Properties of faecal sludge from on-site sanitation facilities in Durban, South Africa

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Pollution Research Group

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- Water Research Commission, SA
- Fukamela Building and Maintenance

Overview

Research projects of Pollution Research Group on sludge from site-sanitation:

- Mechanical Properties of Faecal Sludge from different types of onsite sanitation facilities – BMGF
- Reinvent the Toilet Challenge, phases 1 and 2 – BMGF
- Characterisation of On-site Sanitation Material and Products: VIP latrines and pour-flush toilets – WRC

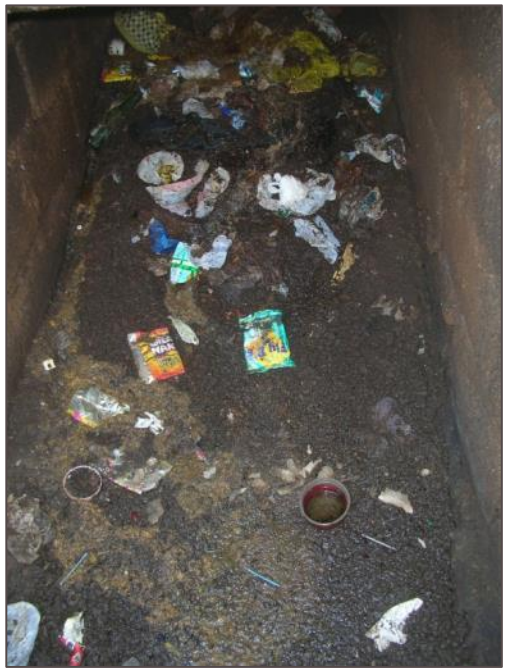
Objectives

- Generate first hand data on faecal sludge characteristics from on-site dry sanitation facilities
- Establish a correlation between facility usage and sludge quantity and quality.
- Provide data for improving of the design and sizing of pit-emptying devices, transport and processing systems for the sludge and the design of future on-site sanitation facilities

Pit emptying

Facility type	Characteristics	Usage level	Number of facilities to be sampled
Household VIP latrine	Dry	Low use (<5 users/facility)	5
		High use (>5 users/facility)	5
	Wet	Low use	5
		High use	5
Household UD toilet		Low use	5
		High use	5
Household unimproved pit latrine	Wet or dry	Low use	5
		High use	5
Community ablution block VIP	Dry or wet	High use	5
School VIP toilet block	Wet or dry	High use	4

Dry VIP



Pit emptying – dry VIP

Wet VIP

Pit emptying – wet VIP

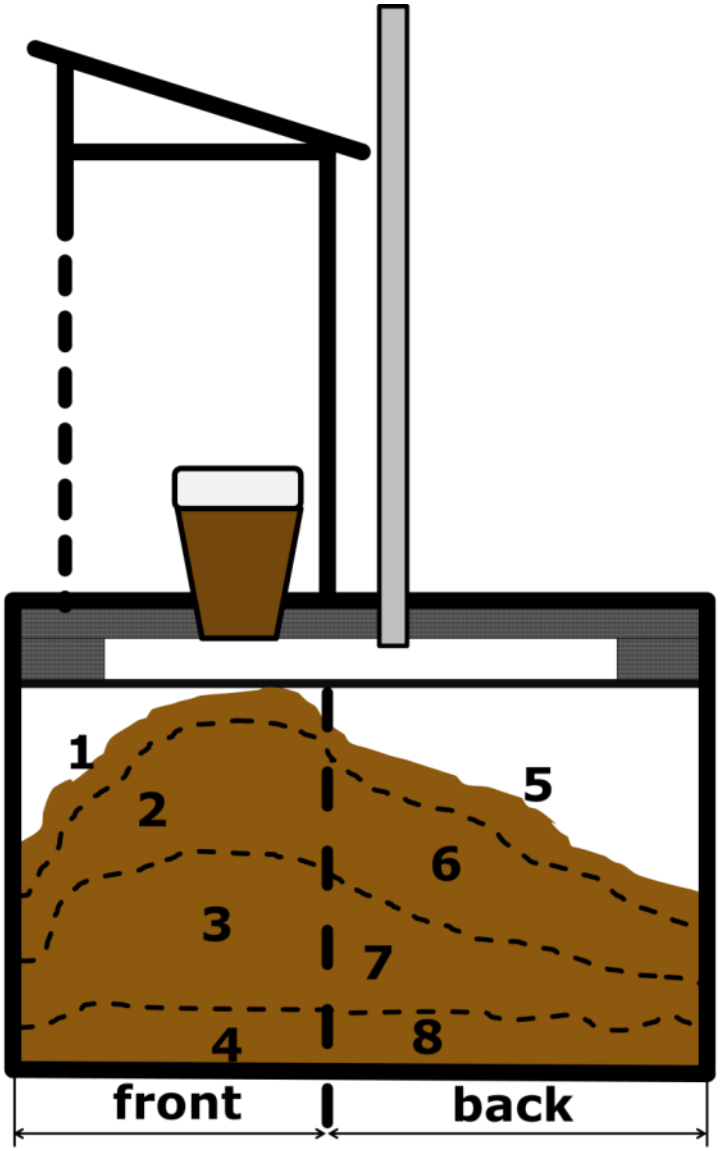
Pit emptying – wet VIP

Indication of the water level depth

UD

Pit emptying – UD toilet

Selection of analytical samples at different depth levels of pit



Experimental programme

Analyses on faecal sludge

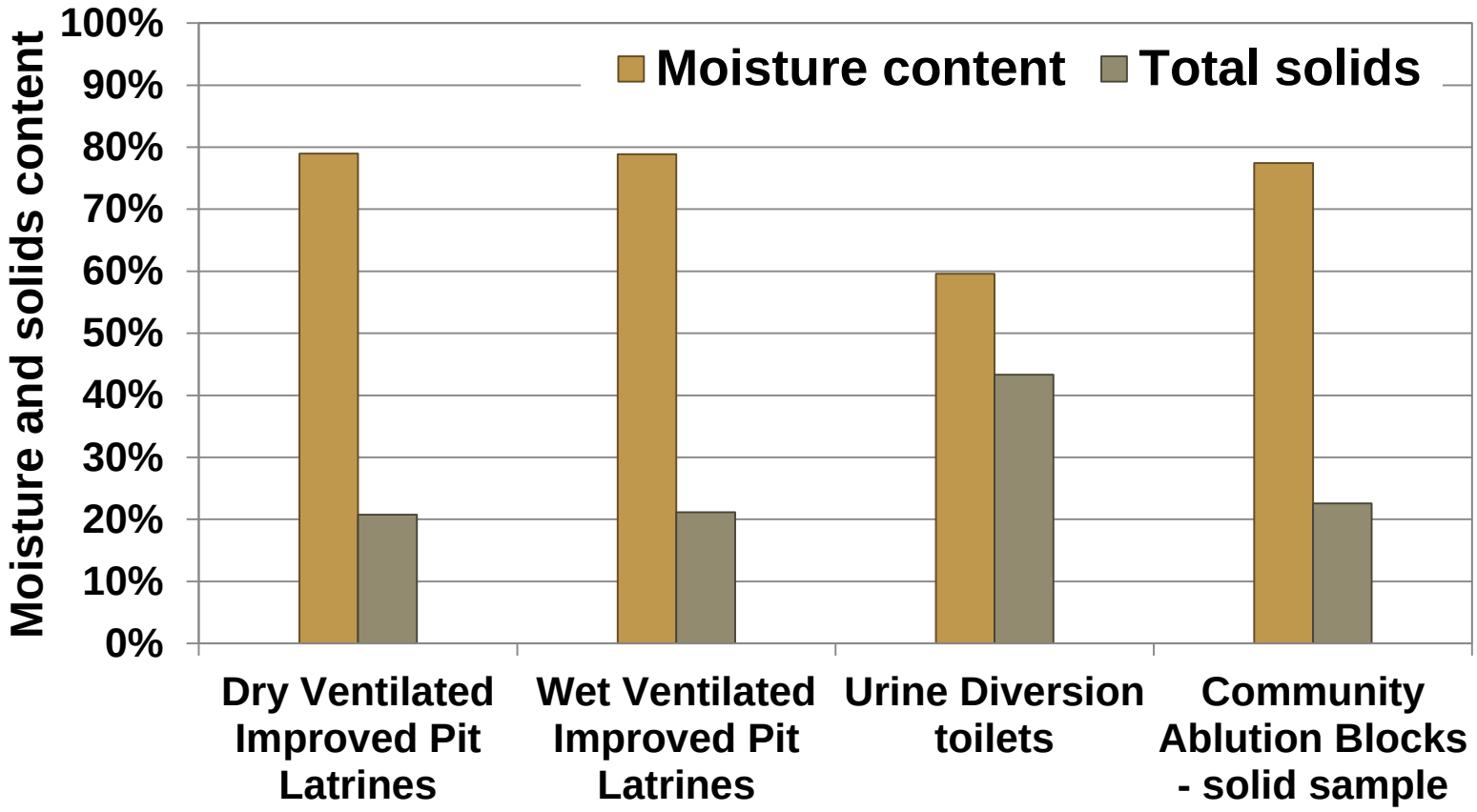
- Moisture content/ Total solids
- Volatile solids
- Suspended solids
- TKN
- Ammonia
- COD
- pH
- Nitrates/Nitrites
- Potassium
- Orthophosphates/Total phosphates
- TOC

Analyses on faecal sludge

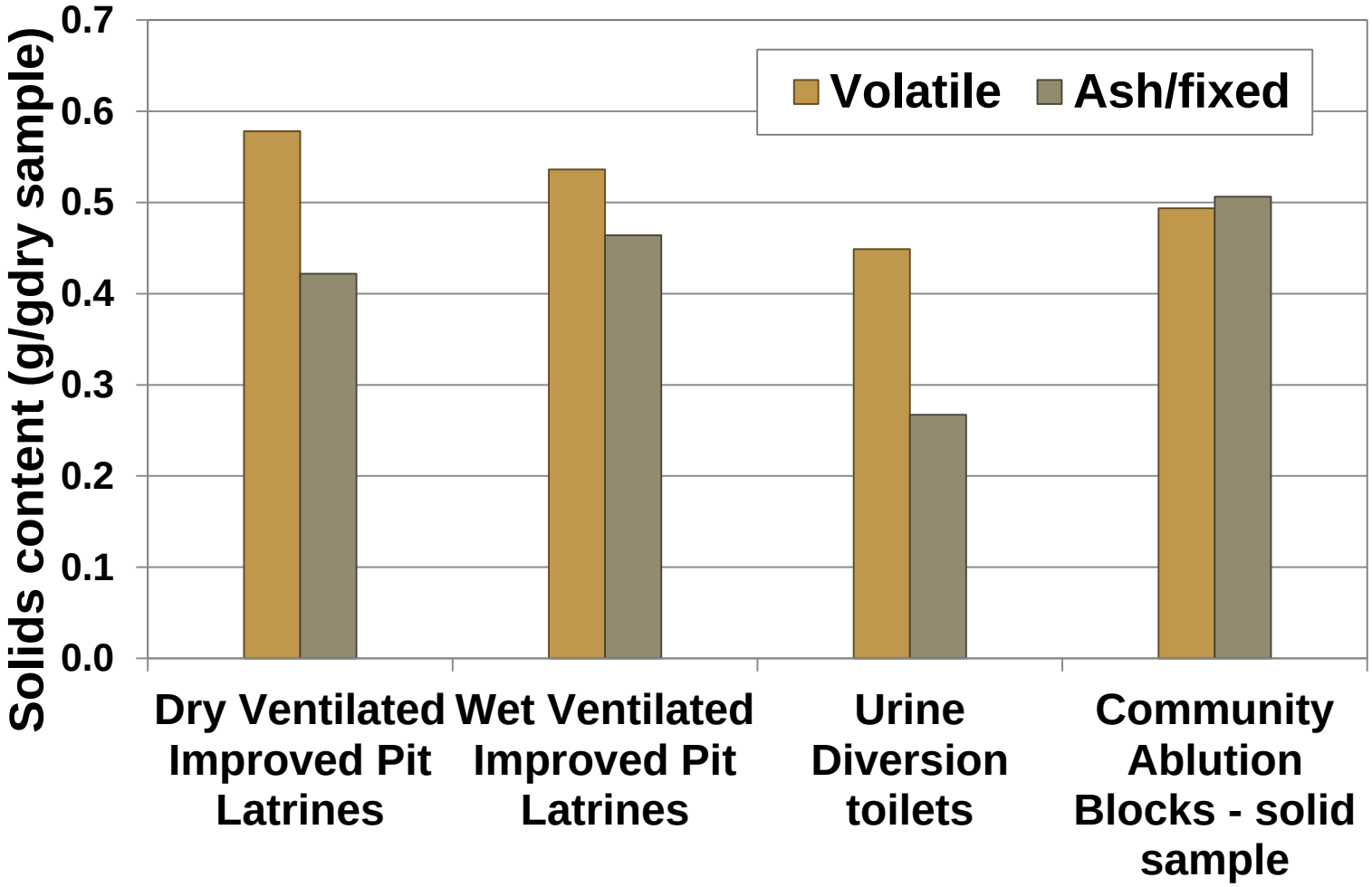
- Calorific value
- Specific heat
- Thermal conductivity
- Rheological properties (Viscosity)
- Plastic and liquid limits
- Density
- Sludge volume index
- Particle size distribution
- Ascaris/parasites content

Results

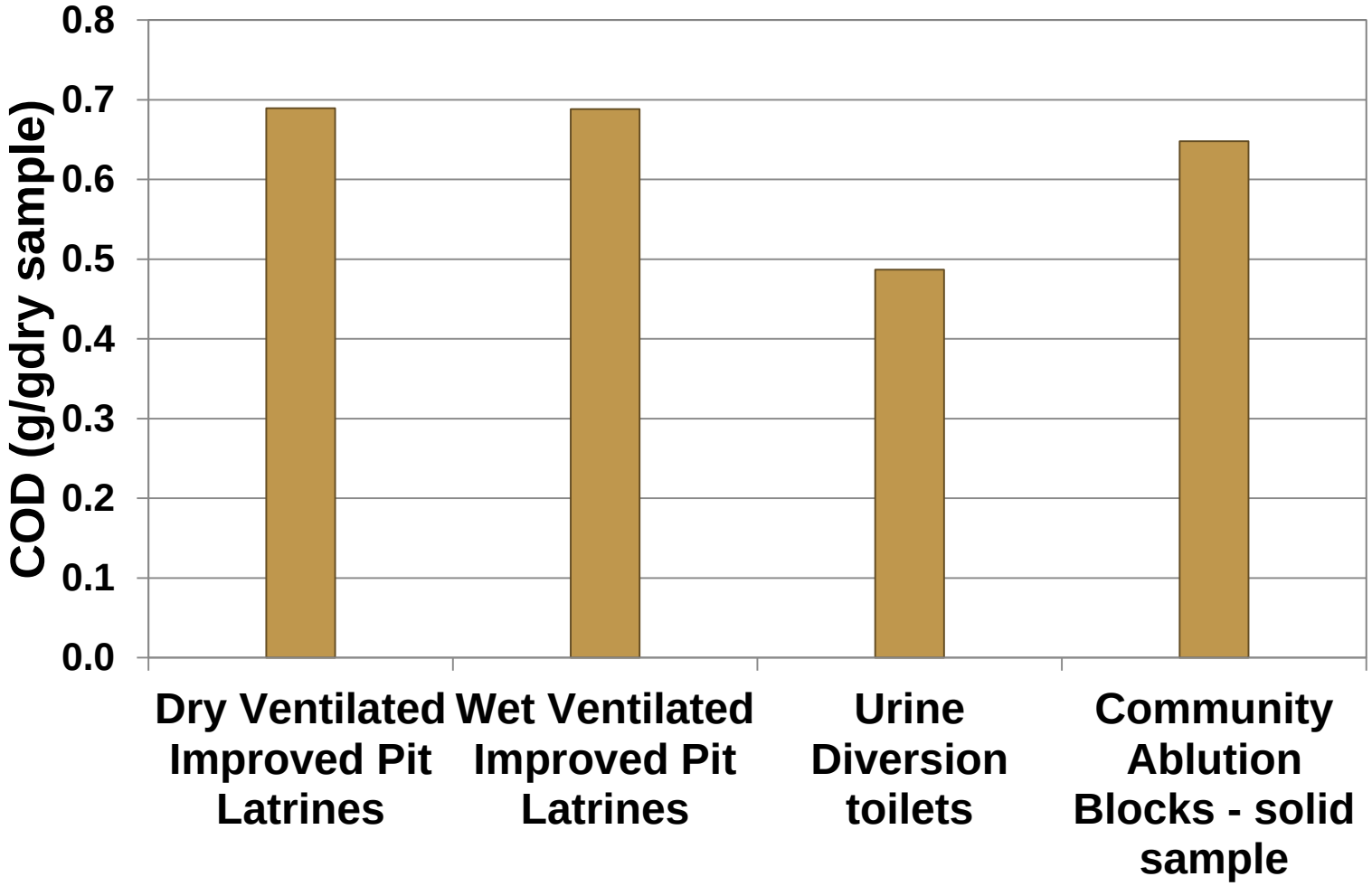
Average moisture and total solids content



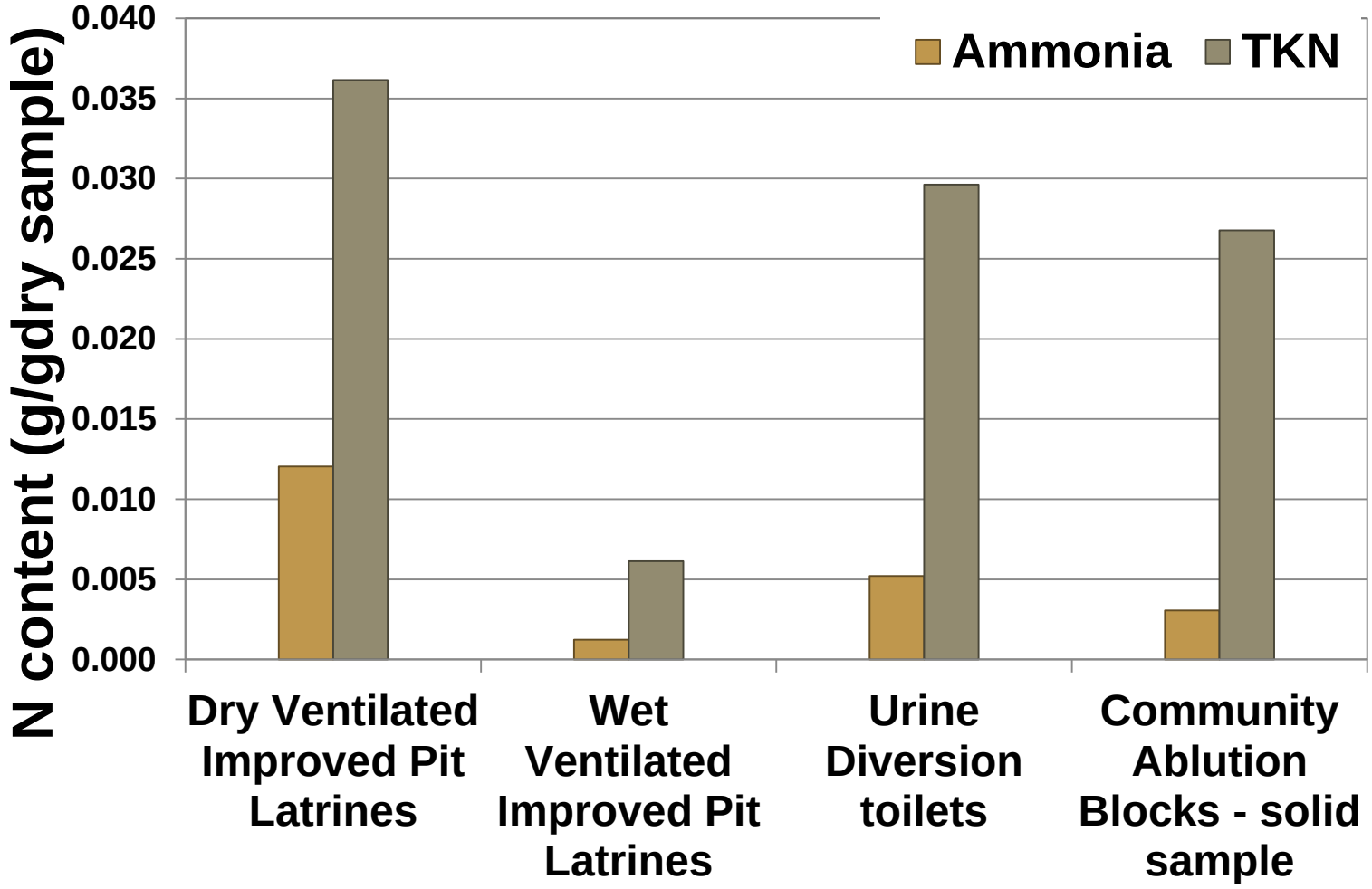
Average solids content (volatile and fixed)



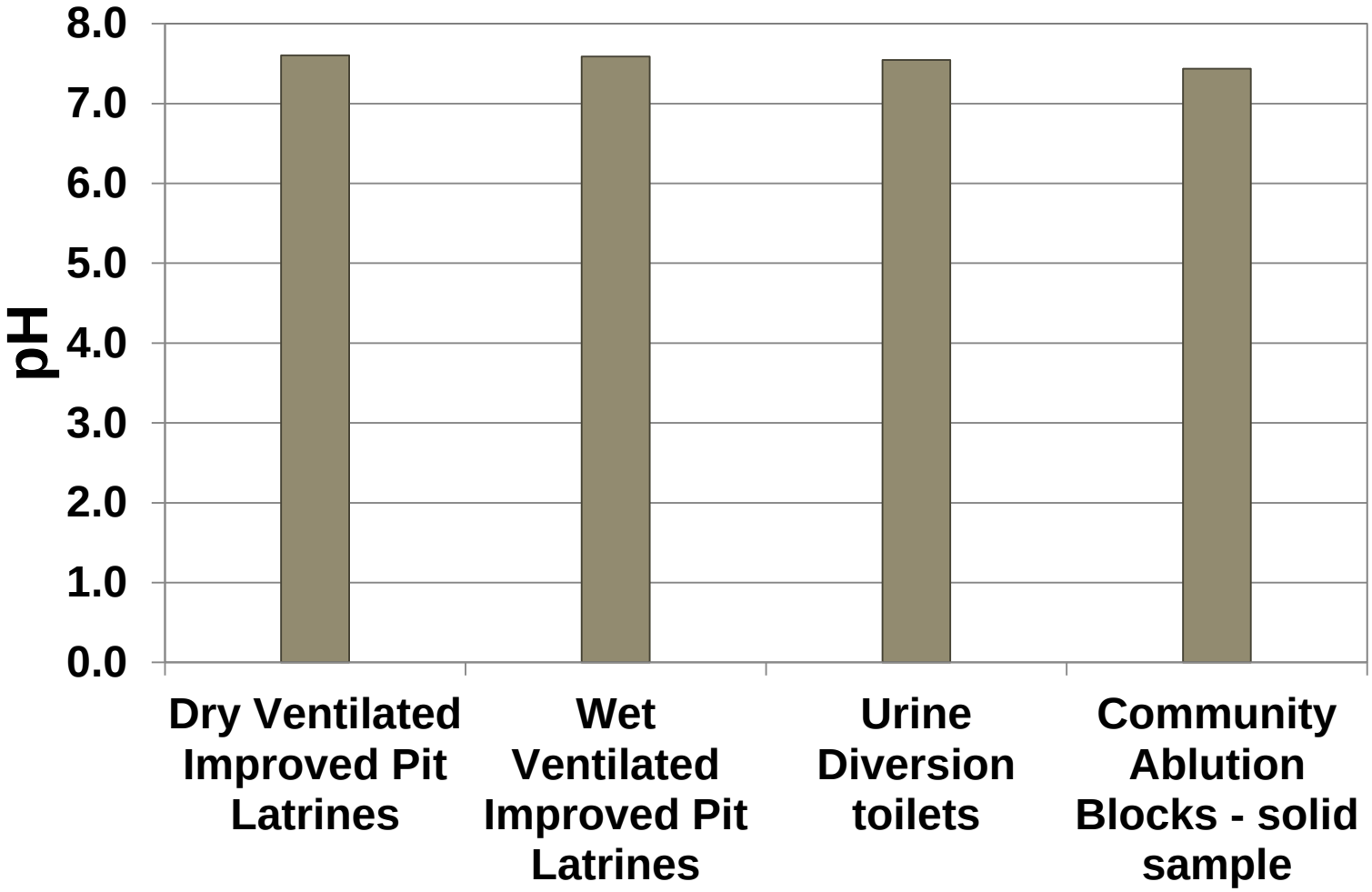
Average COD content



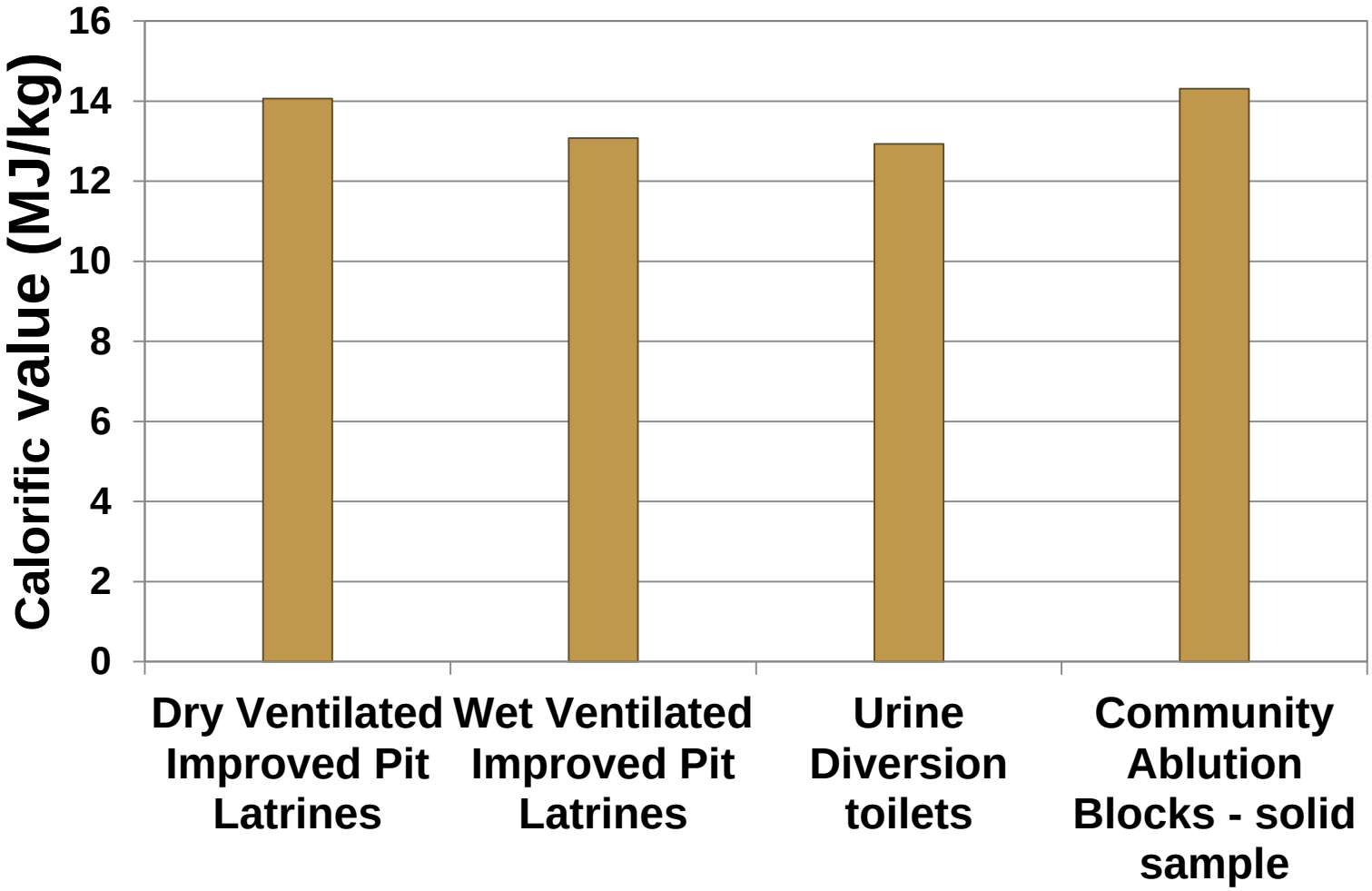
Average Ammonia and TKN content



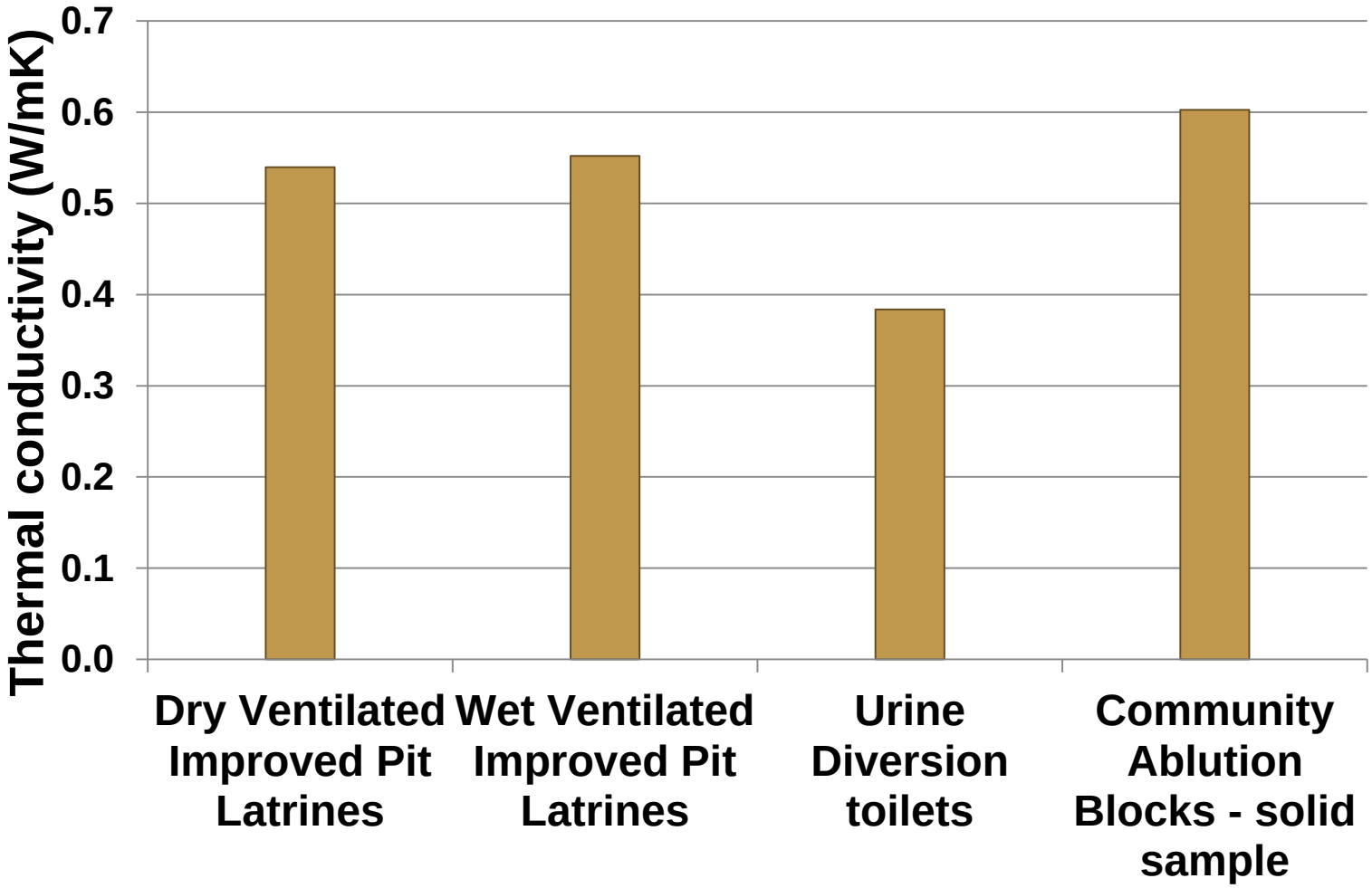
Average pH values



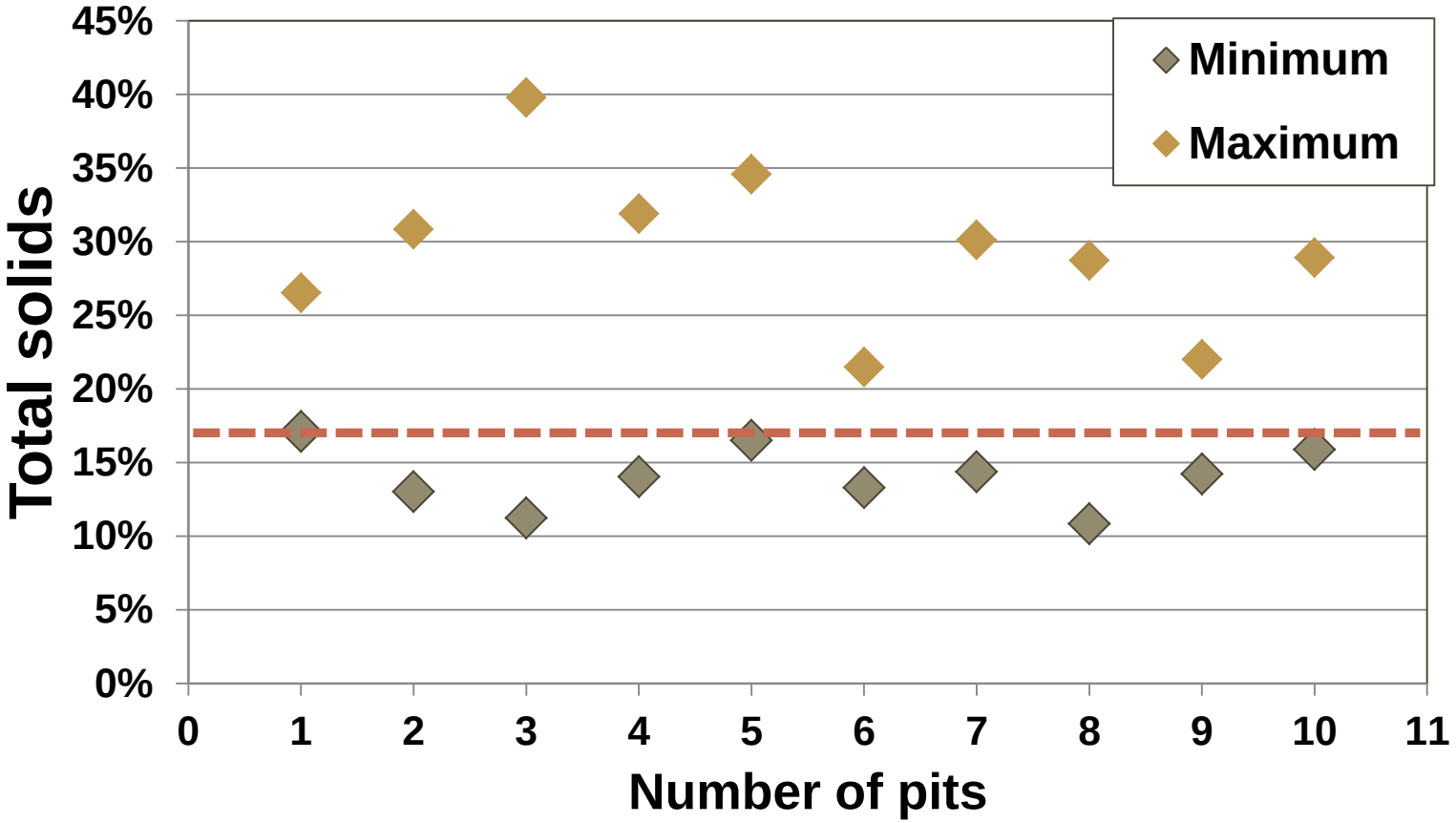
Average calorific values



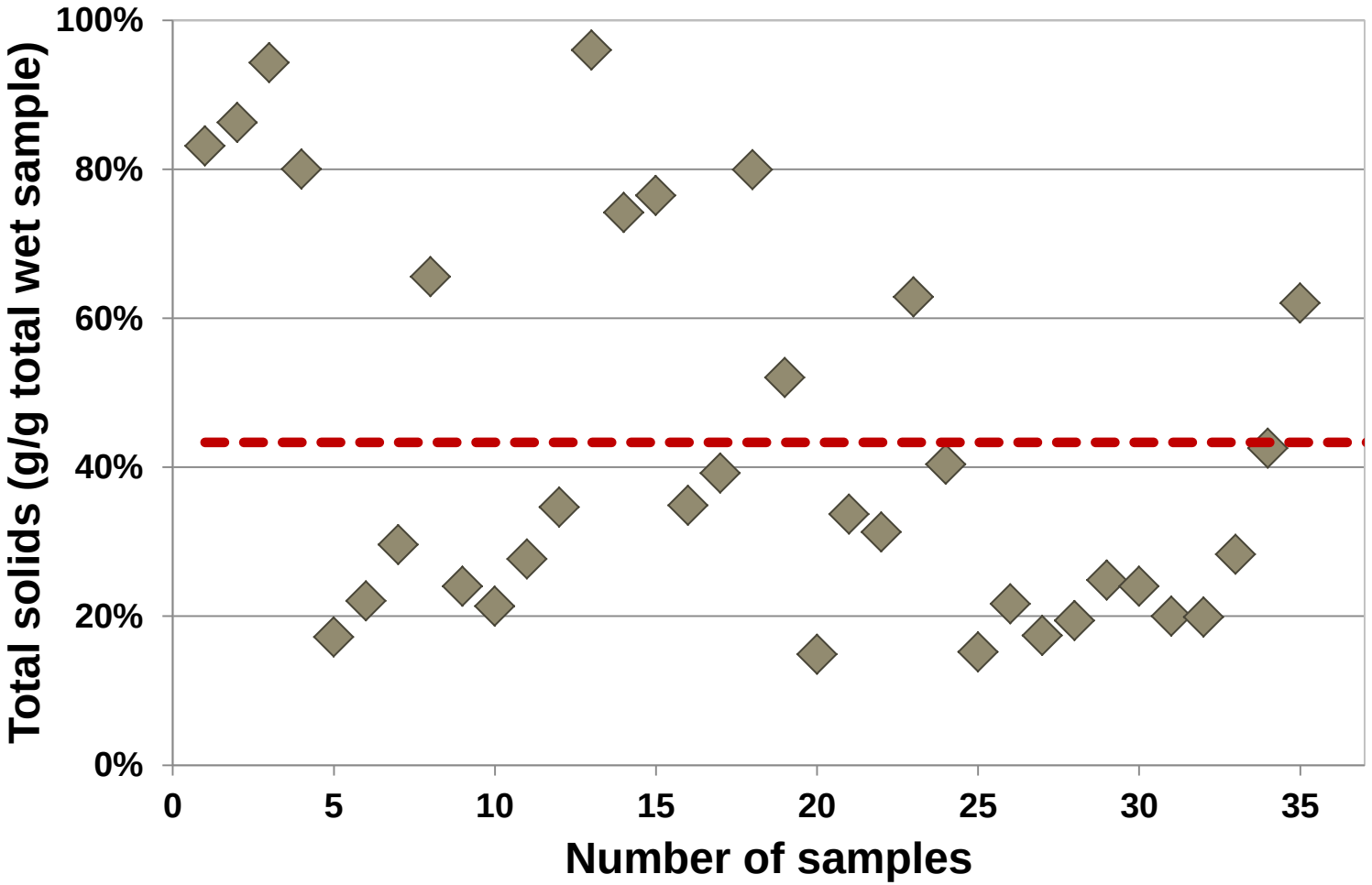
Average thermal conductivity



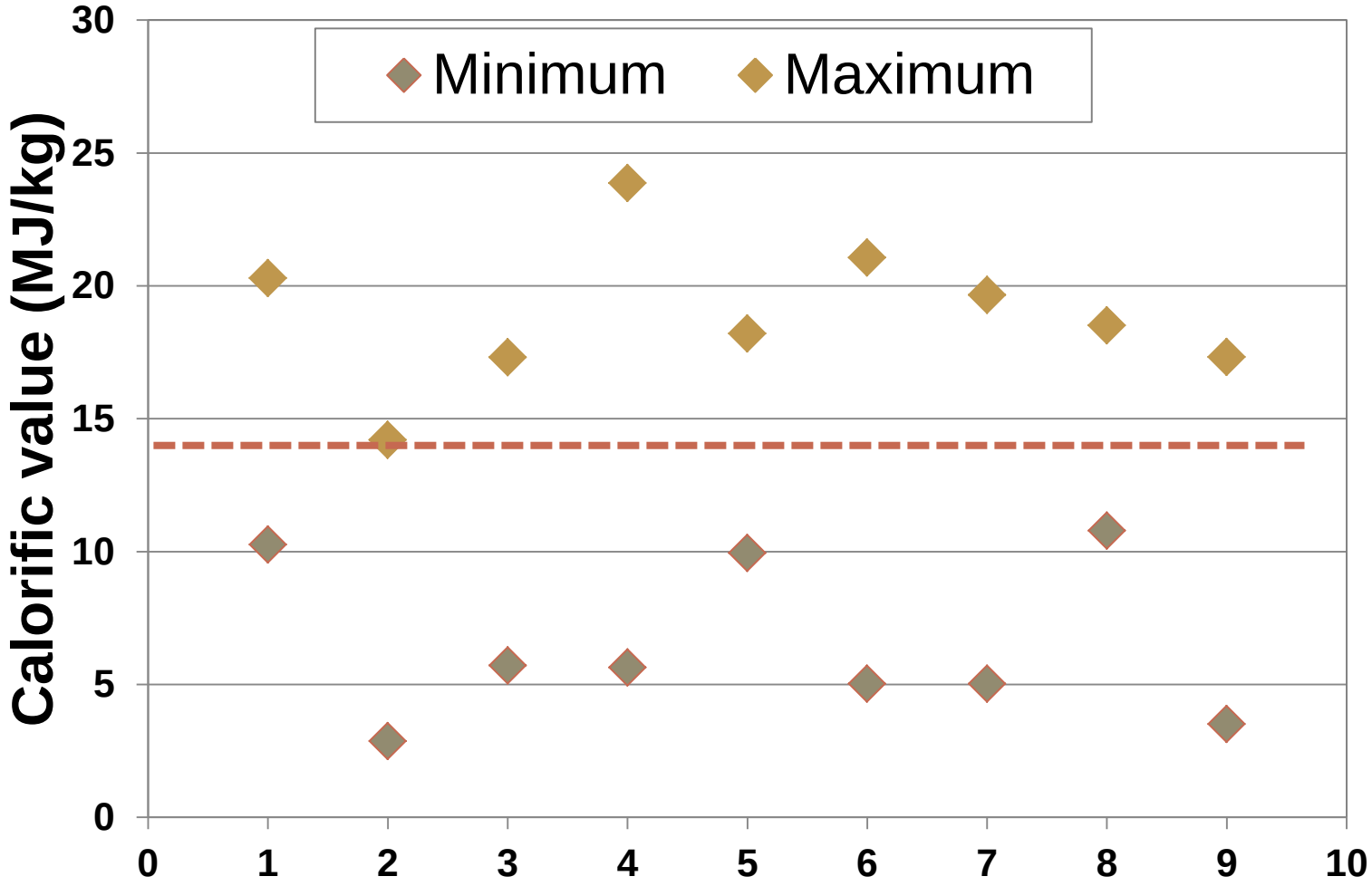
Total solids variation – dry VIP



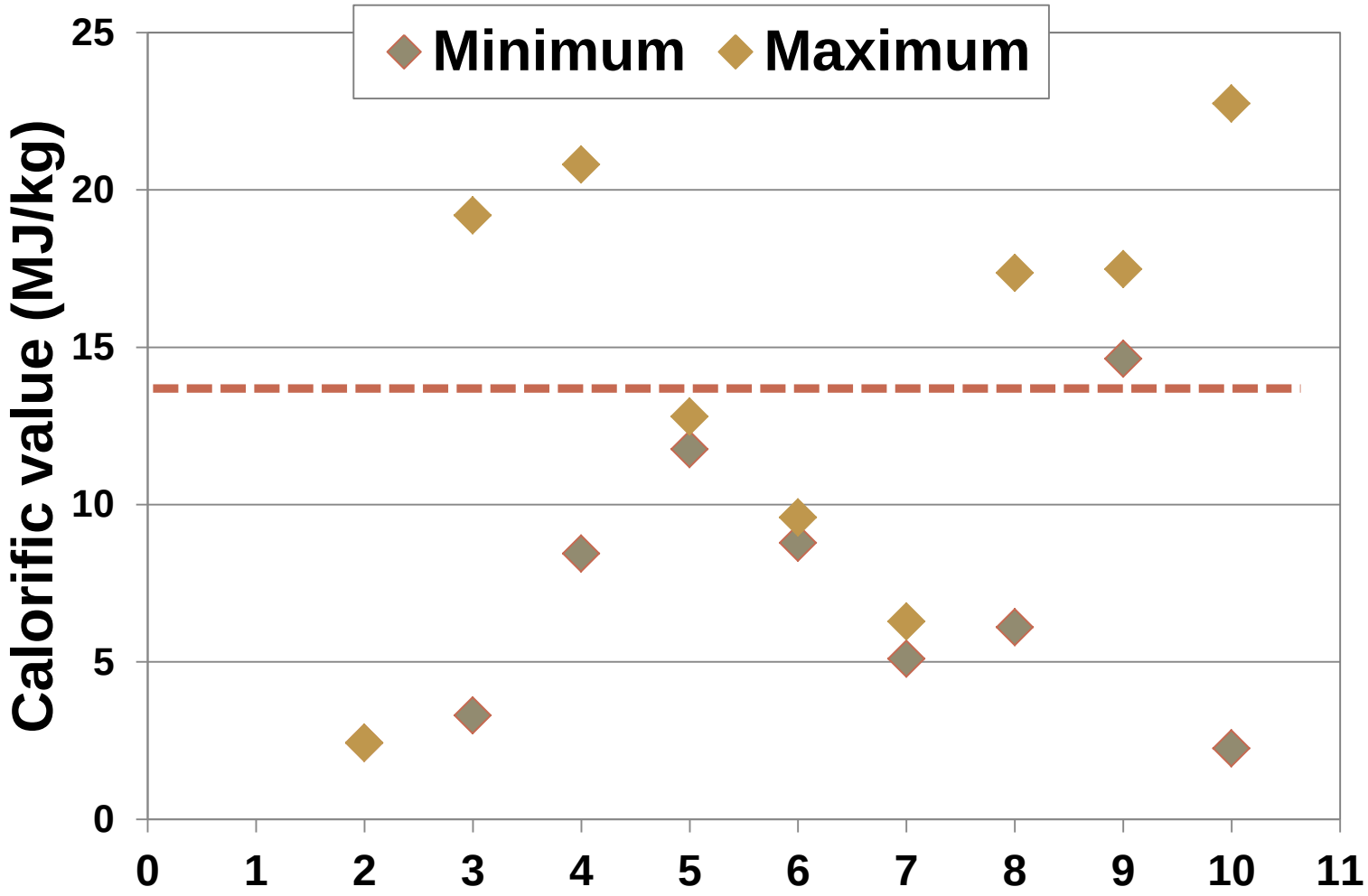
Total solids variation – UD



Calorific value variation – dry VIP



Calorific value variation – UD



Conclusions

- The front and back sections of the dry pits showed a tendency of a decrease in physico-chemical properties with depth
- The degree of degradation within the dry pits decrease with distance from the drop hole both horizontally and vertically.
- The wet VIPs do not show any clear trend, however three distinct regions were observed: crust of sludge (top layer), liquid (middle layer) and sediment (bottom layer).

- By average values, there were no significant differences of the presented properties between different on-site sanitation facilities
- However, there were variations (sometimes significant) between the minimum and maximum values of one and the same pit
- The differences are due to changes in properties with depth of the pit and users behaviour
- Further research and data analysis will provide better link between properties of faecal sludge and usage load

Thank you!

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