count	**45**
Adjusted count (variable refill lag time and multiple flushes)	**40**
Litres per flush	**8**
Volume of water for flushing	**320**
Total water recorded through meter to toilet and tap point for similar period	**600**
Water through tap point	**280**

Notes - the door is in very poor condition, hard to open and provides little privacy, external drain under tap blocked

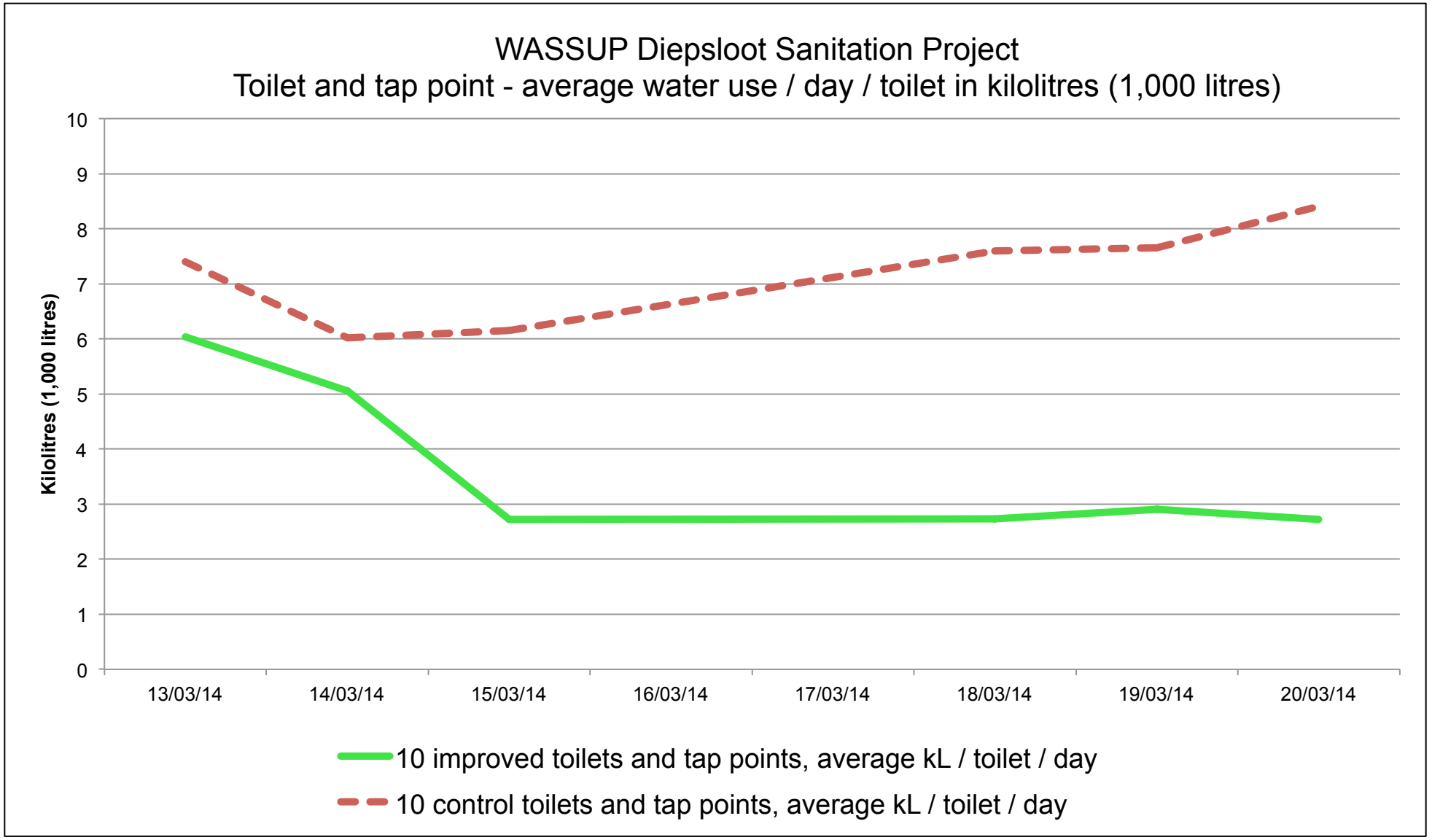
Toilet 04 14-15 March 2014

Raw count	**547**
Adjusted count (variable refill lag time and multiple flushes)	**258**
Litres per flush	**8**
Volume of water for flushing	**2064**
Total water recorded through meter to toilet and tap point for similar period	**2600**
Water through tap point	**536**

Notes - external drain under tap blocked

Water use – average volume used per toilet and tap point every day – improved / control

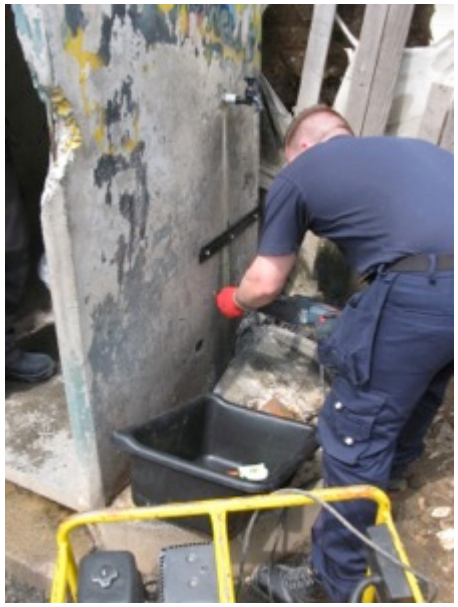
After only 7 days, the water meter readings show the difference between the improved toilets/ tap points and the control group, with an average difference per toilet of over 5,000 litres per day. This could mean over half a million litres of wasted water a day passes through the other 110 toilets being managed by WASSUP if the poor existing hardware is not improved.



Demonstrating water use

On South Africa's Human Rights Day (21st March) WASSUP partnered with a number of Diepsloot based organisations to celebrate and raise awareness of the right to a healthy environment, including; Bontle Ke Thlago (a recycling cooperative) DACN (Diepsloot Arts & Culture Network) and the Greater Kyalami Conservancy.

Human Rights Day occurred near the end of the construction period and WASSUP took the opportunity to show local residents and visitors the impact of improving the toilets and tap points by showing the volume of a cubic metre of water (1 cubic metre = 1,000 litres or 1 kilolitre or 1 tonne of water). Note that the water meter reading graphs are stuck to the cube .



LEFT measuring the correct height for the washing tubs , CENTRE fitting the tubs *RIGHT load testing by the WorldSkill plumbers*

Water in – tubs were fitted under the tap points outside each toilet. The tub was placed off-centre to ensure large containers could still be placed on the ground for filling.

Drainage

Traps under water points were found to be full of gravel and silt. Attempts to clean the traps using steel rodding tools (not the more flexible plastic rods) meant broken trap bases.

LEFT TOP the problem being exposed
LEFT LOWER the broken base of the trap
TOP 4 (clockwise from top left) fitting a new trap, positioning the trap, adding the inlet, remaking the concrete drainage apron.

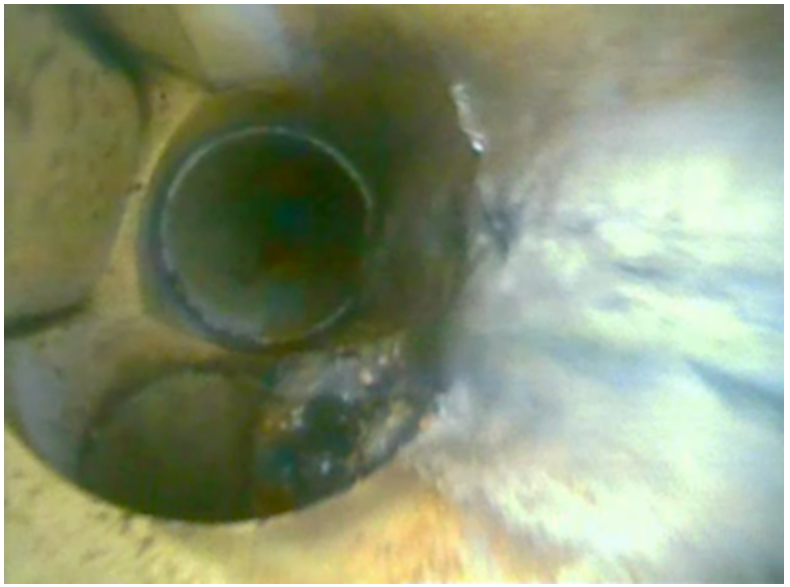
Drainage

Local 110mm wastewater drain lines, taking waste water from toilets and water points, were inspected using a drain camera to assess any potential blockages.

These drains were clear and in good condition and there were no nappies, rags or newspaper found.

The blockages were occurring at the traps directly under the drain points (see later section) and gravel and small stones were found in the blocked traps.

LEFT setting up the drain cam (the camera was loaned to the project by Nganampa Health Council, an Aboriginal controlled health service in central Australia)
ABOVE a crowd gathered to watch the 'drain movies'.



ABOVE two snapshots from the 'drain cam' movies showing clear drains and junctions.
LEFT a crowd gathered to watch the 'drain movies'.

Fabric improvement

Once toilet, tap and tub function was achieved, drainage works commenced. Then new doors were manufactured. These will include strengthening jamb pieces to repair concrete wall damage. Holes in the walls were filled and then pressure cleaning and repainting of the inside and outside of the toilet units commenced.

LEFT completed toilet, tap and tub work, *CENTRE high pressure water cleaning and wall patching* *RIGHT painting*

Fabric improvement

New doors were manufactured. These include polycarbonate sheeting for lighting the inside area and strengthening jamb pieces at the locking point to repair concrete wall damage. The doors will be assessed in mid 2014.

Drainage improvement

A variety of wastewater drainage ideas were put in place to be trialed. Top and right pictures show the ground drain has been capped and filled with the new tub drain installed. Bottom left picture shows the new tub drainage working and the newly improved ground drain blocked. These alternatives will be assessed and reviewed in mid 2014 using thel data collected on the volumes of water being drained.

General improvement

Gravel was used to infill erosion and improve ease of access to the toilets and tap points. The gravel also helps maintain drainage and water flow around the toilet units. WASSUP began placing their brand on the improved toilets - linking their work to improved function.

General improvement

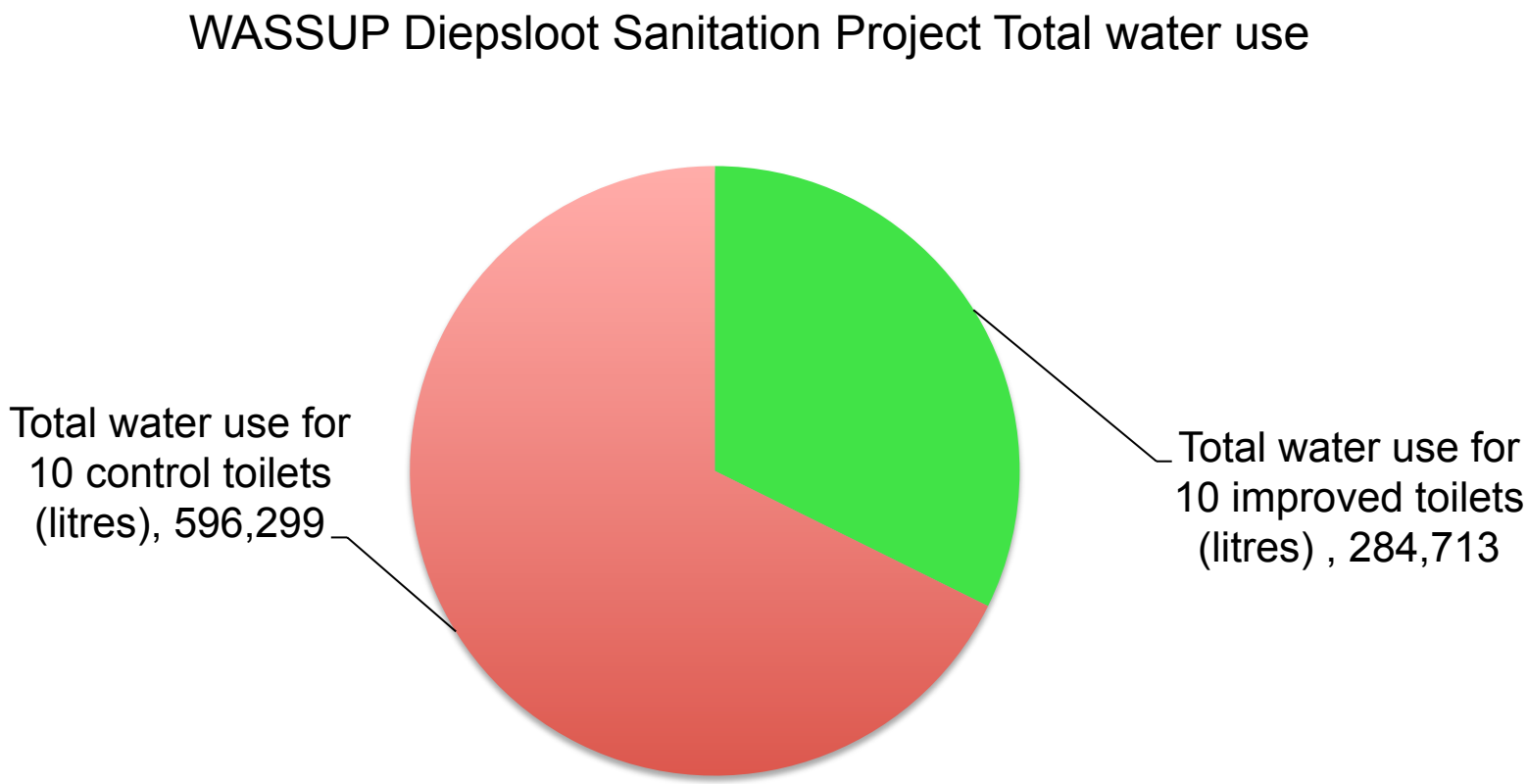
An example of the general overall improvement - Toilet 3 before and after the construction. 10 toilets and tap points were improved.

Improvements include

- *Water isolation valve*
- *Water meter*
- *New cistern*
- *New tub and drainage*
- *Ground drain repair*
- *Wall repair*
- *New door and repainting*
- *Ground works (gravel and fill)*

General improvement

Total water use in the improved toilets and tap points compared to the control group, only 16 days after the works were commenced, shows the dramatic improvement in water saving whilst improving access to the facilities.



The team and ongoing works

WASSUP, Sticky Situations and the WorldSkill plumbers celebrated St Patrick's day (below) after work finished for the day.
The photo left, reflects the co-operation between the WorldSkill plumbers and the local WASSUP team.

The construction phase of the works will continue with:

- Drainage works that will provide a variety of solutions to be evaluated by mid 2014
- Replacement doors for the 10 improved toilets
- Completing the painting work
- Paving around the toilet areas to reduce local erosion and improve drainage.
- Ongoing water use meter readings
- Ongoing function surveys of each toilet and tap point

About the participants in the construction phase March 2014

WASSUP

WASSUP began as an initiative of the international, interdisciplinary action research project Global Studio (GS) (www.theglobalstudio.com) that worked in Johannesburg from 2007-2009. Working with Diepsloot residents, GS students proposed ecologically sustainable solutions to address the pollution of the Jukskei river that runs through the centre of Diepsloot. Other projects included a simple bucket drain system to reduce drain blockages, and the mapping of defective communal toilets. Building on this collaborative work, the WASSUP steering committee, representing community leaders and minority groups, was established in mid 2009. A repair phase commenced in March 2010 and WASSUP registered as a co-operative in December 2010.

Particular thanks for the work during construction week go to – Jack, Lerato, Junitha, Obed, Mathebule and Manyisi. They provided history, direction, advice, materials, tools, lunches and a great sense of humour.

Sticky Situations (http://www.stickysituations.org/wassup-diepsloot/)

At Sticky, we utilize participatory design methods to facilitate, co-ordinate and implement community-driven projects of all shapes and sizes. Our work is grounded in community capacity building, and we assist communities and stakeholders identify their goals, and to then build the skills and confidence they need to create change.

We have established long-term relationships with a number of grass-roots organizations in Diepsloot, with new relationships forming in other communities, and over the years we have worked together, with local government and businesses, to identify and deliver solutions to complex problems.

Thanks to Jennifer for all the pre- construction organisation and follow up. Also thanks to Anne Fitchett from the University of Witwatersrand for generating ideas and a plan to pave and drain around each pair of toilets.

WorldSkill Foundation (http://www.dsf.org.au/current-projects/340-worldskills-foundation)

The WorldSkills Foundation (WSF) was launched in Madrid, Spain in 2011 and is the research, advocacy and education arm of WorldSkills International. Its purpose is to complement the WorldSkills Competition. In this way the Foundation aims to achieve its shared mission with WorldSkills International to promote skills across the world. Jack Dusseldorp, previously President of WorldSkills International, is the Chairman of the WorldSkills Foundation.

Thanks to Ciaran Coady (Ireland) and Shane Trevitt (UK) who were the participating WorldSkill champion plumbers in Diepsloot. They worked in partnership with the local WASSUP team to make significant changes. Thanks also to Grant Stewart for his co-ordination and support in Australia and Seán Kearney in Ireland for his efforts to spread the word about the project via the WorldSkill network.

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