Presentation on Drought Mitigation Plan, Interim Progress and Operations

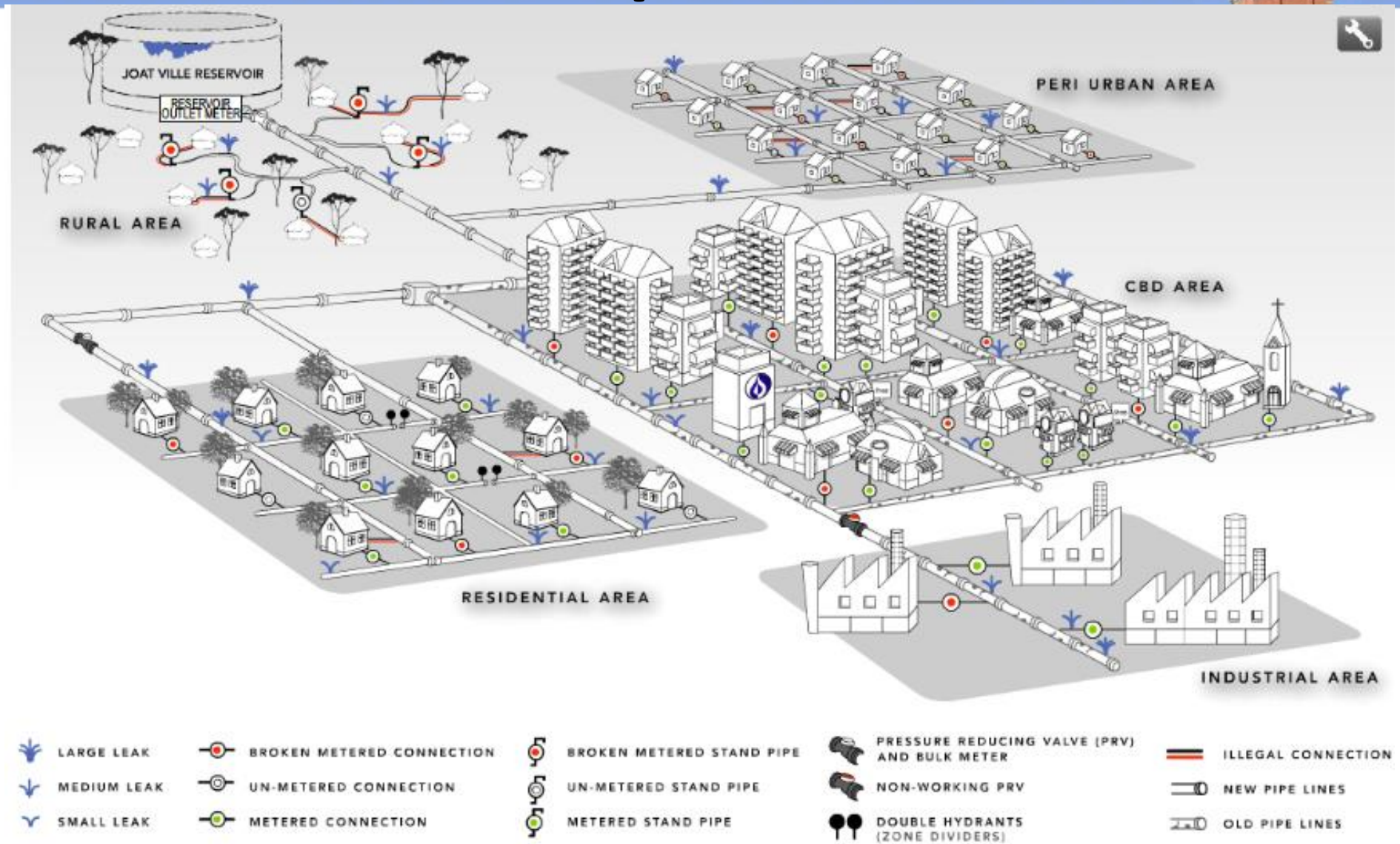
What is a Water Reticulation System

- A water supply system or water supply network is a system of engineered hydrologic and hydraulic components that provide water from a Water Service Provider to customers

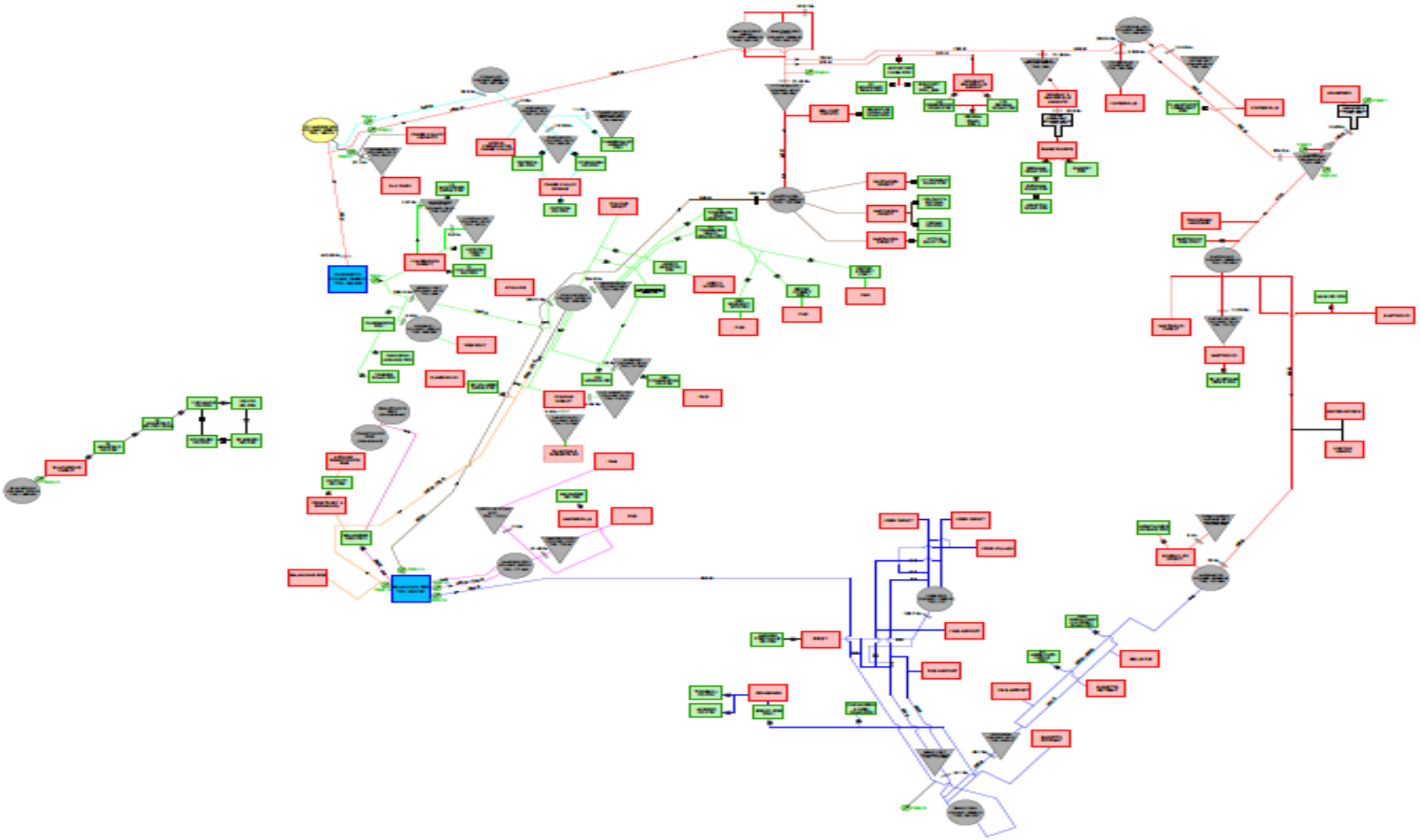
- Main Components include but not limited to:

Pipelines	Service connections	Meters
Hydrants	Isolation valves	BPTs
PRVs	Gaskets and Joints	Pumps
NRVs	Reservoirs	Air Valves
etc.		

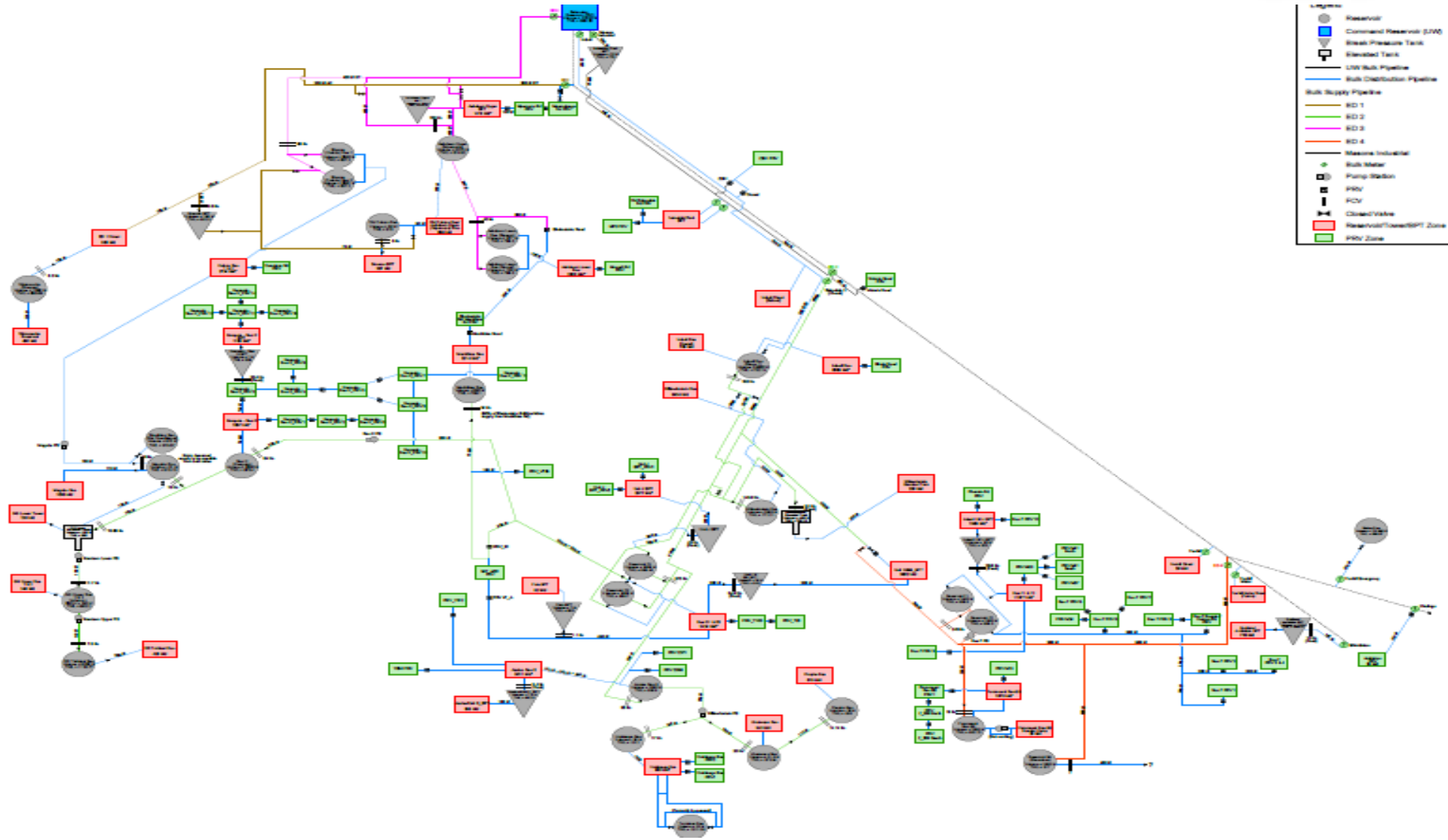
Typical Water System Layout with Components



Pietermaritzburg Bulk System

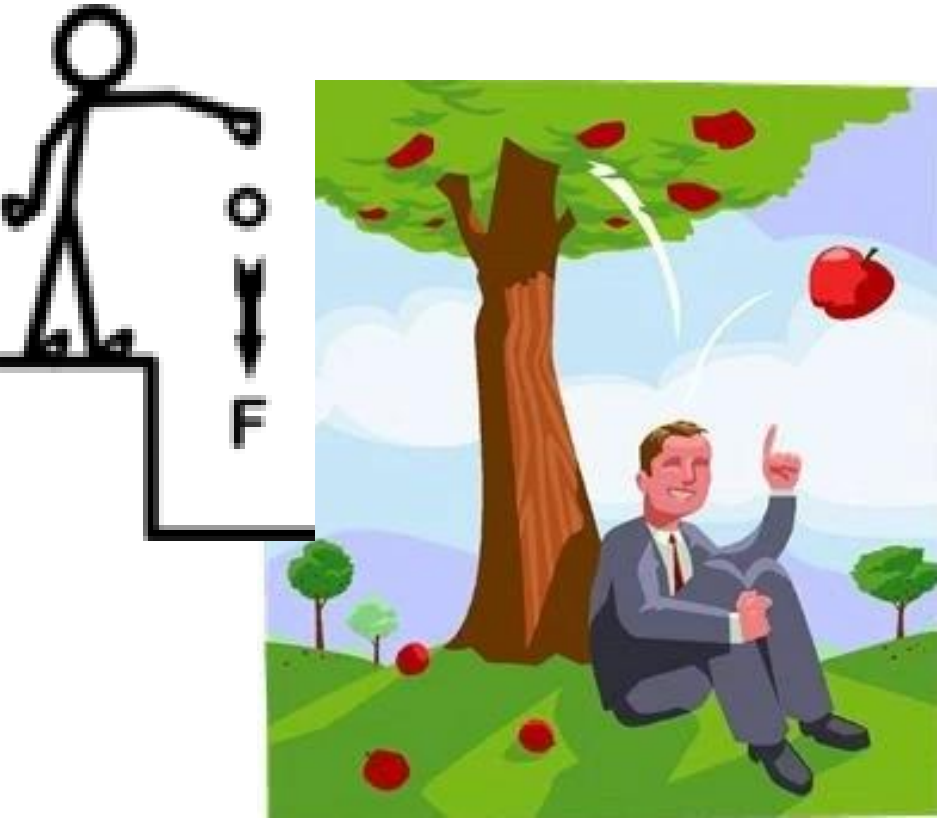


Edendale Bulk System



How Does Water Travel?

Only TWO Options: **GRAVITY** or **PUMPING**



99% of Msunduzi Consumers are fed through Gravity

Gravity Systems

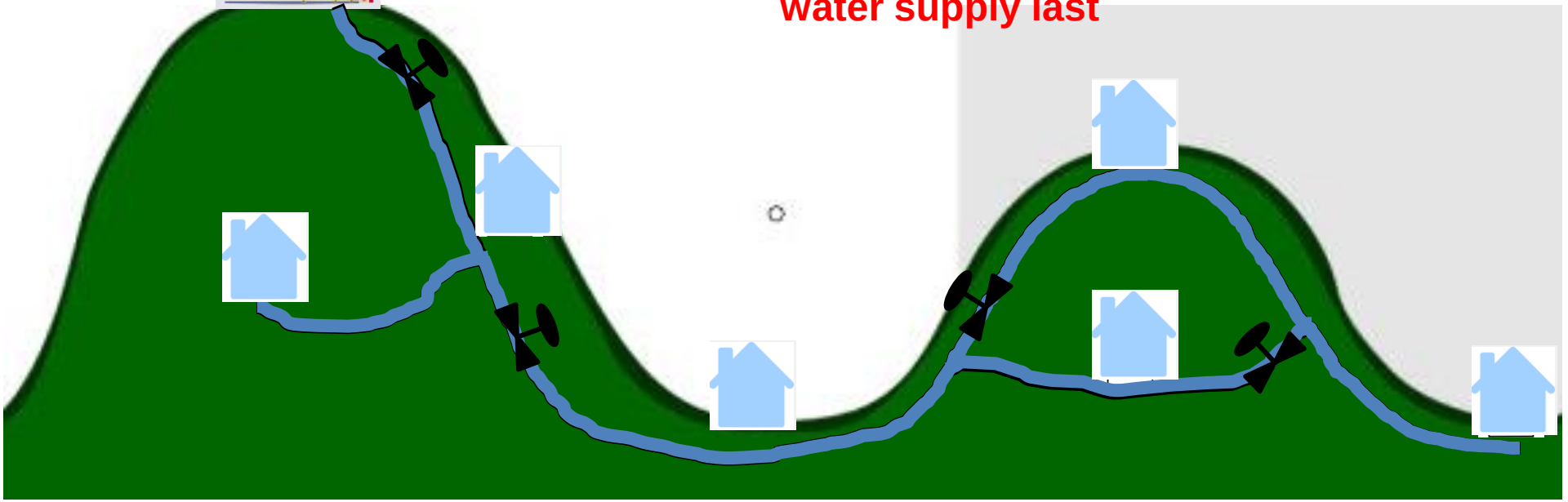
Empty Pipeline and OPEN isolation valves connected to all Consumers

Reservoir opened to feed entire network

Entire System has Water

Reservoir

The Consumer at the highest point will always get water supply last

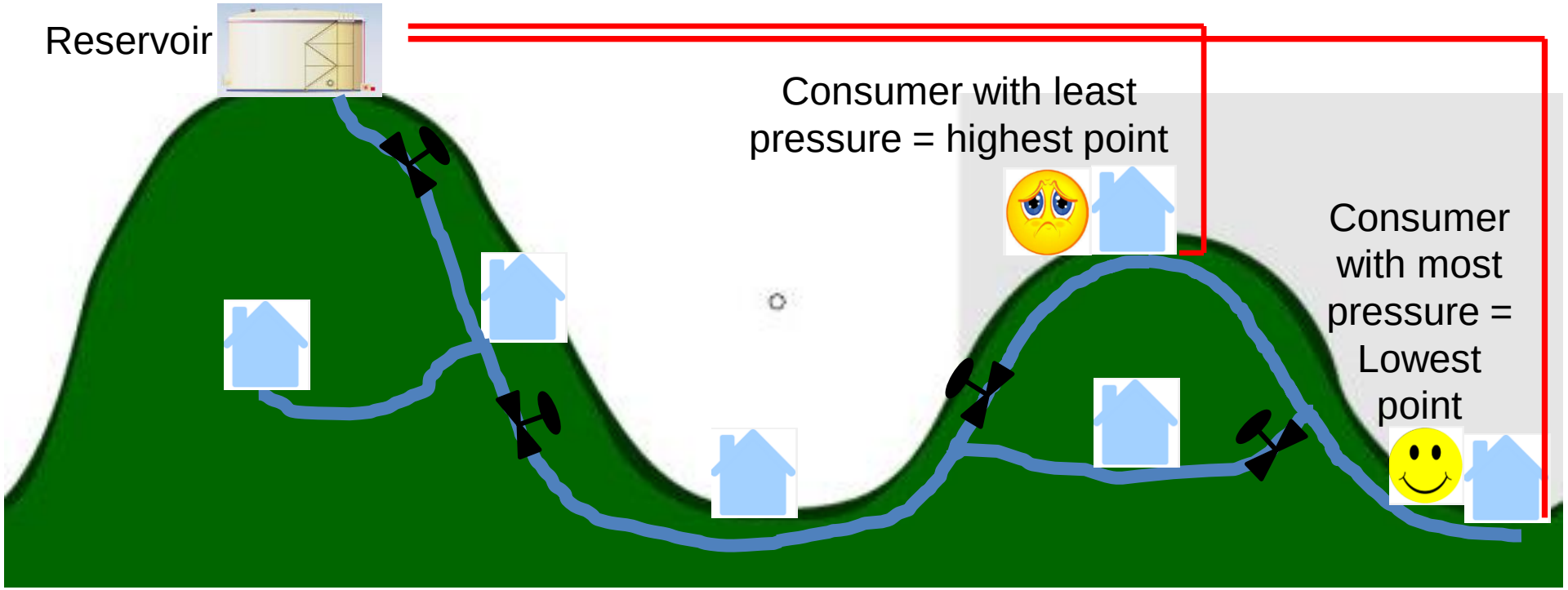


It should be noted that only once the lowest point in a system gets filled will consumers at higher levels receive water thereafter!

Gravity Systems

Q - Why do all houses have different pressures in the system?

A – Depending on the contour level of a consumer they will receive more or less pressure than their neighbours



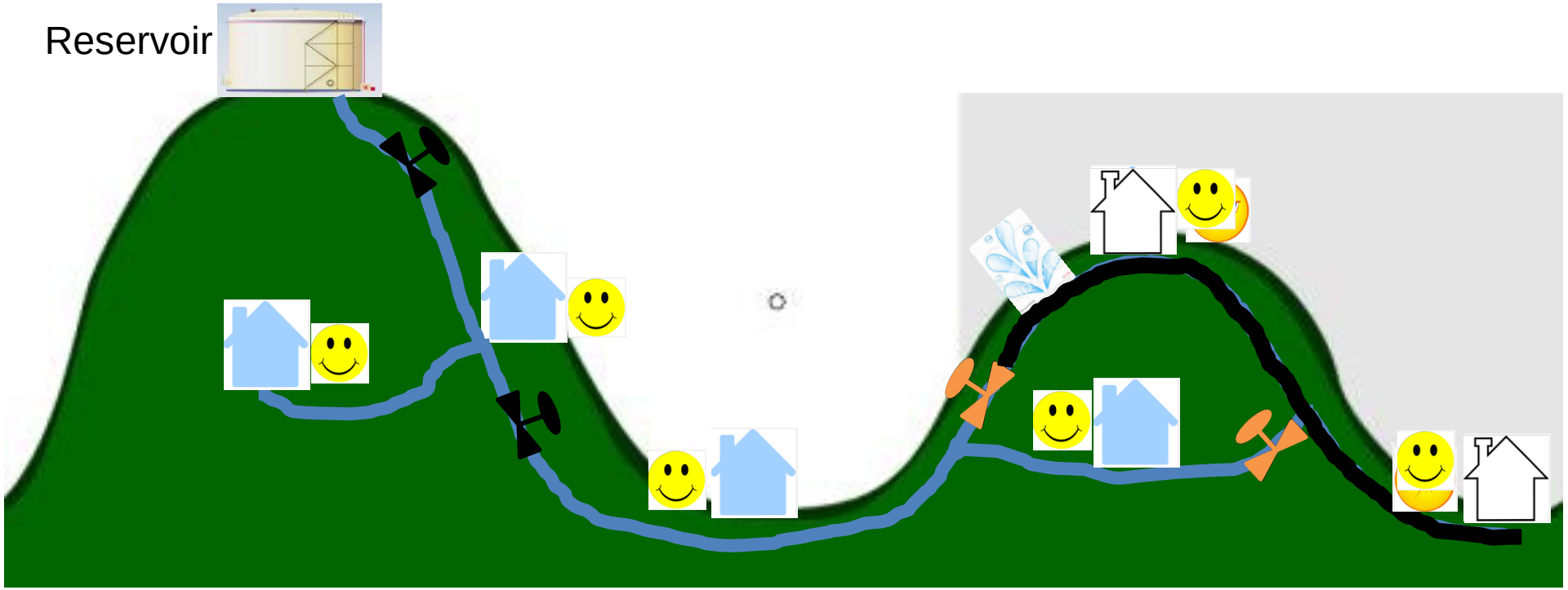
What takes place when a BURST occurs?

Operations will go to site and isolate/close valves and carry out repairs whilst **disupting the least amount of consumers as possible**

At this stage certain consumers still have water whilst others do not!

Once the burst is repaired and isolation valves opened all consumers get water

Q - But why do certain Bursts take so LOOONNNGGG to get repaired?



Why do bursts Occur?

A limited list of reasons why bursts occurred….

- Design faults – insufficient wall thickness;
- Improper construction and repair – bedding/wrong fitting;
- Improper use – materials outside operating specifications;
- External loads – point loading from rocks, traffic etc;
- Wet weather – causes soil settlement and movement;
- Infrastructure passed usable lifespan – causes brittleness;
- Excess water pressure inside pipeline;
- Water hammer;
- Scouring/cavitation or erosion;
- Exposure to sunlight – in all PVC type pipelines;

Why do bursts Occur?

- Defective materials – microscopic cracks in steel/impurities in PVC;
- Changes in momentum – bends, junctions, reducers, valves etc.;
- Galvanic Corrosion – 2 different metals submersed in acidic conditions;
- Electrolytic Corrosion – stray current uses steel pipe as a shortcut;
- Closing and/or Opening of isolation valves to quickly;
- Joints in AC pipes become brittle over time and any movement causes fractures;
- Fluctuations in pressure – caused by emptying and filling pipelines of which the main cause is Water Shedding!
- **NO ASSEST REPLACEMENT – PLANNED MAINTENANCE**

FUNDING

- **MOTIVATION FOR FUNDING FOR ASSET REPLACEMENT OF WATER INFRASTRUCTURE**

  Report dated 28 April 2015 incorporating the recommendations of the Infrastructure Services Portfolio Committee.

  RESOLVED TO RECOMMEND TO FULL COUNCIL

- *That approval be granted for R614.2 million capital funding over the next five (5) years in order to replace and upgrade antiquated water pipelines in line with Burst Frequency Analysis (BFA) as follows:-*

FUNDING

Supply Zone	No. of Bursts	Length of Mains in Zone (km)	Length of Mains in Zone to be renewed (km)	Total Cost	Ward No's in Zone
Hathorns	843	140	73	R103.7million	28, 30, 31, 32 and 33
Belfort	515	113	27	R39.2million	28,30, 31 and 32
Clarendon	168	35	14	R20.1million	25 and 26
Balancing 1	283	49	24	R34.5million	23, 24 and 26
Masons	298	52	50	R73.3million	26 and 27
Edendale	n/a*	496	234	R325.7million	1, 10 to 18 and 20 to 23
Vulindlela	n/a*	516	14	R17.7million	2 to 9
			Total	**R614.2million**	

Budget proposed (not by Business Unit) in R 5 million for 2016/2017

Q & A on Bursts

Q – Will bursts ever stop?

A – No, they will never stop as a reticulation system is a live, dynamic beast that is ever-going changes in its modes, pressures differentials from day to night, consumption patterns between seasons, between industrial and residential areas.

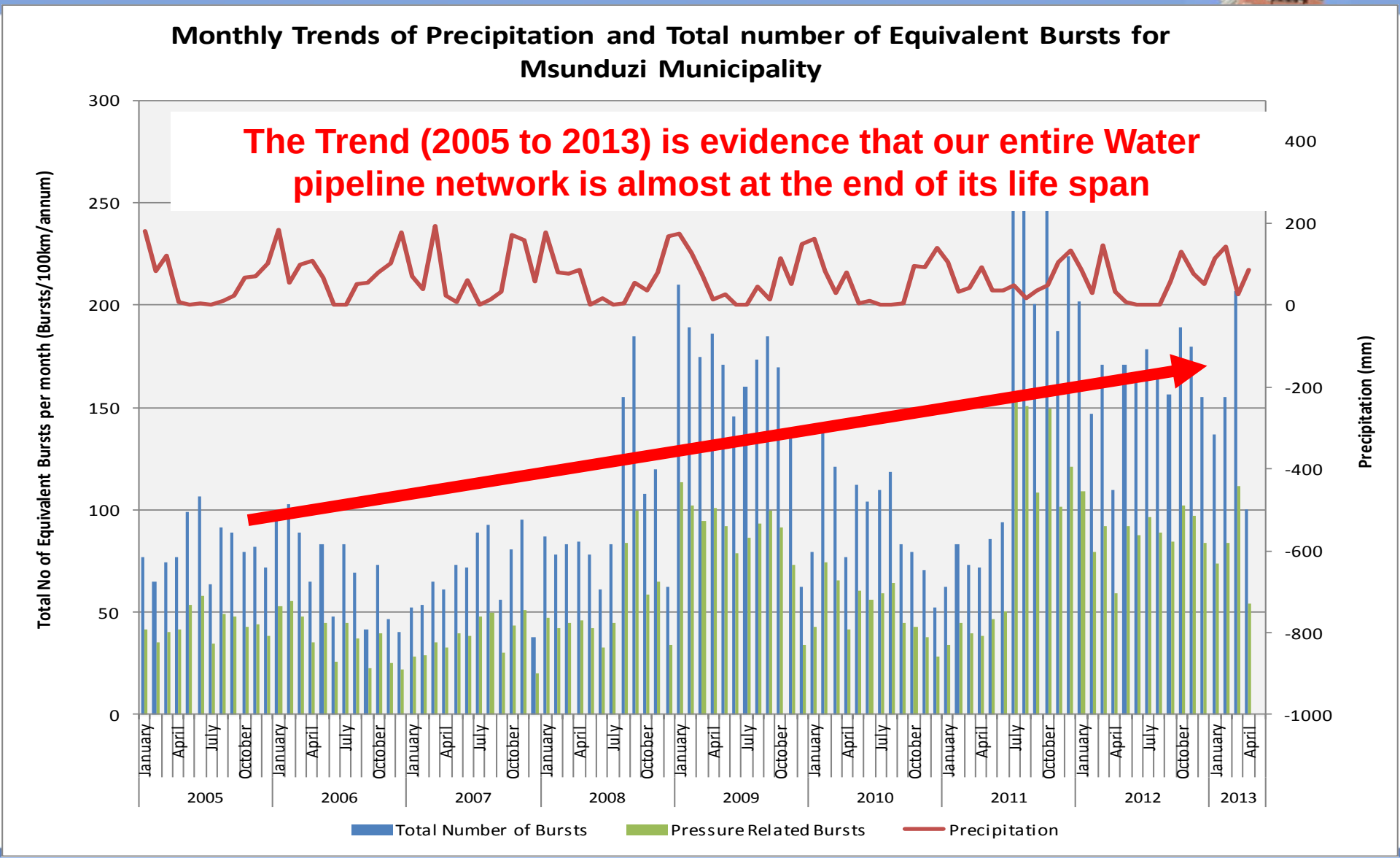
Q – Has a Burst Frequency Study ever been conducted?

A – Yes, in 2013.

Q – What where the main outcomes/findings?

A – Msunduzi has ageing pipeline infrastructure and if at least 2% or 50km of pipelines are not replaced annually the situation will get worse!

Burst Analysis for Msunduzi



Bursts – Sequence of Events

Burst Occurs

Operations are notified via consumers/call center

Bursts – Sequence of Events

Operations need to go to Site

Sometimes using VAGUE information from consumers they cannot find the location easily

This can cause delays!

Bursts – Sequence of Events

Arrive on Site – Need to find isolation valves to shut the Leak
Typical pipeline Map Book with isolation valves

At this stage Plumbers could be 200m away or 3 streets away trying to isolate valves!

It should not be assumed that because you cannot see a Municipal vehicle that they are not attending to the burst

Bursts – Sequence of Events

Burst is isolated

Excavate down to pipeline

Depending on the situation this could take time!

Whilst excavating known (rare) and unknown services like Telkom, Eskom, Fibre Optic cables, sewer cannot be damaged

Bursts – Sequence of Events

Excavation need to be pumped out

Once pipeline can be examined materials for repair needs to assessed

Plumbers cannot carry all materials/fittings in their bakkie (and may need to go to Depot to retrieve certain materials)

The system has old infrastructure that sometimes are not standardised. In these situations fittings need to be made up. This could take 1 day to 3 months to procure!

Bursts – Sequence of Events

Repair Completed

BUT that only half the job!

Bursts – Sequence of Events

Backfilling of excavation

Generally the material that has been excavated cannot be used!

Why?

As it is WET. Dry material may need to be imported from Stores to complete backfilling.

Also some backfilling will require Roads Unit to come and complete repair which could take days

Bursts – Sequence of Events

Bleeding of hydrants

It is an industry norm

Used to expel air out of the water system

Used to expel soil materials/dirty water out of system

If this is not done:

Consumers receive “dirty” water

Air locks appear in system and causes more bursts

Air locks also cause areas of low pressure – increased consumer complains

Bursts – Sequence of Events

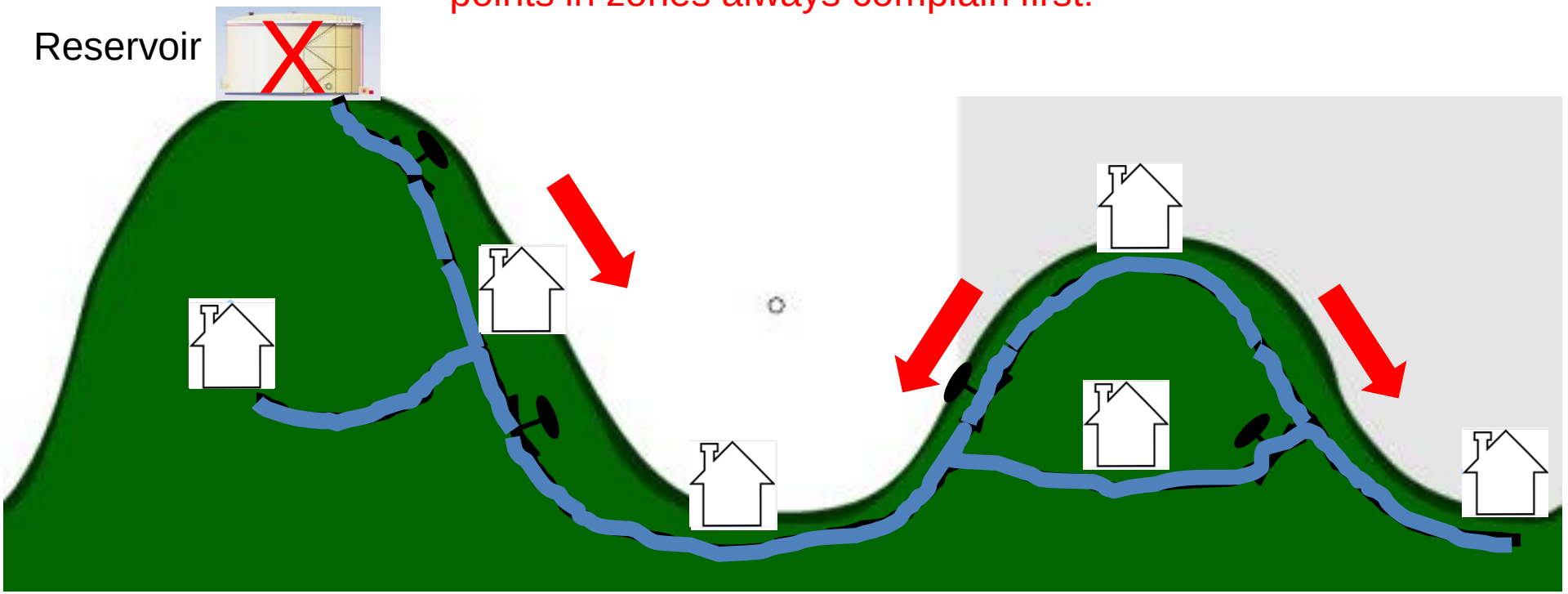
Open Isolation valves SLOWLY – restore water back to Consumers

Carry out Quality Control on Repair

What will happen when Water Shedding Begins?

Reservoir Open to feed all pipelines

This is the reason that consumers at the highest points in zones always complain first!



Water Shedding Begins… No feed from the Reservoir

Slowly gravity controls the system through consumer demand and leakage!

Q & A on Water Shedding

Q – What happens when Water Shedding is over?

A – The system is recharged in that the reservoir has water again and fills the pipeline

Q – Is this a problem?

A – Yes, While the system is draining the pipeline is filled with air. When a column of water pushes air (which is incompressible) this will cause air pockets or bursts as the air does not know how to leave the pipeline!

Q – What do air pockets cause?

A – They reduce the diameter in a pipeline thereby reducing pressure in any system.

Q & A on Water Shedding

Q – How do you get rid of air pockets?

A – By using air valves… BUT it is not practical to have air valves installed at every bend, junction, contour level change etc.

Q – What is the most practical way and/or international standard to get rid of air pockets?

A – To bleed the system or rather flush the air out of a fire hydrant

Current Drought Alleviation Objectives and Initiatives

- Reduce Demand by 15% with immediate effect
- Reduce Water Losses to under 30%
- Complete all initiatives in 3 months starting end of Feb 2016 after fast-tracking SCM procedures

Initiative	Primary Stakeholder	Secondary Stakeholder
Internal Leak Repairs	Plumbing Contractors	Councillors
Active Leak Detection and Repair	LD & R Contractor	Plumbing Contractor
Aggressive Pressure Management	NRW Consultant	W & S Unit Operations
Physical Consumer Restrictions	Plumbing Contractors	Councillors
Audit of Standpipe Meters	Meter Readers	Income Unit
Consumer Awareness and Education	Communications Unit	Councillors

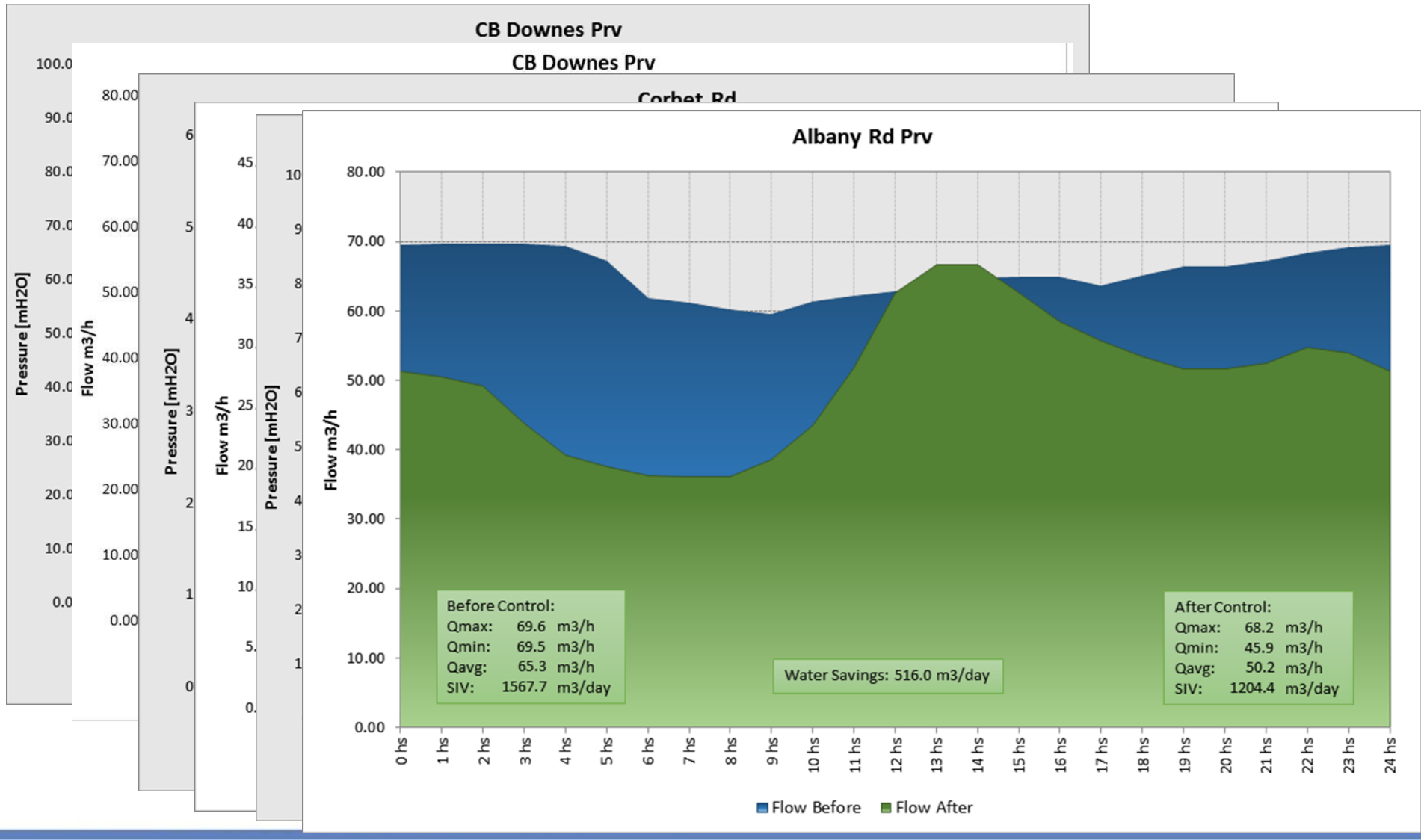
Pressure Management

- 2 Point timer PRV controllers have been procured, built and installed at the existing PRVs
- They can only be commissioned once the zone is discreet
- Unscheduled closing of Reservoir Outlet valves causing delays in commissioning PRV controllers
- To date 19 Zones have been commissioned and the combined recorded **savings to date is 185kl/hr or 4.5Ml/day**
- An additional 17 have been installed and shall be commissioned in the next three weeks!

Pressure Management - Summary

- To date 36 of 88 (or 41%) controllers have been installed
- 19 of the 88 (or 22%) have been commissioned
- 17 of 88 (or 22%) controllers are installed and will be commissioned in the next 3 weeks

Examples of Savings Reports



Active Leak Detection and Repair

- Started on an accelerated program since Jan 2016
- Throughout Msunduzi 2,943km of reticulation has been surveyed
- Since then there have been 1,893 leaks that have been found and repaired
- The theoretical **savings from the leak repairs are approximately 4.2 Ml/day**

Internal Leak Repair

Completed internal leak repairs in:

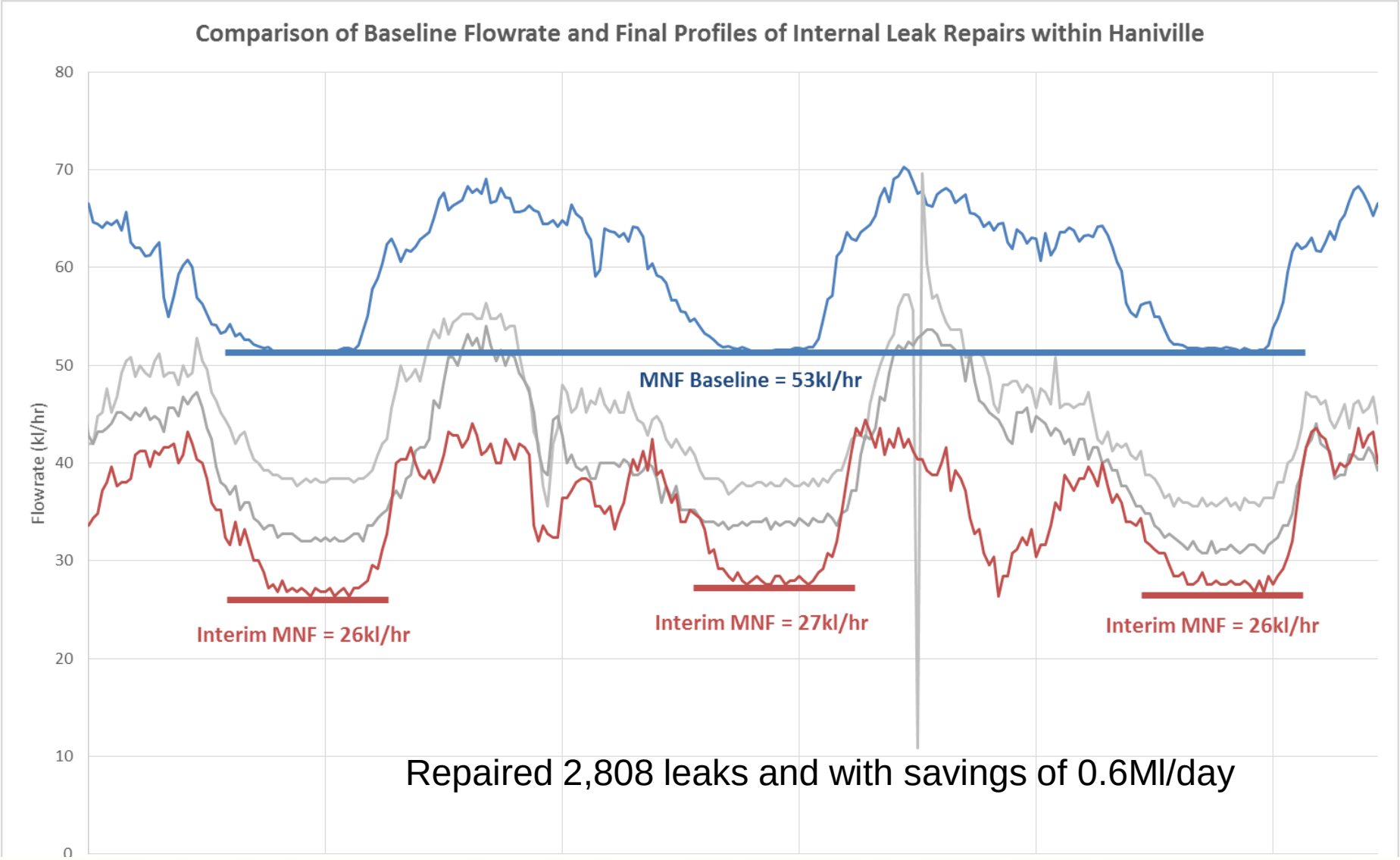
Haniville – 2,808 leaks repaired

Thembalihle – 2,073 leaks repaired

Madiba Park – 1,473 leaks repaired

Cinderella Park – 4,807 leaks repaired

Internal Leak Repair



Repaired 2,808 leaks and with savings of 0.6Ml/day

Restrictor Washers

- In total for the last 18 days 6,233 restrictors were installed at:

Ward Nos	Restrictors installed
25, 26, 28, 31 and 32	630
1, 20, 23 to 27, 32, 33 and 36	949
10 to 13, 15 to 24 and 36	1,609
10, 11, 14, 15, 17 and 18	336
28 to 34	2,385
27, 32 to 37	156
18, 24, 36 and 37	168

Restriction of Consumers

- At present we have restricted the flow to
  - Pietermaritzburg prison by 70%
  - Oribi Village by 50%
  - Various schools by as much as 80%
  - Fort Napier Hospital by 40%
- Presently logging a number of suspect schools and the UKZN for night flows.

Bulk Water Purchases

- In April 2016, Msunduzi purchased an average of 181,459Ml per day.
- Compared to the historical figure of 196.51Ml per day, this represents an 7.66% drop in consumption!
- However there are areas in Msunduzi that are not getting an uninterrupted supply of water on a daily basis due to the water levels in Worlds View Reservoir which rarely exceeds 5% in volume.
- The only way in which UW can increase this level is to shut all outlets for 20 hours!

Bulk Water Purchases

Consumer Awareness

- The program has begun using print media, radio, press conferences, street pole advertising and school awareness

Short Term (next 6 months)

- Consumer Awareness
- Installation of Restriction washers on all households
- Leak Detection and Repair
- Pressure Reduction
- Internal Leak Repairs
- Retrofitting of Standpipes
- Implement Operating Rules – Balancing reservoirs (intermittent Supply)
- Shut Down burst Pipes Immediately – Respond
- Additional Plumbers/Fitters and Vehicles
- Impact on overtime
- **Water Shedding …….**
- **Water Tankers**

Medium Term (6 to 18 months)

- Installation of Restriction washers on all households
- Leak Detection and Repair
- Pressure Reduction
- Internal Leak Repairs
- Policy : Use of hose pipes, Car wash, Penalty/Fines
- **Asset Replacement**
- **Automated Valve installation and check metering**
- Consumer Education
- Employ staff for Water Loss control iro of 2013 approved organisational structure

Long Term (3 years)

- Intensive assets replacement program (R 615 million)
- Elimination of Standpipes via the implementation of the bulk water master plan
- Non-Revenue water reduction program. (ongoing)

Thank You