Characterisation of faecal sludge from Pour-flush Toilets

chemical, mechanical and biological properties

Aoife Byrne
(BA BAI Trinity College Dublin)
University of KwaZulu-Natal

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WATER RESEARCH COMMISSION

PRG
pollution research group

Household Information

- 4 sites were sampled on 4 occasions over a period of 11 months

Site Name	Site 1	Site 2	Site 3	Site 4
Household Size	7	6	2	8
Leach pits type and commission date	*Standing pit:* Jan 2011 – Dec 2012 *Active pit:* Dec 2012 - present	*Standing pit:* Jan 2011 - Dec 2012 *Active pit:* Dec 2012 - present	*Single pit:* Jan 2011 - present	*Single pit:* Jan 2011 - present

Site 1

Active

Standing

Site 2

Active

Standing

Site 3

Site 4

Sampling Tube

Sampling Bucket

Sample Storage

Chemical Analysis

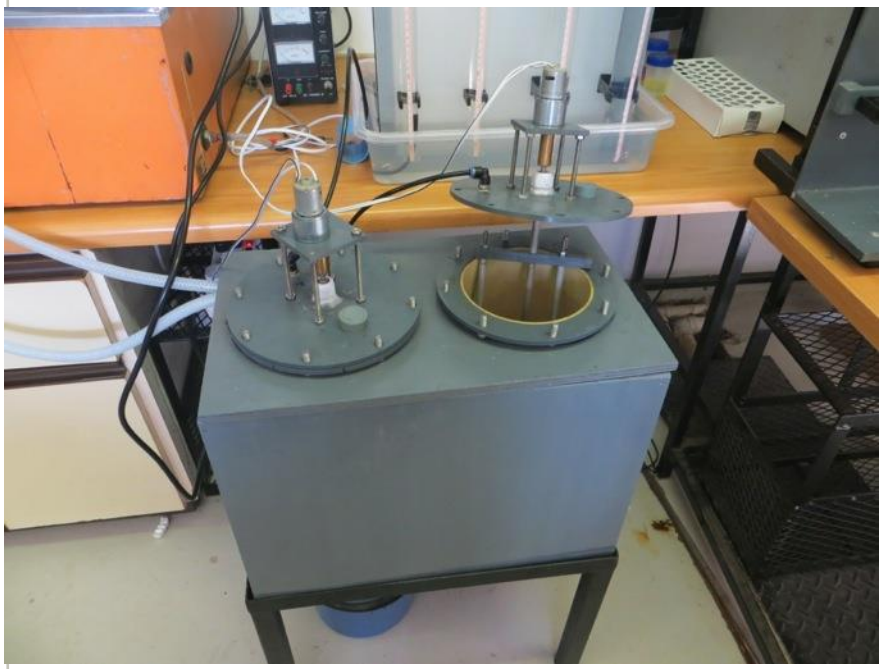
- Total solids
- Volatile solids
- Ash content
- Water content
- Total and soluble COD
- TKN
- Ammonia
- Nitrate
- Total and ortho phosphate
- Sodium
- Potassium
- pH

Mechanical Analysis

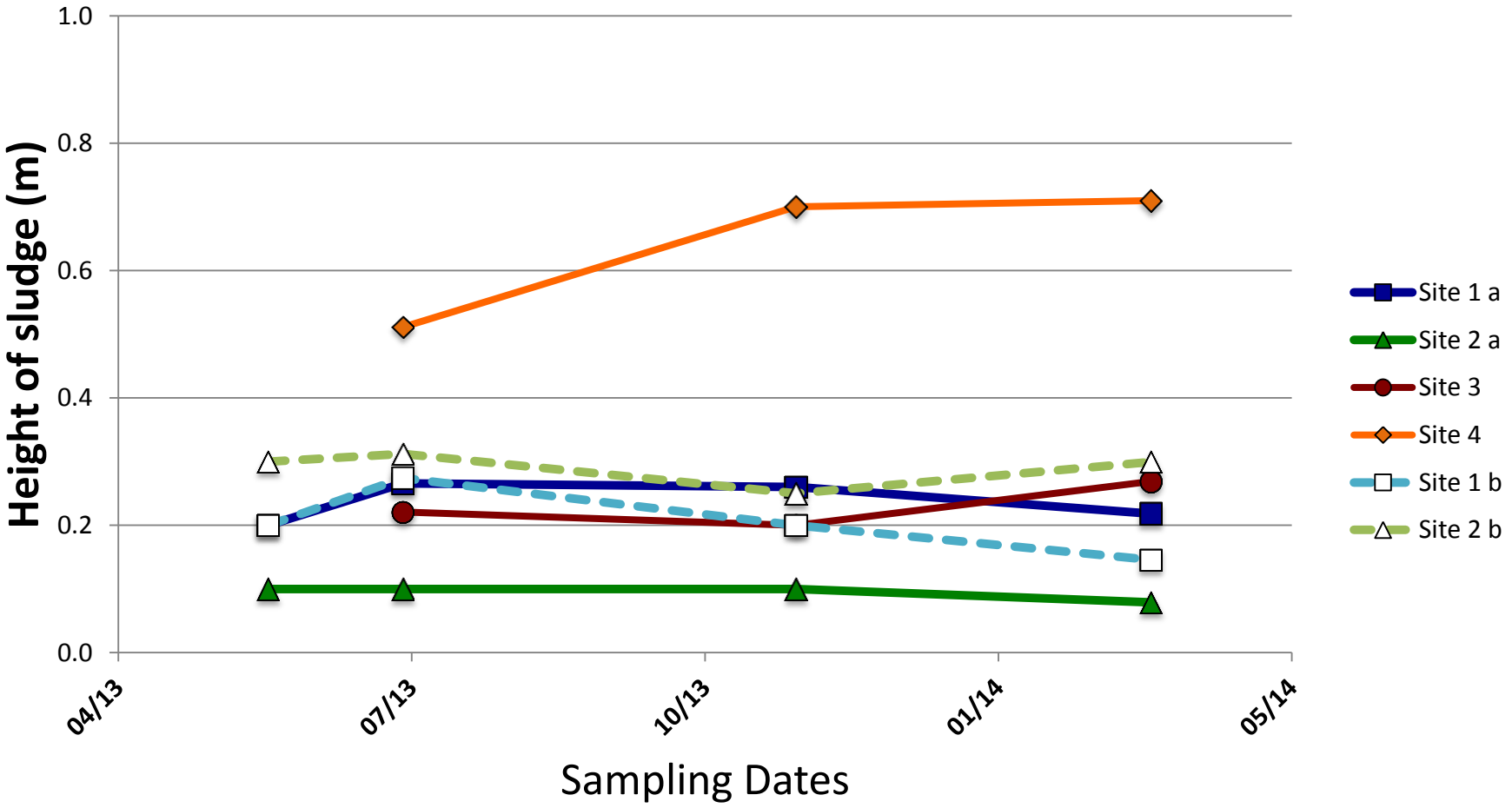
- Viscosity
- Shear strength
- Plastic and liquid limit
- Flow

Biodegradability

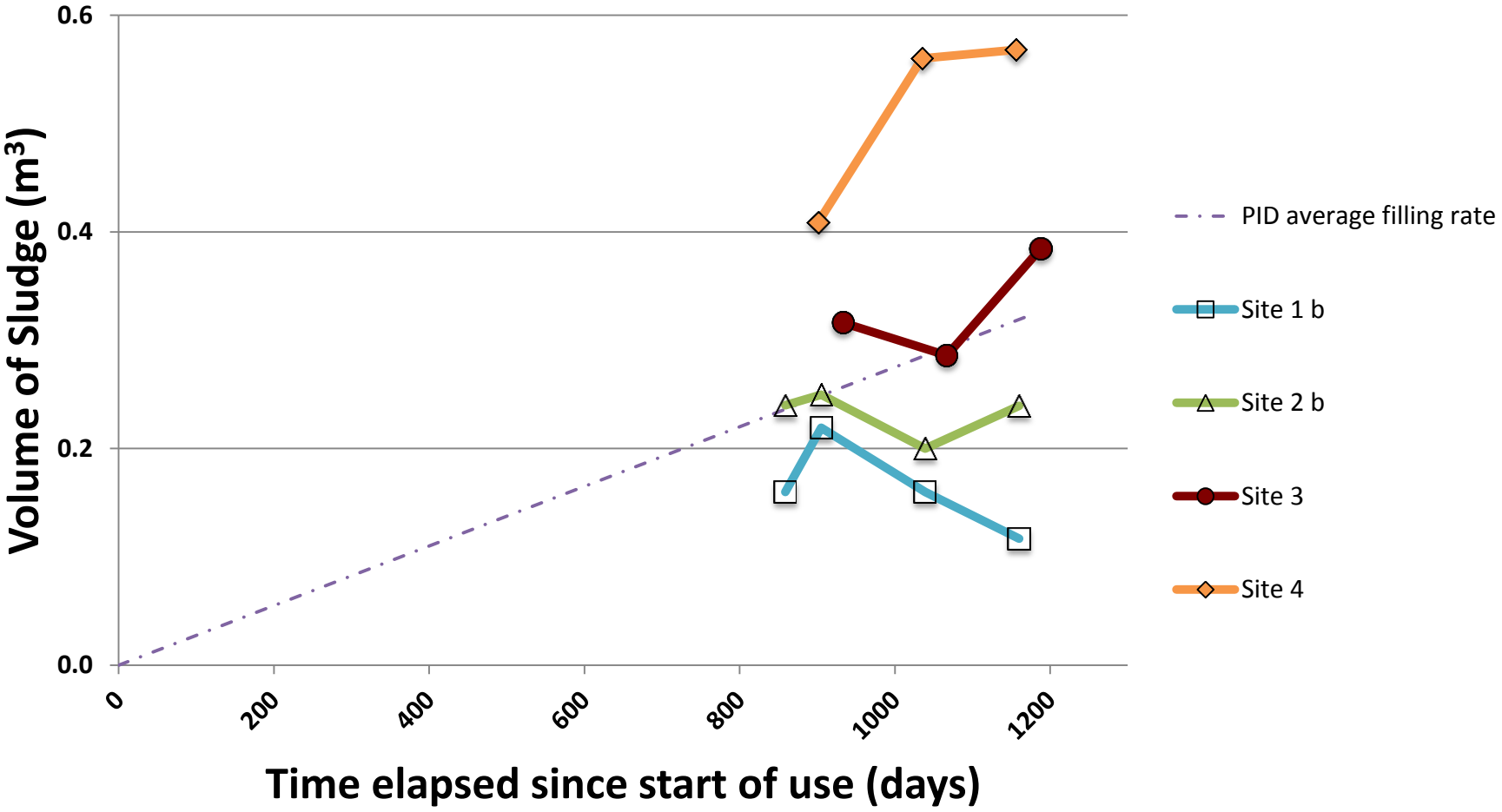
- Continuously Stirred Tank Reaction



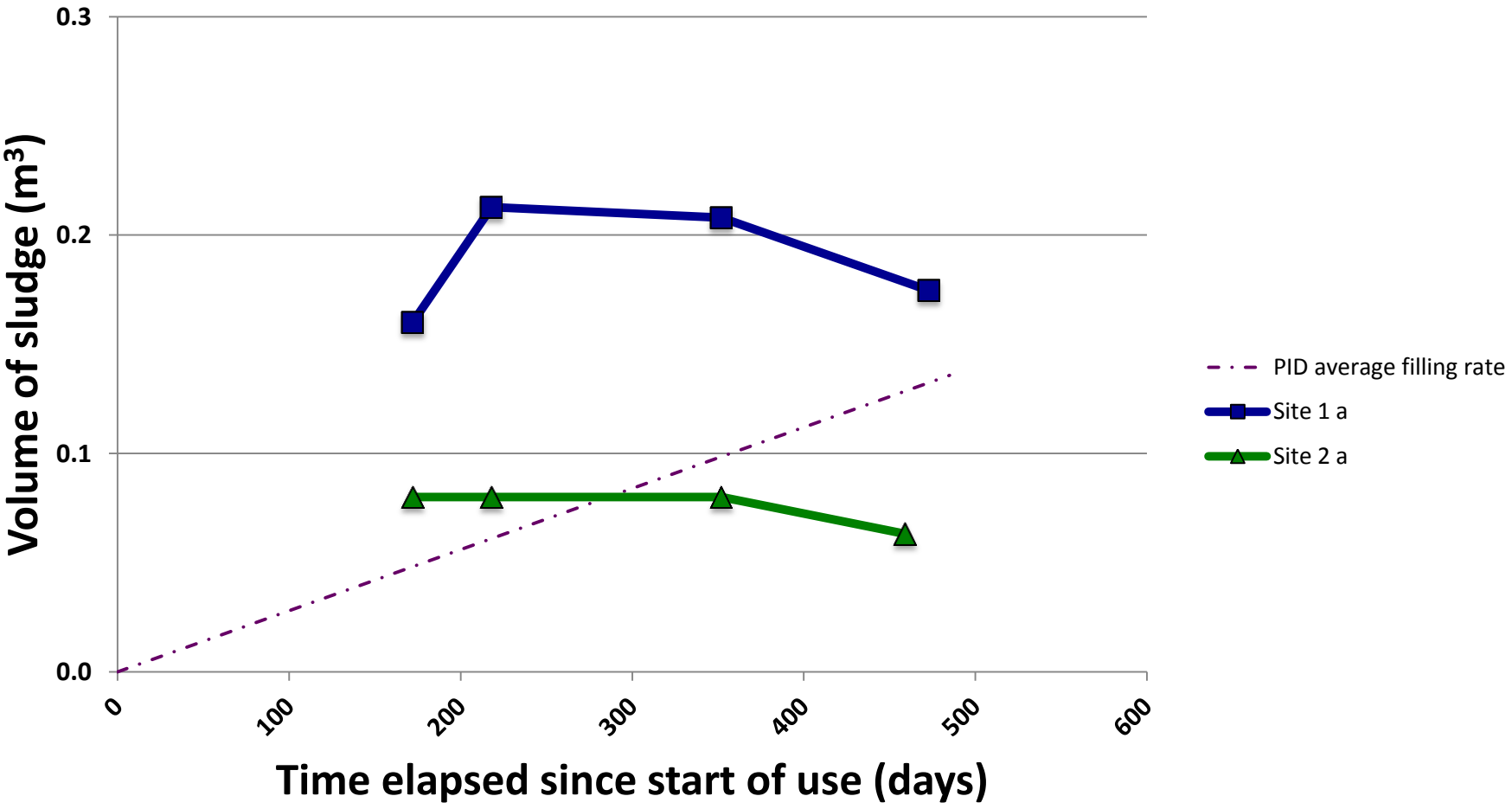
Measured sludge heights



Sludge volumes of pits commissioned in 2011

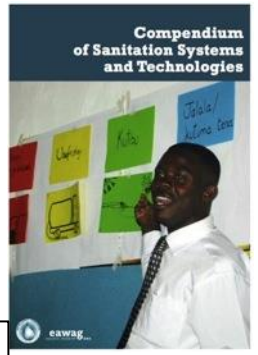


Sludge volumes of pits commissioned in 2012

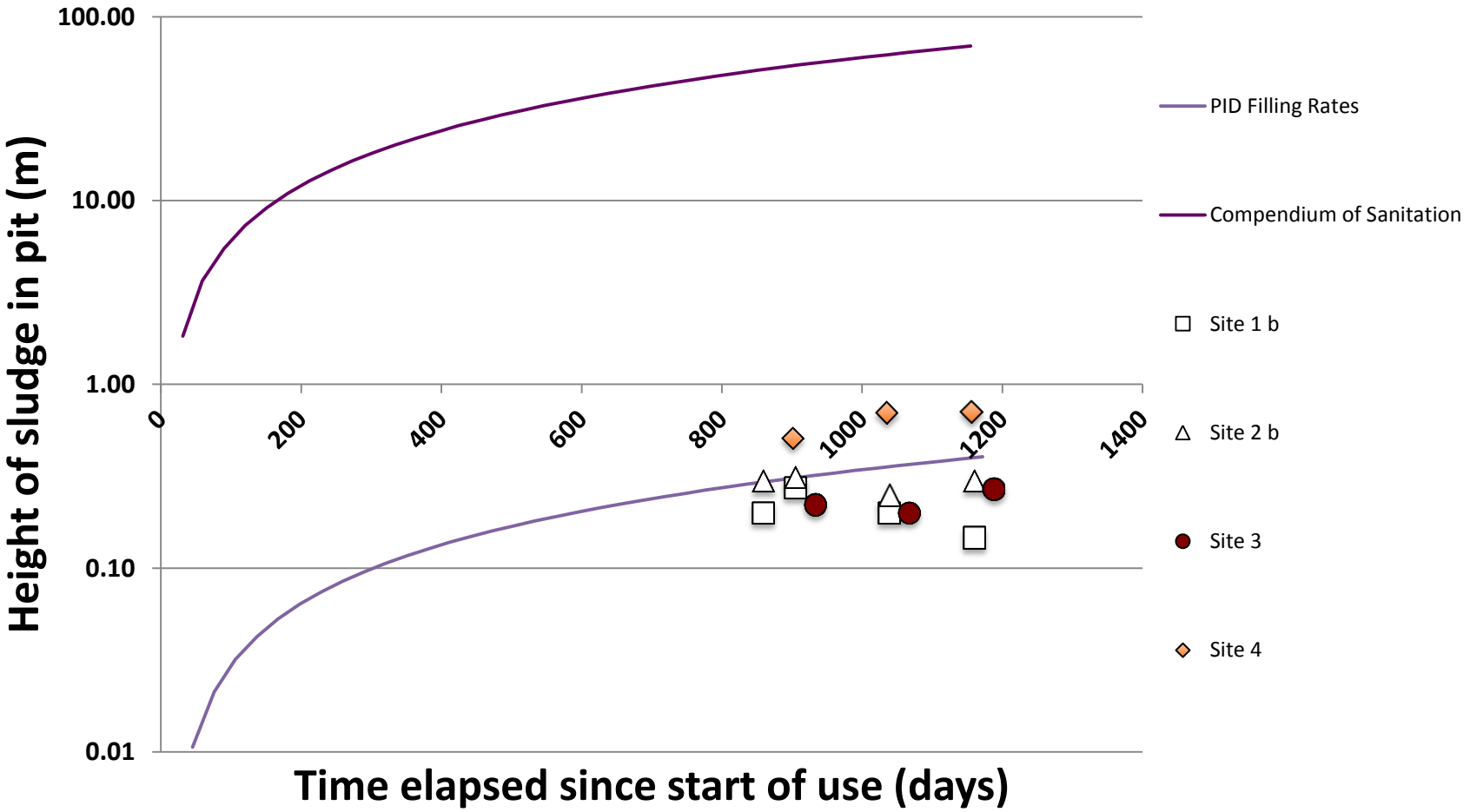


Gross Mass Balance

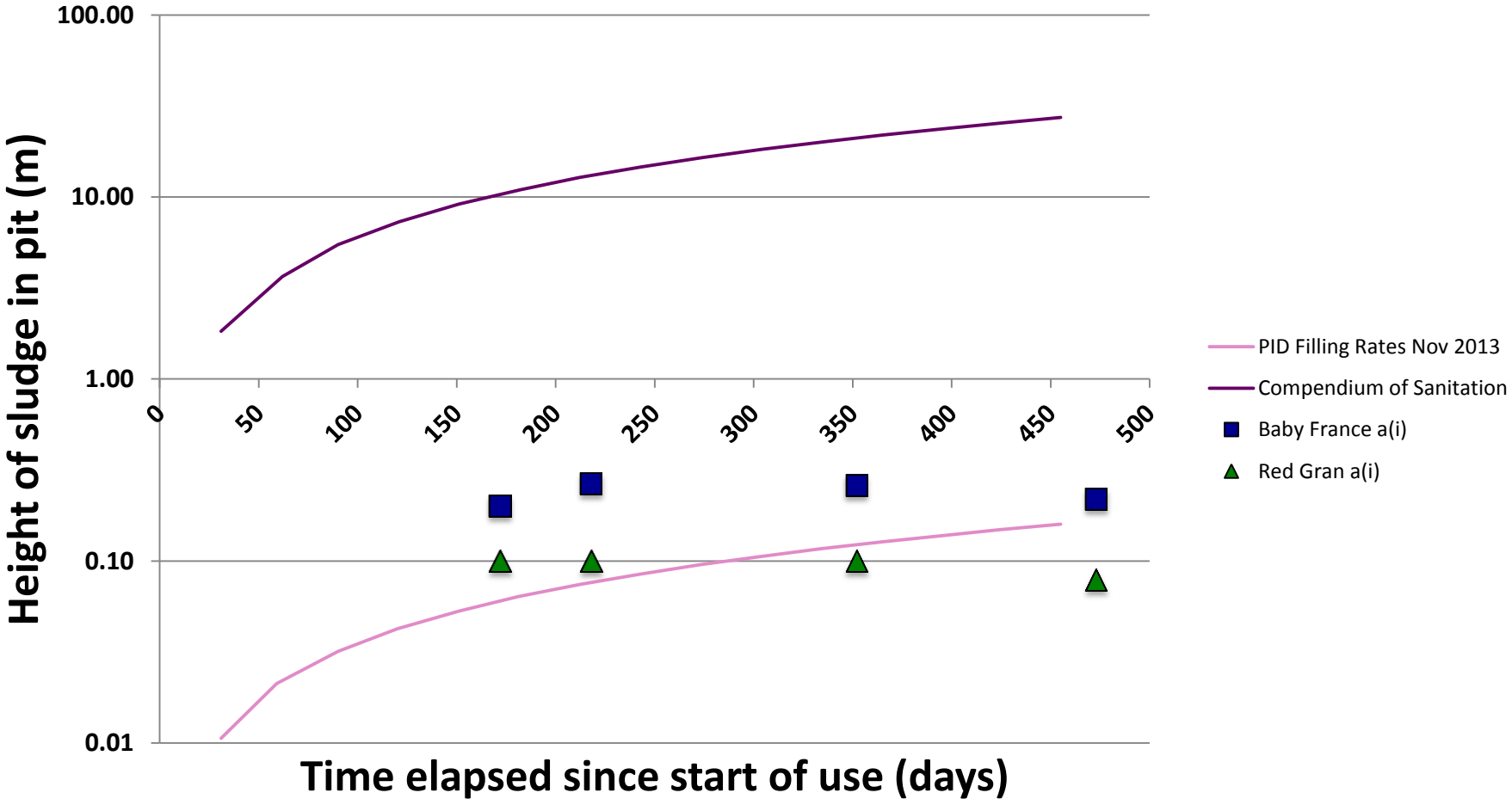
- Compendium of Sanitation (Tilley et al. 2008)
  - Faeces = 50 l/p/yr
  - Urine = 500 l/p/yr
- Still and Louton (2012)
  - Average household size = 6.4
  - Cross-sectional area of leach pit = 0.8 m^2
  - Volume of water per flush = 1.5 l
  - Filling rate = 23 l/p/yr
- Assumptions
  - Closed system
  - Flushes per person per day = 4
    - 4 x 1.5 l x 365 = 2190



Height of sludge in pits commissioned 2011



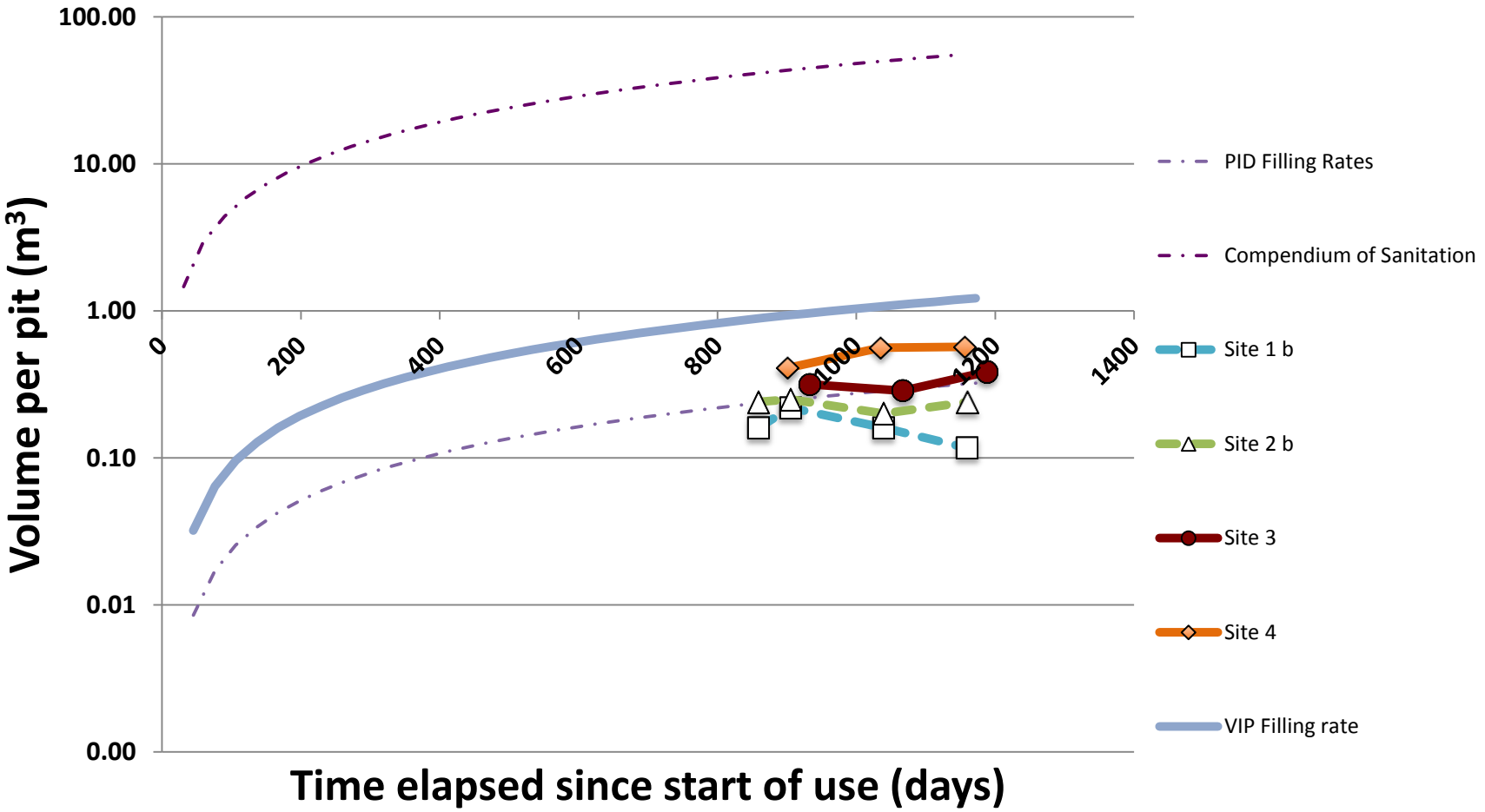
Height of sludge in pits commissioned 2012



Comparison to VIP latrine sludge

Determinand	Units	Ventilated Improved Pit latrines	Pour-flush toilet
Total Solids	[g/g wet mass]	0.2 – 0.5	0.2 – 0.4
Moisture Content	[g water/g wet mass]	0.7 - 0.8	0.6 – 0.8
Ash content	[g ash/ g wet mass]	0.02 - 0.3	0.1 – 0.3
Volatile Solids	[g/g wet mass]	0.07 – 0.2	0.08 - 0.09
Total COD	[g COD/g wet mass]	0.03 – 0.2	0.07 – 0.2
TKN	[g N/g wet mass]	0.004 – 0.01	0.004 – 0.007
Ammonia	[mg NH_3/g wet mass]	0.3 – 5	0.6 – 1
Ortho Phosphate	[mg PO_4^{3-}/g wet mass]	0.02 – 0.2	0.5 – 2
pH		7.3 – 8.9	6.0 – 8.4

VIP vs. Pour-flush filling rate



Conclusion

- Pour-flush leach pit 'cleaner' than VIP latrines
  - Limited amount of household waste enters the pit
  - Slower filling rate
  - Should be easier to empty by pumping

- Chemical, mechanical and biological analysis has been conducted on samples taken over a period of 11 months
  - Full analysis yet to be completed