WRC RDI SYMPOSIUM – BIRCHWOOD HOTEL
16th SEPTEMBER 2015

FROM R&D TO APPLICATION
of Toilets and PETs

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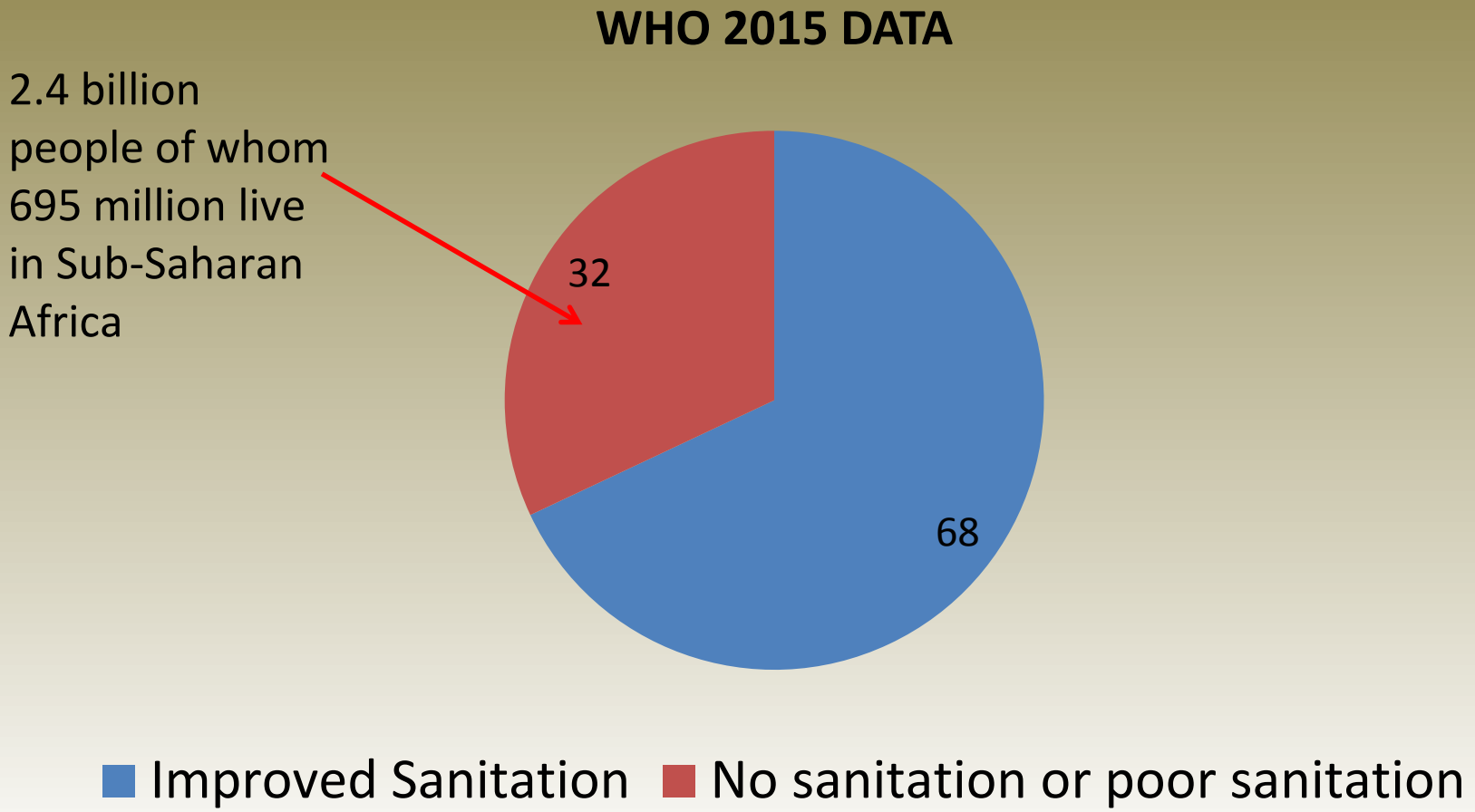
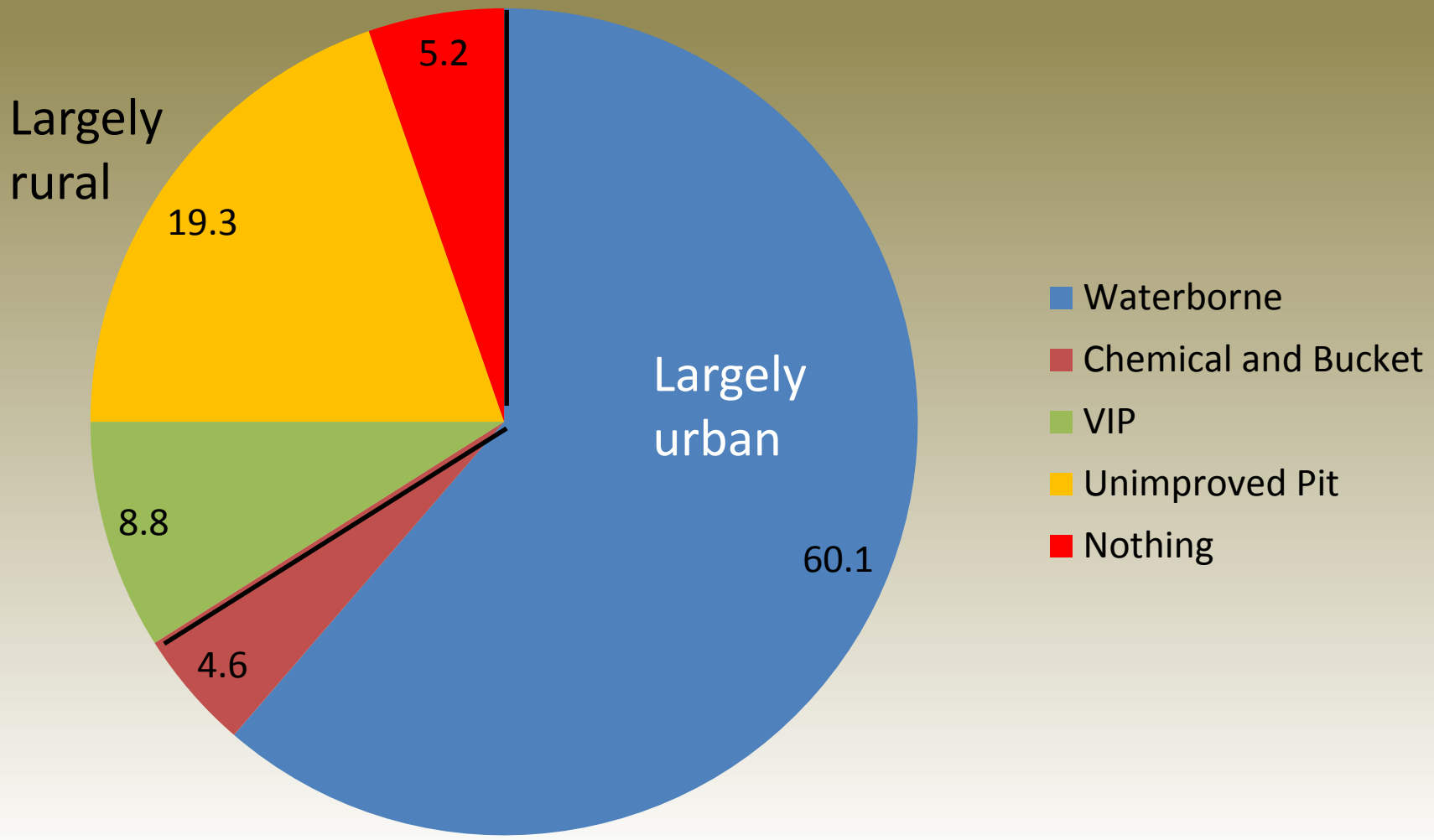
WATER RESEARCH COMMISSION

Sanitation worldwide



Sanitation in South Africa

Census 2011 data



DWS Press Statement August 2015

“R50 billion needed to eradicate sanitation backlog”

If we are planning to spend that kind of money, should we be stopping to think about how we are spending it?

Waterborne sanitation

Universal aspiration,
but
1. Major water consumer
2. Expensive to operate and maintain
3. Major environmental polluter (due to leaking sewers and poorly functioning WWTW)

Basic Sanitation in Africa –

the Ventilated Improved Pit Latrine, or VIP

VIP advantages

1. Robust -
"nothing can go wrong"
2. Inexpensive
3. Effective

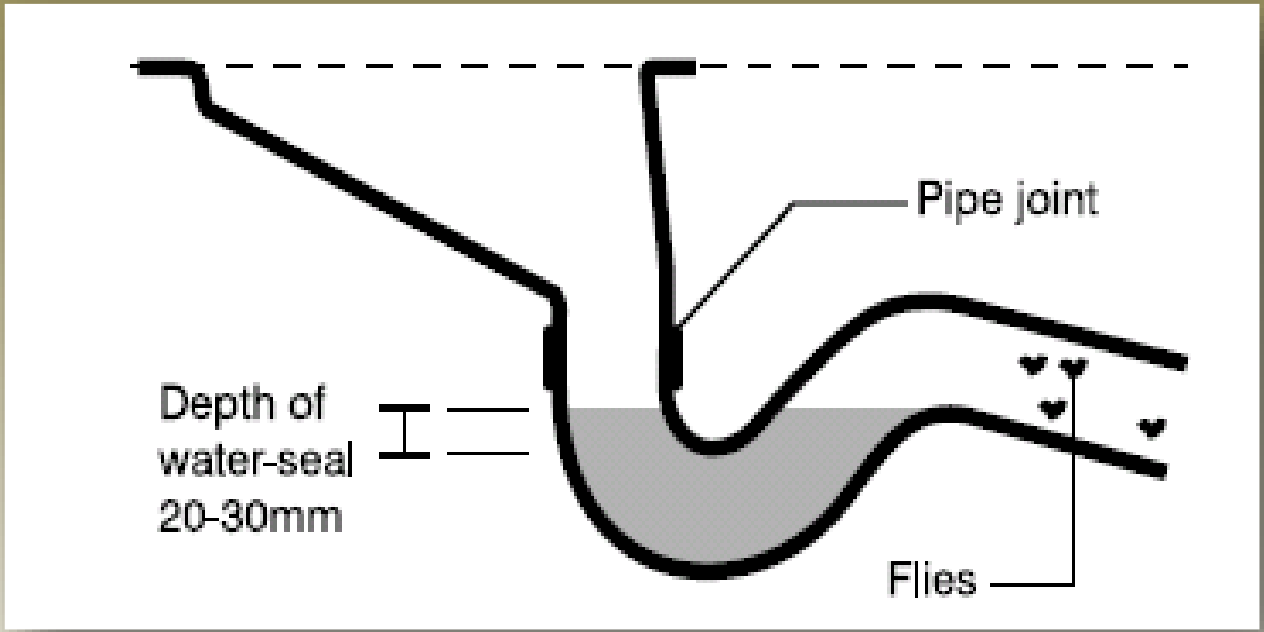
VIP disadvantages

1. Not odour free
2. Perceived as unsafe for children
3. Can't be in the house
4. Widely used for solid waste disposal, especially nappies
5. They fill up.

Is there something between the VIP and the Full Flush which combines their advantages and avoids their disadvantages?

- There are many sanitation alternatives. Many however are still too expensive or not robust enough. Some do not appeal to the average user.
- The simplest alternative, widely used in Asia, is the pour flush toilet.
- Is the pour flush a feasible alternative in SA?

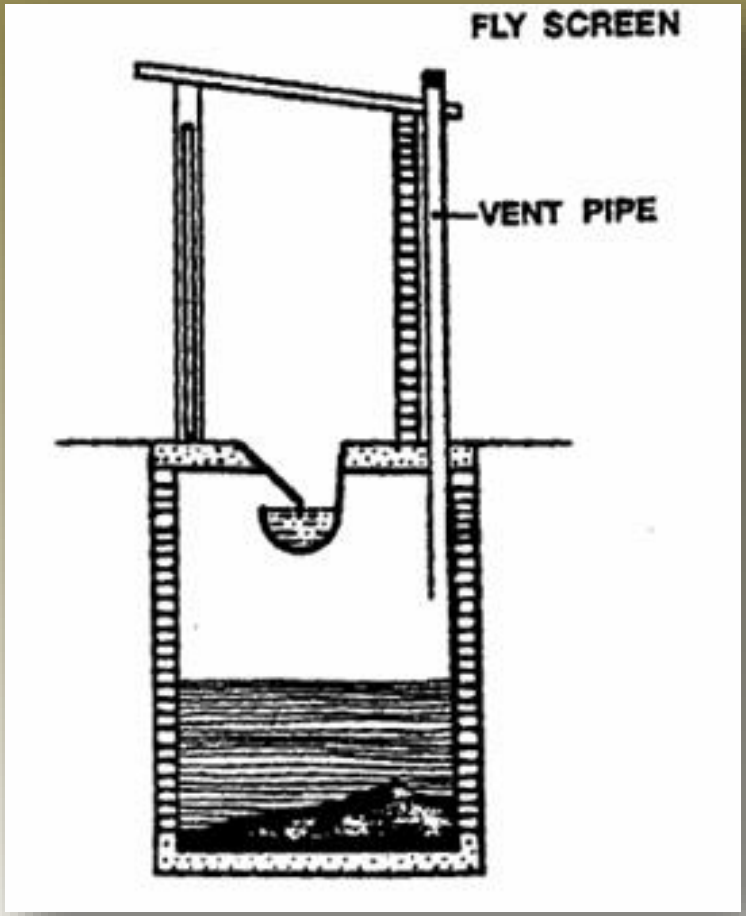
WHAT IS POUR FLUSH?



THE ASIAN STANDARD POUR FLUSH PAN

BACKGROUND

Early use in SE ASIA, mid 1900s



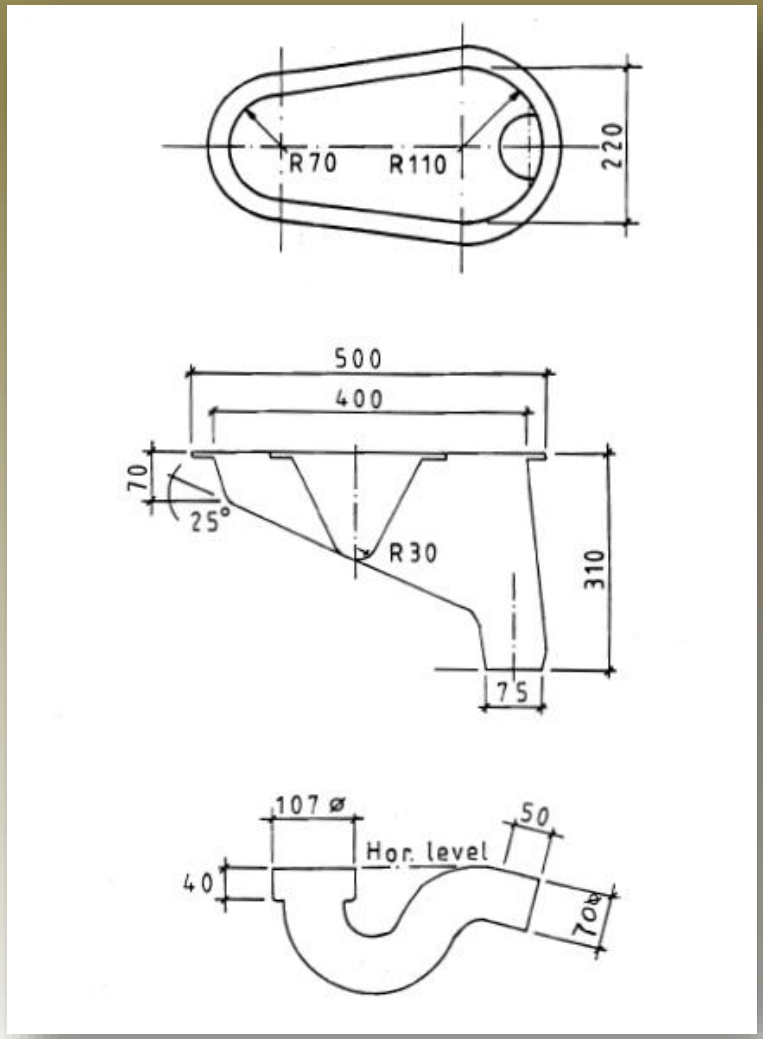
BACKGROUND

Alternating Pit demo at Sulabh toilet musem, Delhi India

BACKGROUND

The **Blueprint**

World Health Organisation (WHO) report by DD Mara 1980s



ADVANTAGES

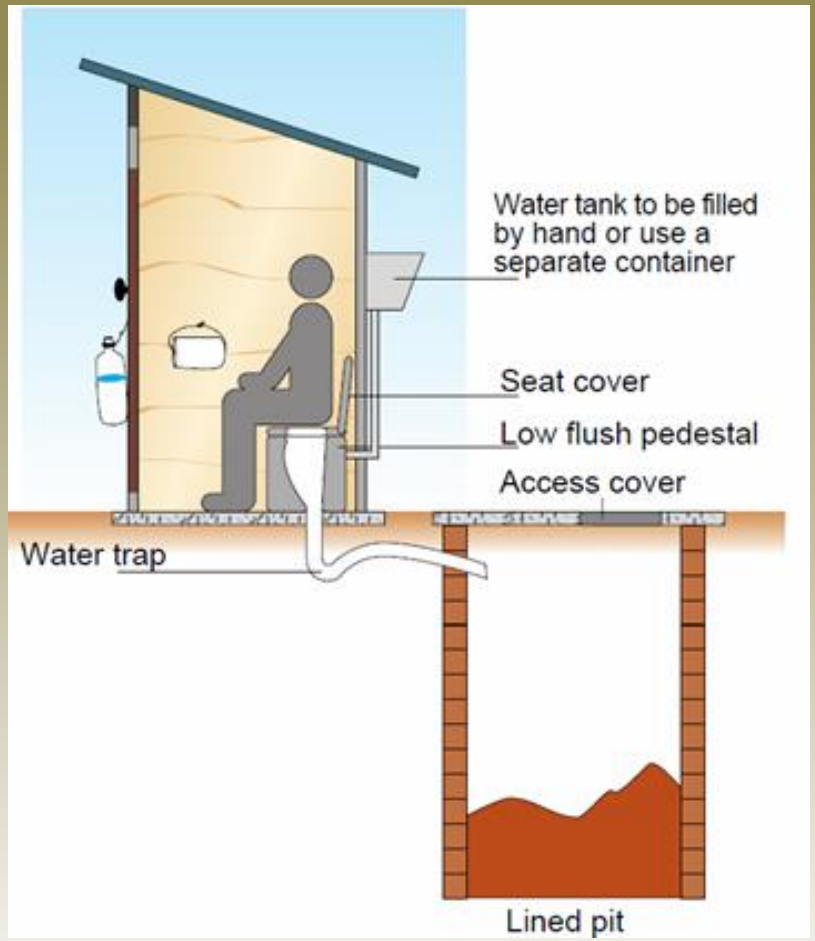
- Can be built onto or inside a house
- Only 1 to 3 litres needed for flushing
- Cheaper to build than a full flush toilet with septic tank – cost not much more than VIP
- Can assist with greywater management
- Not able to flush ‘trash’
- Suited to rural and high density settlements alike

THE CHALLENGE

pedestal design for pour flush or low flush in South Africa

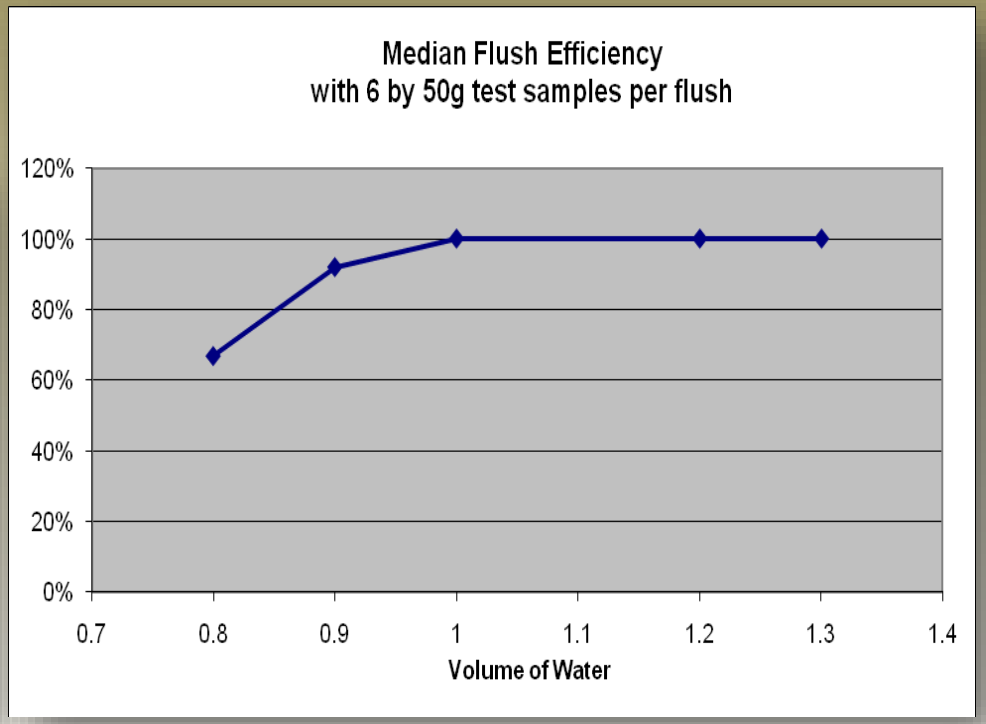
SIT not SQUAT

PAPER not WATER



THE SOLUTION

MAXIMUM PERFORMANCE TEST (MaP)



KWA ZULU NATAL PILOT

This pilot was commissioned on 1 Sept 2010. The sewer is over 17 metres long and the first section falls at only 1%. Only one blockage in that time, when kids flushed a plastic bag. This was removed at one of the inspection chambers

Completed installation – note no cistern, no water connection = no 24/7 leakage

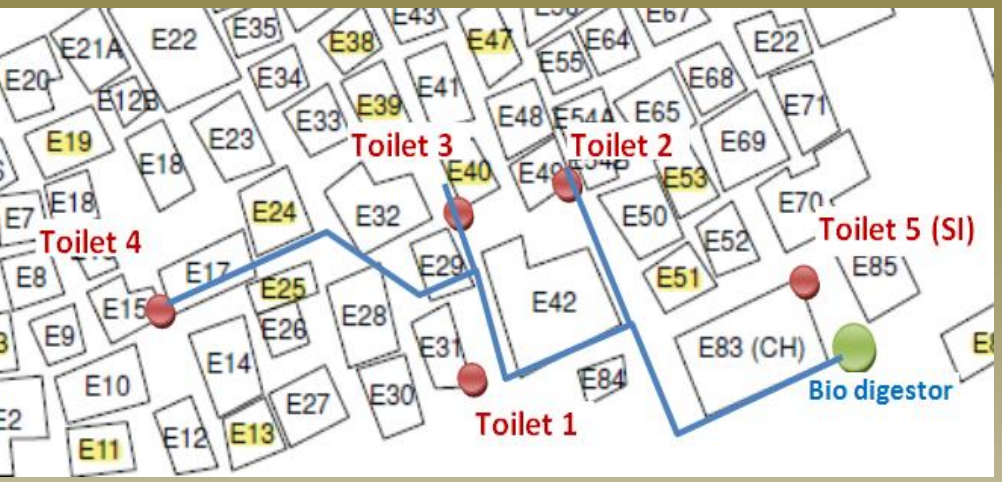
Splitter box to enable usage of two leach pits

Leach pit – easy access for emptying


Leach pits after installation either side of tree – no visible sign on surface

This pilot pour flush has been in operation since January 2011. In that time the users have had no problems and are delighted with the toilet. Here the mother demonstrates its use.

WESTERN CAPE PILOT – retrofit in HIGH density settlements



Here Mr Zuma, from Azalea, Edendale, PMB, demonstrates how the low flush adaptation of his pour flush works. This was installed in January 2013. He hasn't had any problems with it and is very pleased


Monitoring of leach pit filling rates and sludge characteristics:
Pits fill at half the rate that VIP pits fill up

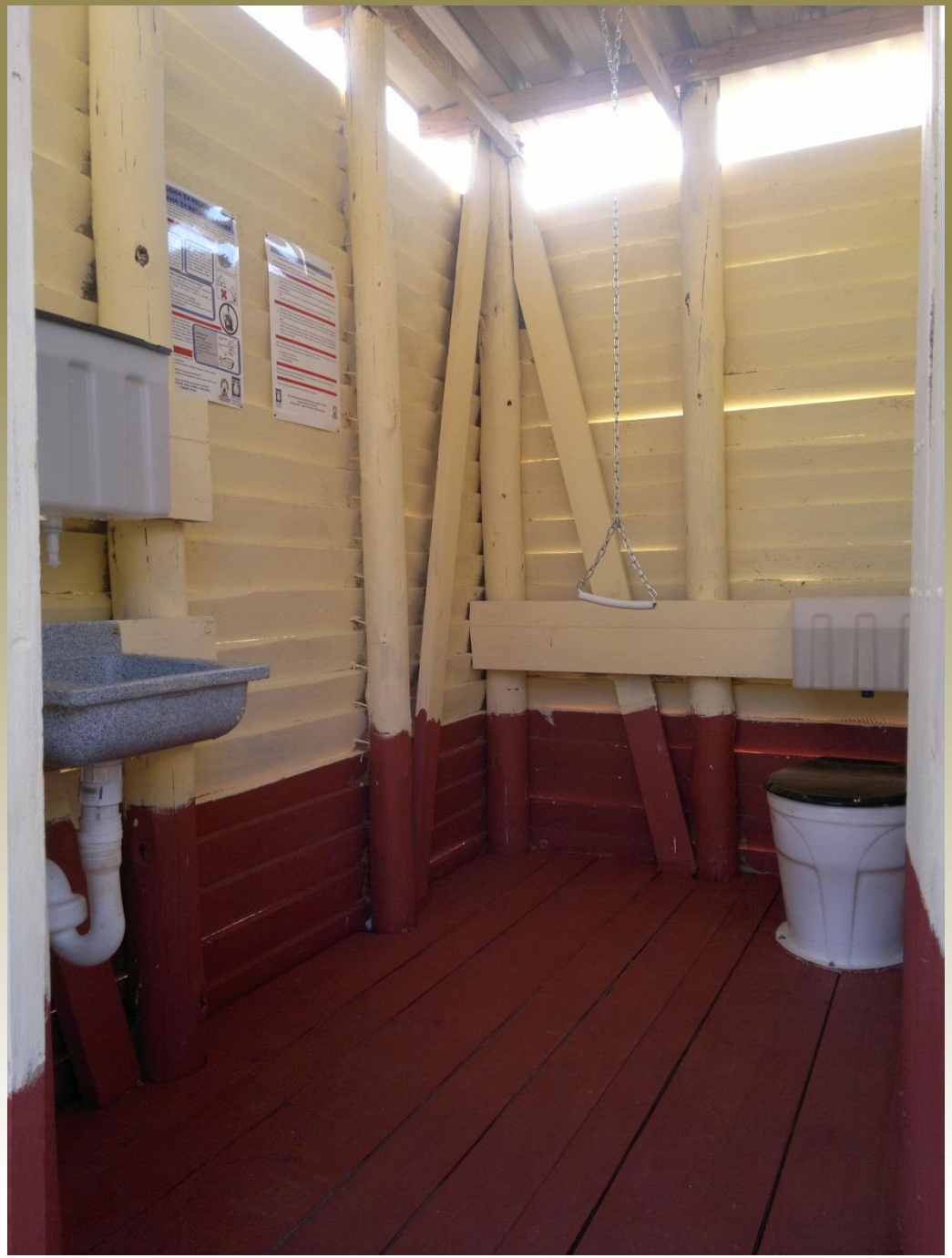
Field Test History

- First 2 units near Pietermaritzburg Sept 2010
- Another 20 near Pietermaritzburg and Richmond in 2011
- A further 15 in 3 municipalities in the W Cape in 2011/12

Blockages very rare, even when newspaper is used for cleaning.

Low flush at schools - Durban

Pour Flush at schools - Limpopo



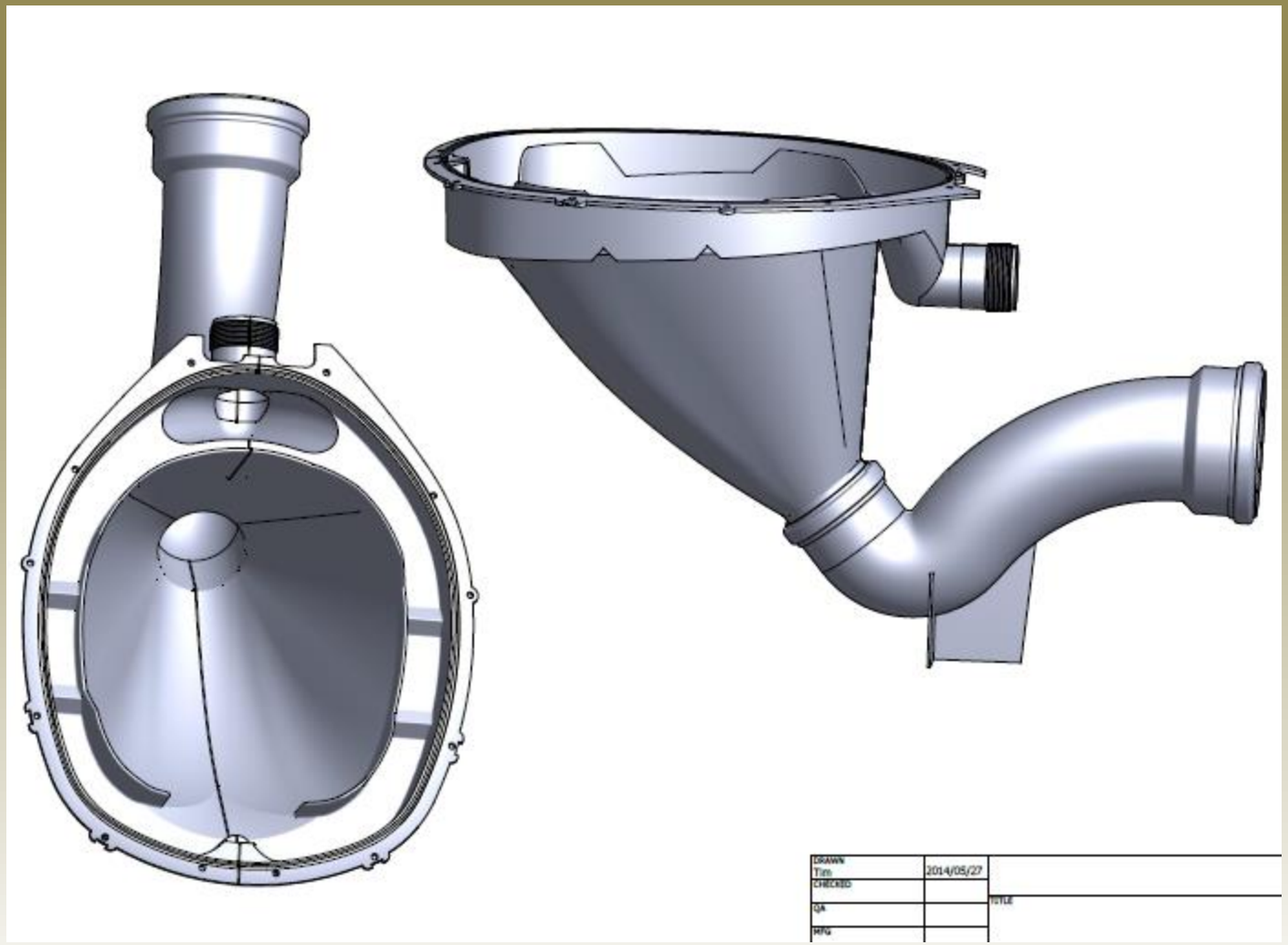
Pour Flush at schools - Limpopo

Pour Flush at Schools – Eastern Cape

Pour Flush at Schools – Eastern Cape

Commercialisation

Envirosan's
Pour flush / low flush pedestal



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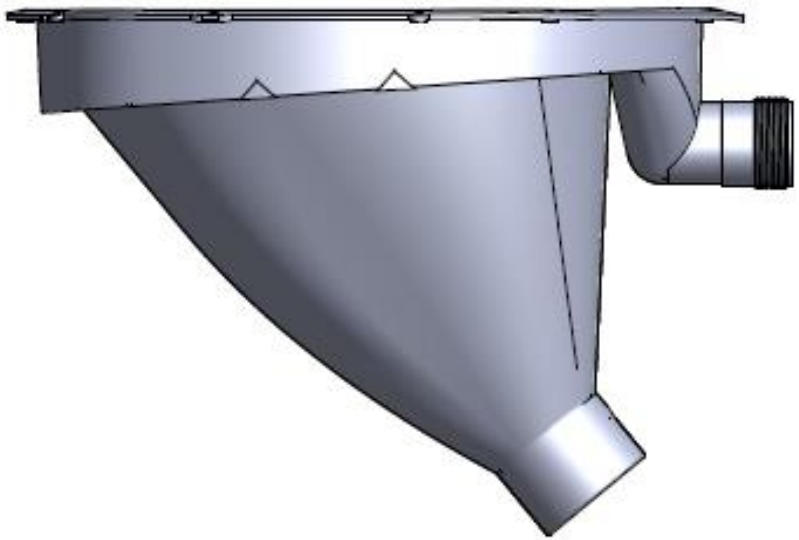

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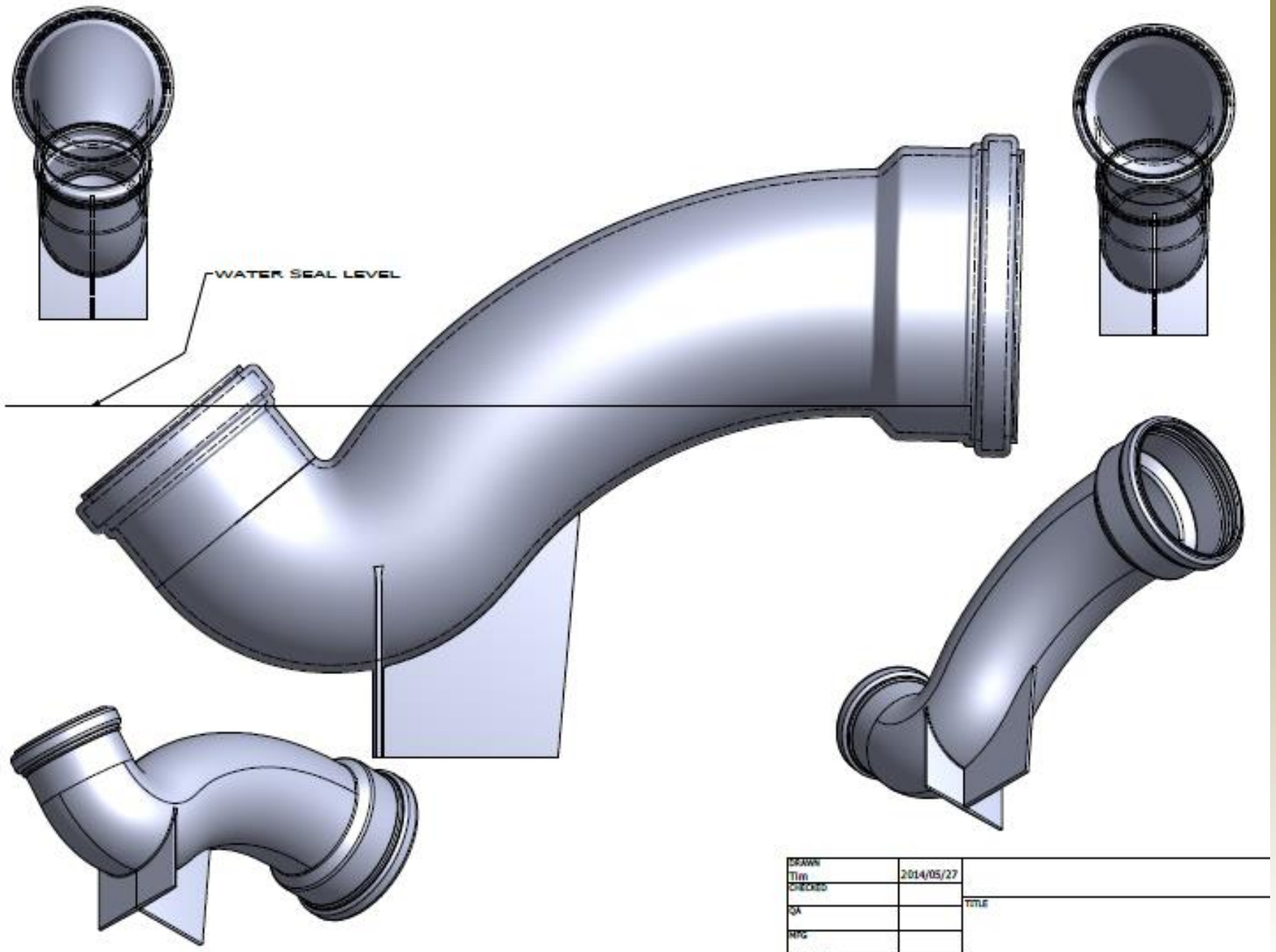

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Amajuba DM, KZN

First larger scale demonstration project 125 units, completed May 2015

- Very popular
- No blockages reported
- “Safe”
- Median water use 7 litres per person per day

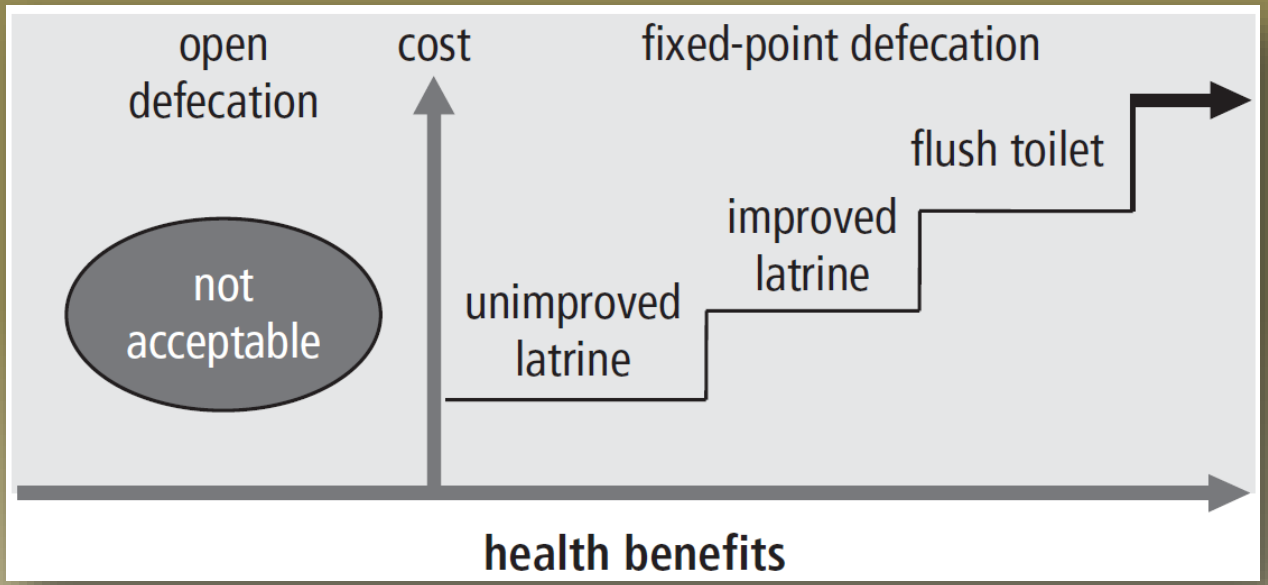
Scaling up 2015/2016

Pour Flush toilet at Jerseyvale, near Stutterheim, Eastern Cape

Scaling up 2015/2016

- eThekwini 700 units, 2015/16
- KZN, 1500 units
- Eastern Cape, 750 units
- Mpumalanga, 300 units

POUR FLUSH SANITATION – *THE FUTURE OF BASIC SANITATION OR A FLASH IN THE PAN?*



- Stepping 'up' the ladder:
  - Does not have to cost much more
  - Does not have to use more water
  - Increases convenience and therefore health benefits
- Allows an Incremental upgrading approach

The Sanitation Ladder

(Source: Morella, Foster, and Banerjee 2008)

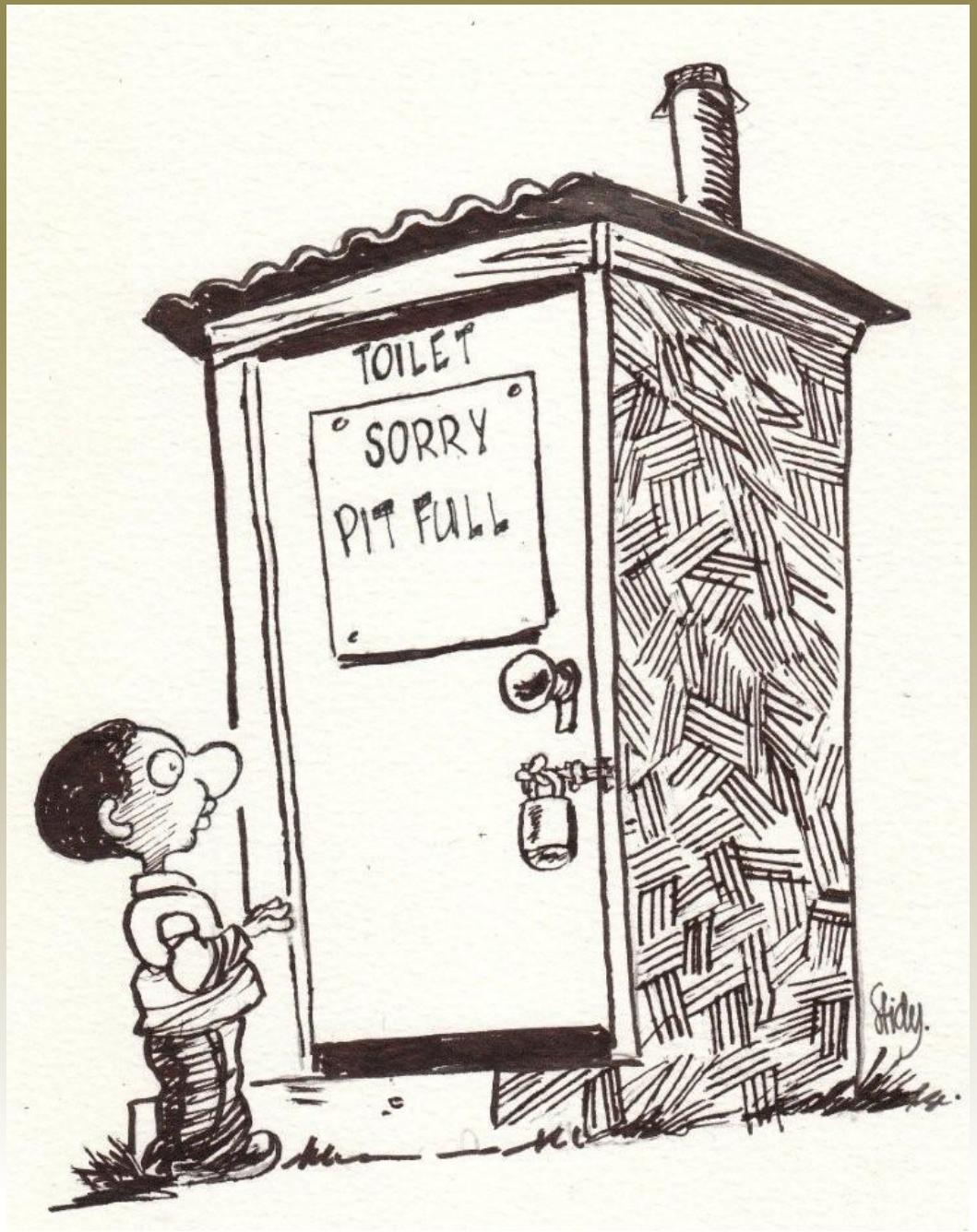
Acknowledgements

The following have all played a key role in the pour flush R&D to date: -

- Jay Bhagwan – WRC
- Jonny Harris – Isidima
- Phillip Ravenscroft - Maluti GSM
- Envirosan Team

# of PETs
(Pit Emptying Technologies)

Problem – pits fill up and must be emptied



Problem: Vacuum trucks are expensive and can't go everywhere


Access can be a problem!

Problem

Pit emptying is messy and a hazard to health

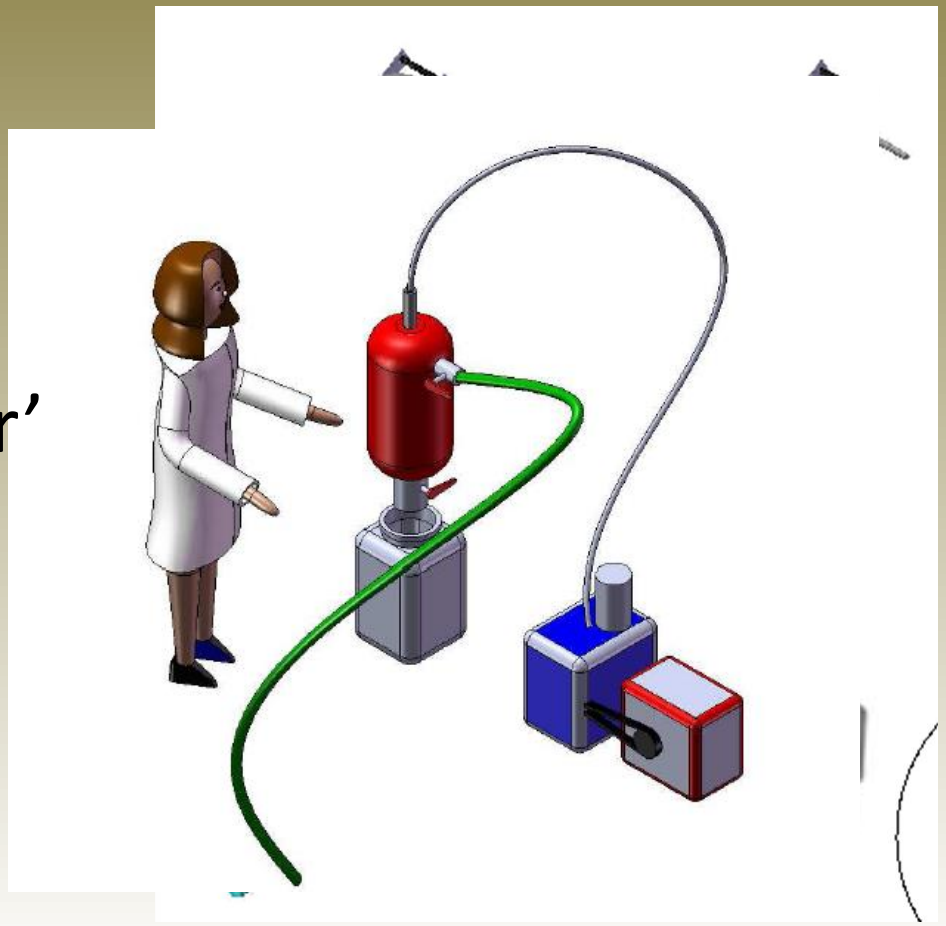
Problem: Pit emptiers find that the most labour efficient way to empty a pit is to climb inside

Small tankers – SMME friendly?

New devices explored by PID-WRC

Three main ideas

- ‘Gobbler’
- ‘Pit Screw Auger’
- ‘Nano Vac’

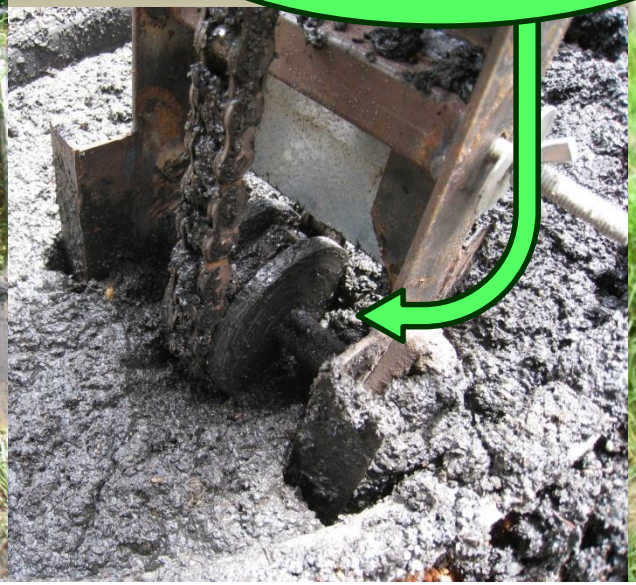


Gobbler – Final prototype

Sprung scraper to remove waste from scoops

No bend = one chain = lower part count, weight

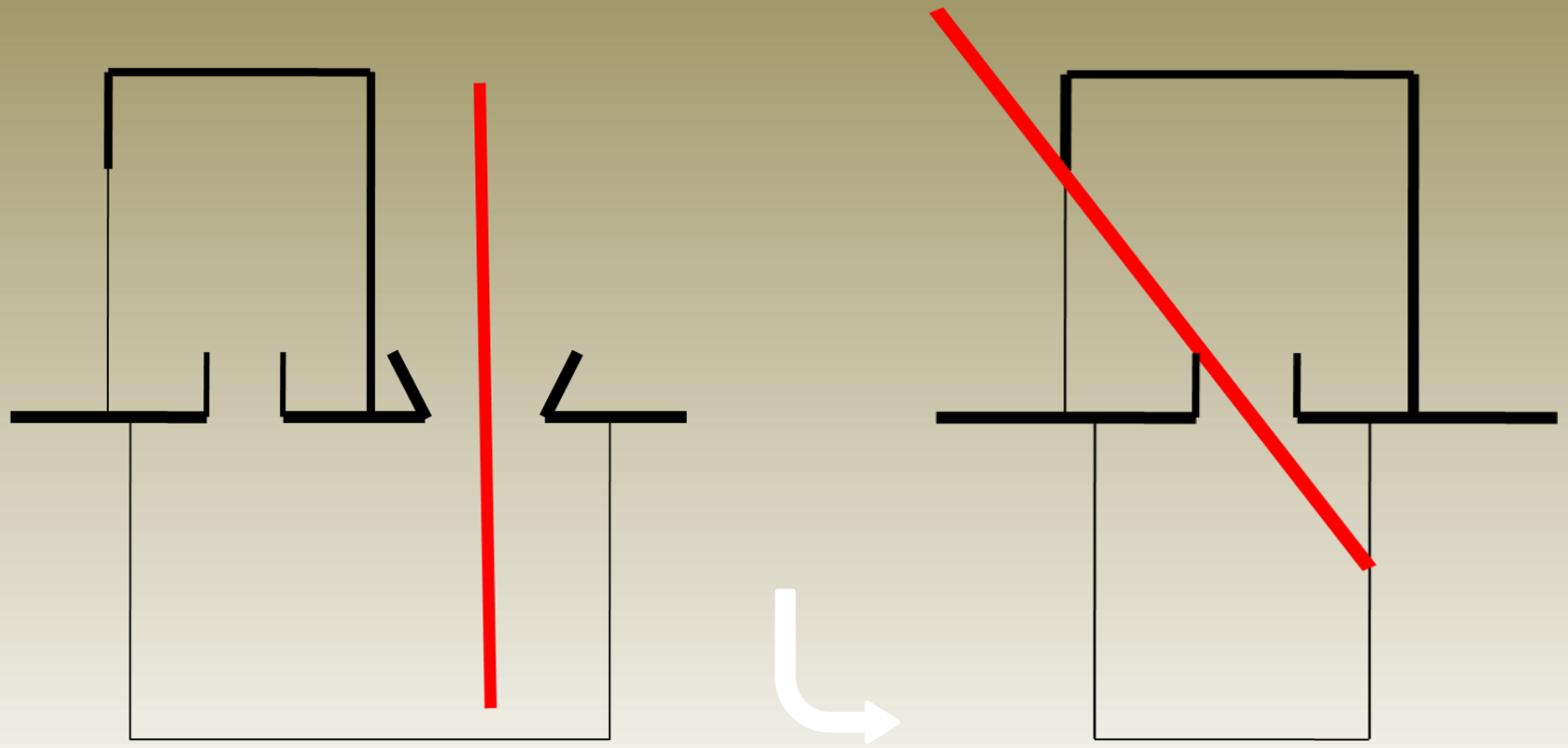
No cog at the bottom



Pit Screw Auger

Taking it to the next level – NCSU's PIT SCREW AUGER

Pit Screw Auger – usefulness limited by design of pit toilets



Nanovac – mini vacuum pump based on the Mapet concept

Moving on - the eVac

Critical – a small vacuum pump works best with a small vacuum tank

Interest in eVac from contractors and NGOs

Units supplied so far to -

- Botswana
- South Africa
- Malawi
- Rwanda
- Uganda
- India


DEPOT

eVac at work
Kigali, Rwand


Mini Vacuum Tanker developed
by Water for People


R D
165C

Acknowledgements

- WRC funded to do the PET development by Irish Aid
- Valuable assistance from Engineers without Borders (UK)
- Also valuable assistance from Water for People (Steve Sugden, Manus Coffey)