Best Management Practices

Assessment of the Design and Function of James City County Retention Ponds

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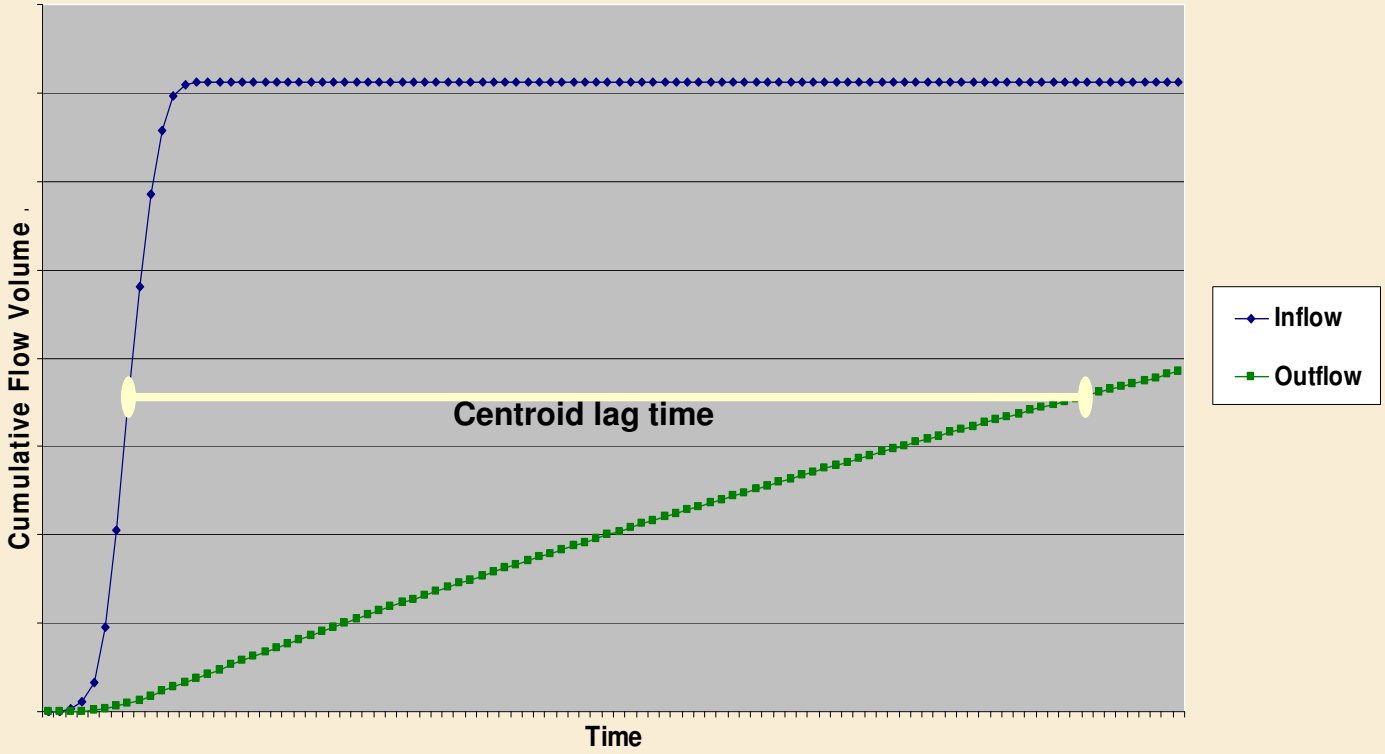
Background

- Retention ponds used for storm water management in developed areas

- Designed to control storm runoff, thus protecting downstream watersheds

James City County Regulations



- James City County requires 24-hour detention of 1-year, 24-hour storm runoff volume (as defined by lag time between inflow and outflow centroids)

Questions

- Do peak inflows, peak outflows, and runoff coefficients at Mulberry pond agree with designs?
- Do centroid lag times at Mulberry pond comply with James City County regulations?
- Are the designs of James City County retention ponds in compliance with regulations?

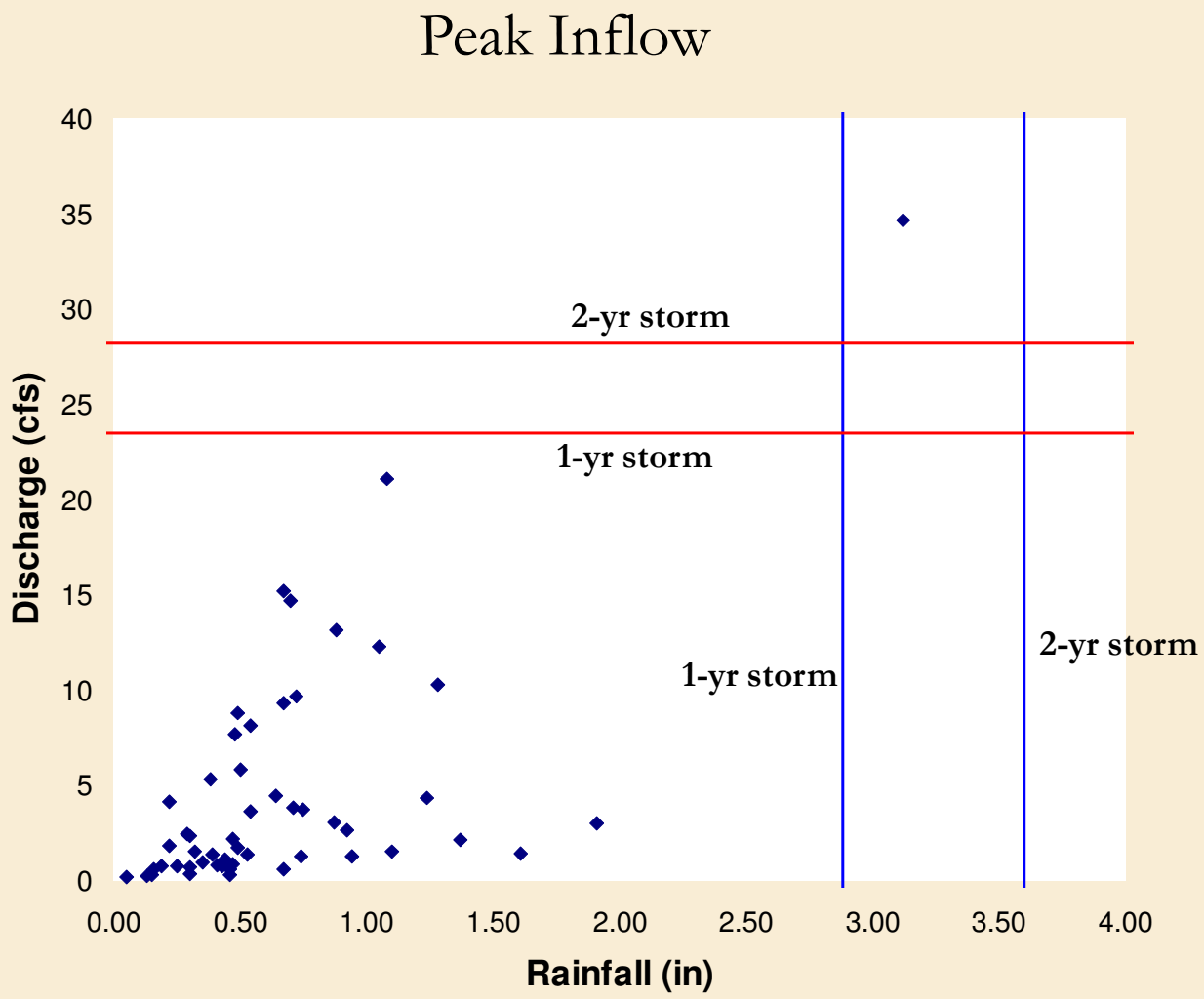
- **Pond designs based solely on calculations; little to no field data**

Mulberry Place

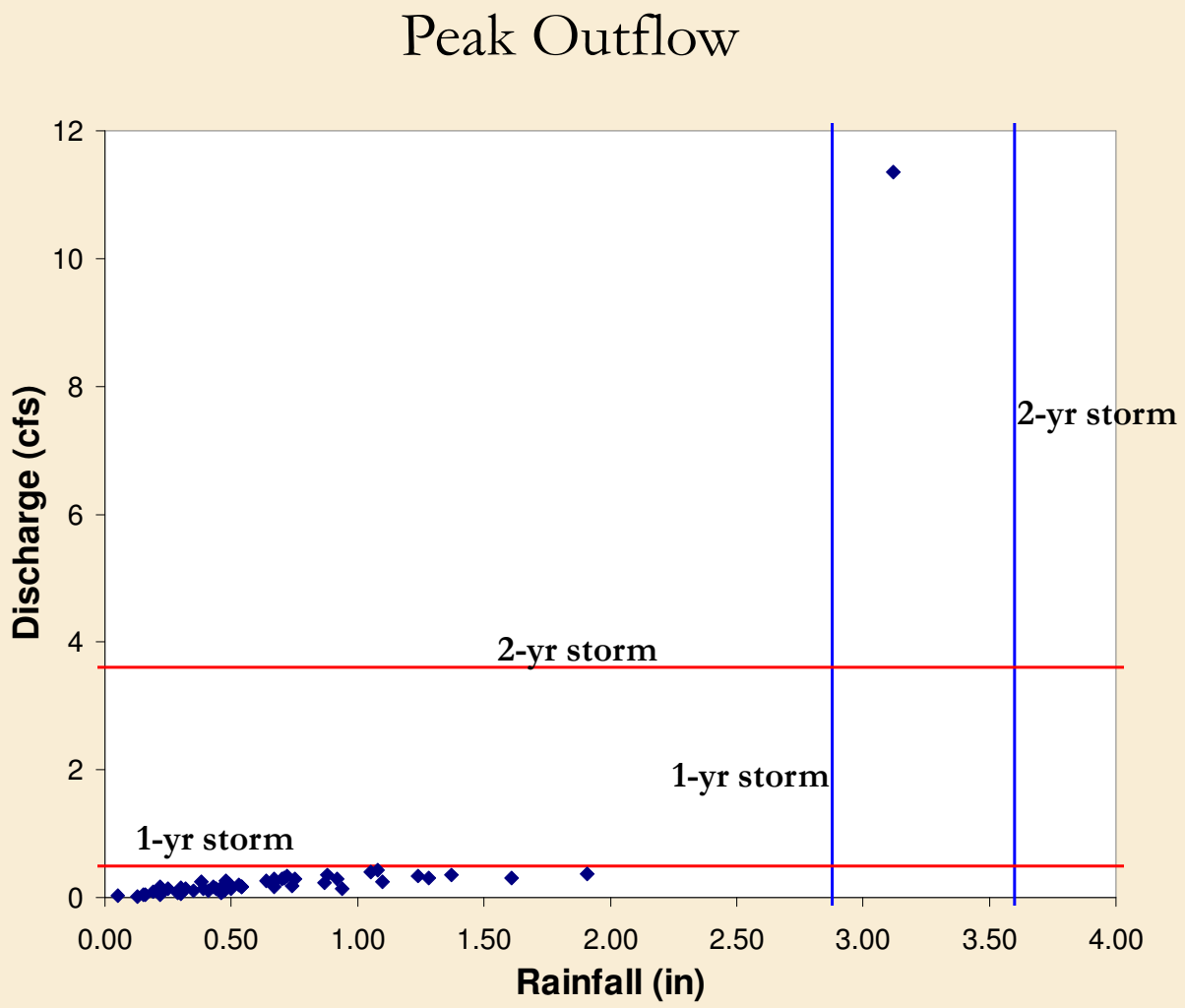
- Pressure Transducer
  - Measures elevation
  - Calculate peak inflow and outflow from this data

- Tipping-bucket rain gauge

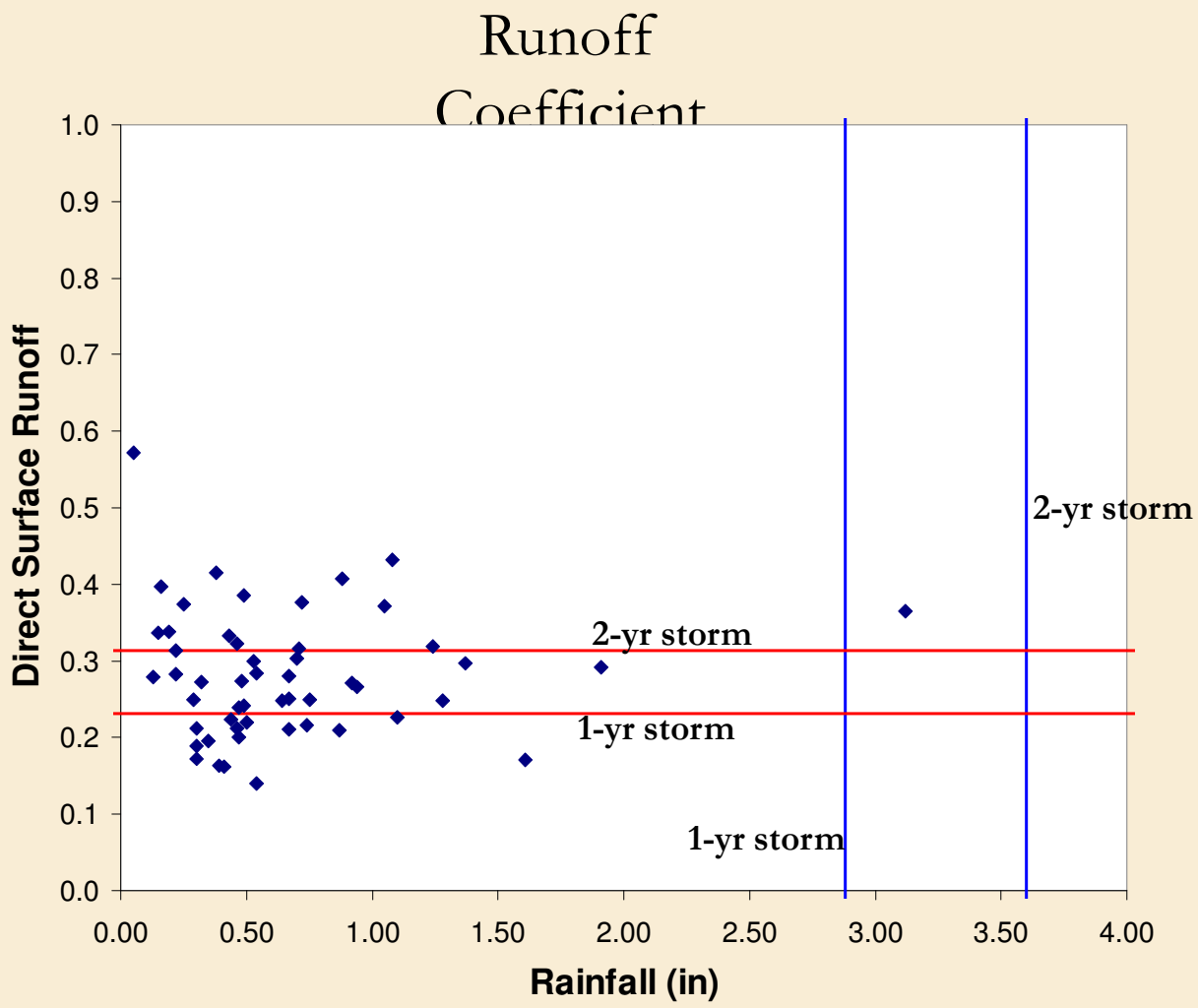
Mulberry Place



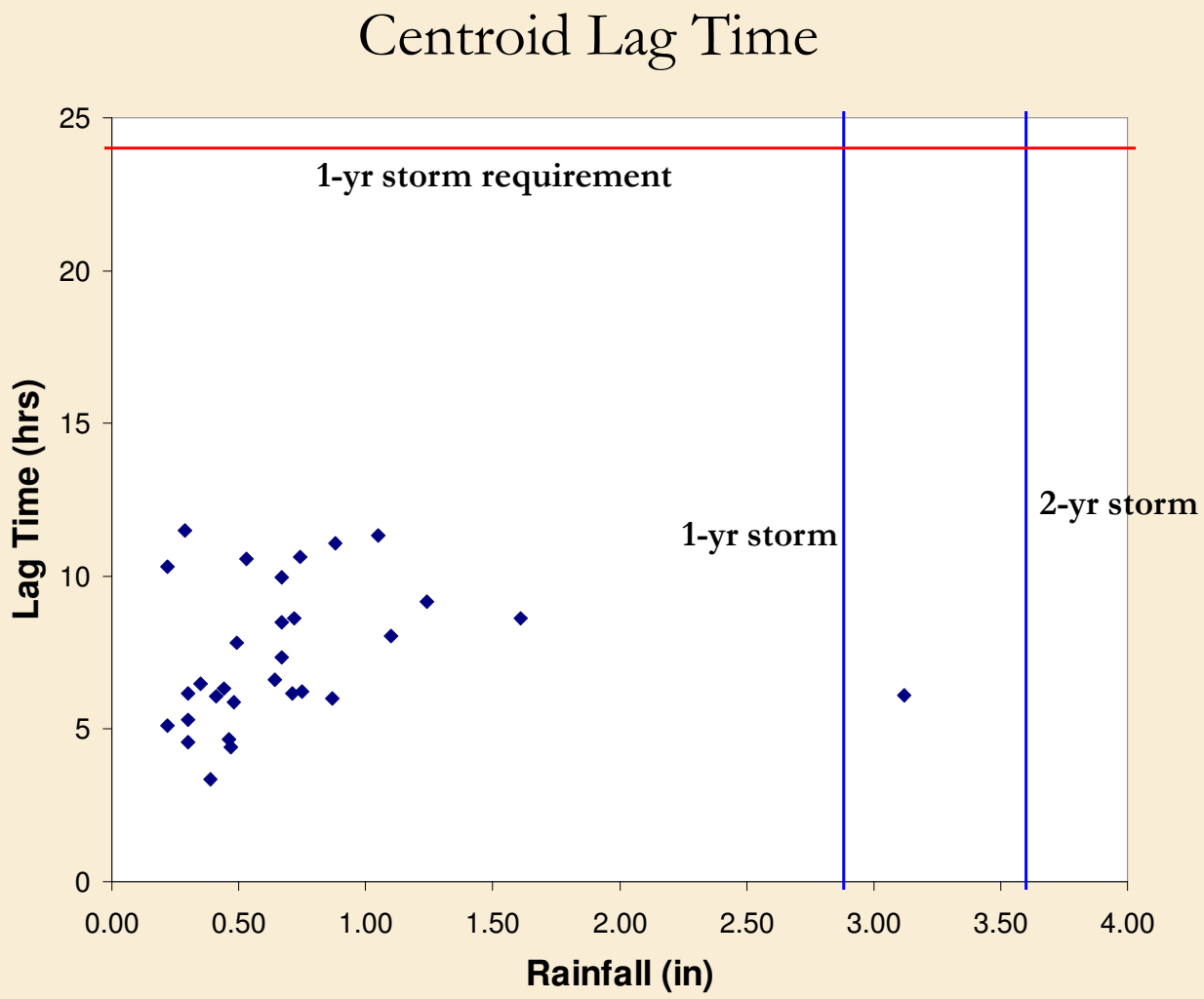
Mulberry Place



Mulberry Place



Mulberry Place

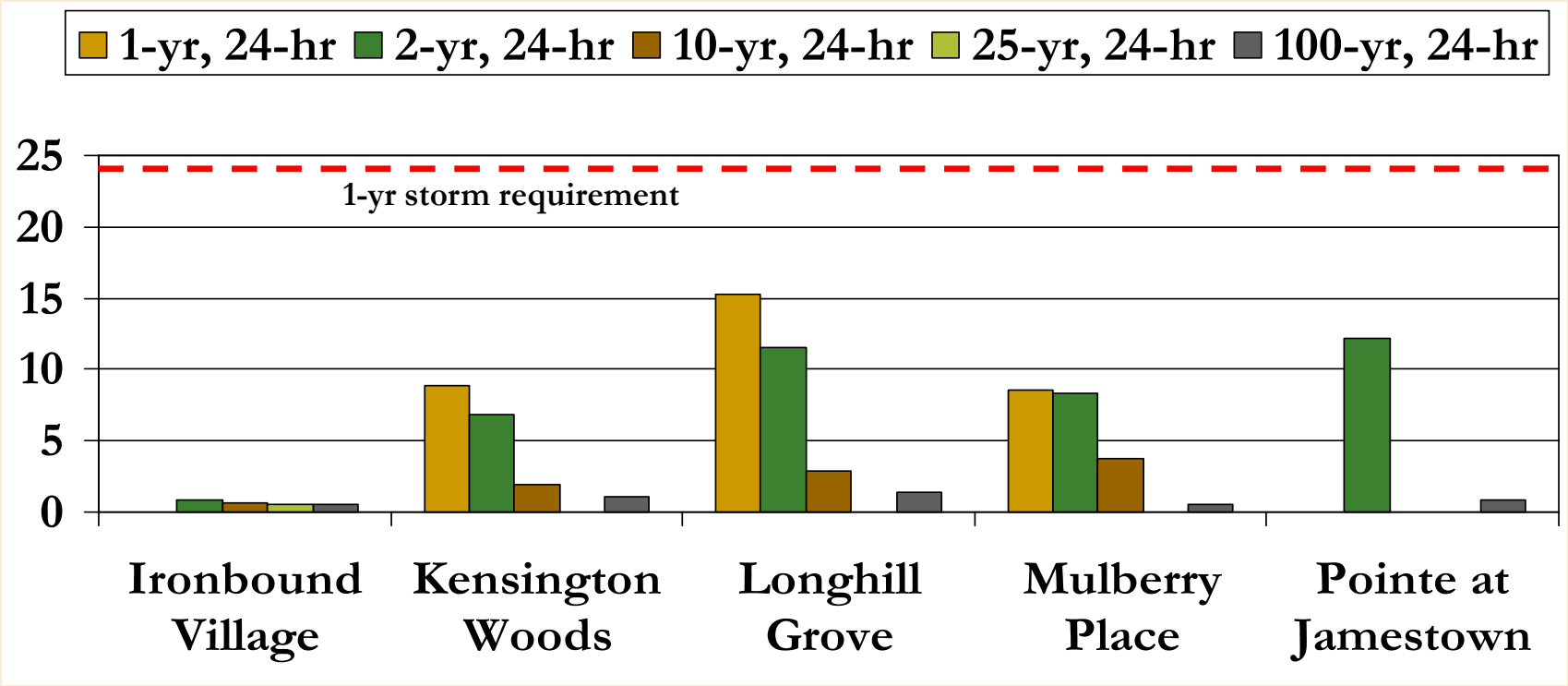


Runoff Curve Numbers

- Based on drainage area cover (imperviousness)
- Affects design flow rates and volumes
- Discrepancies in design calculations of runoff curve numbers

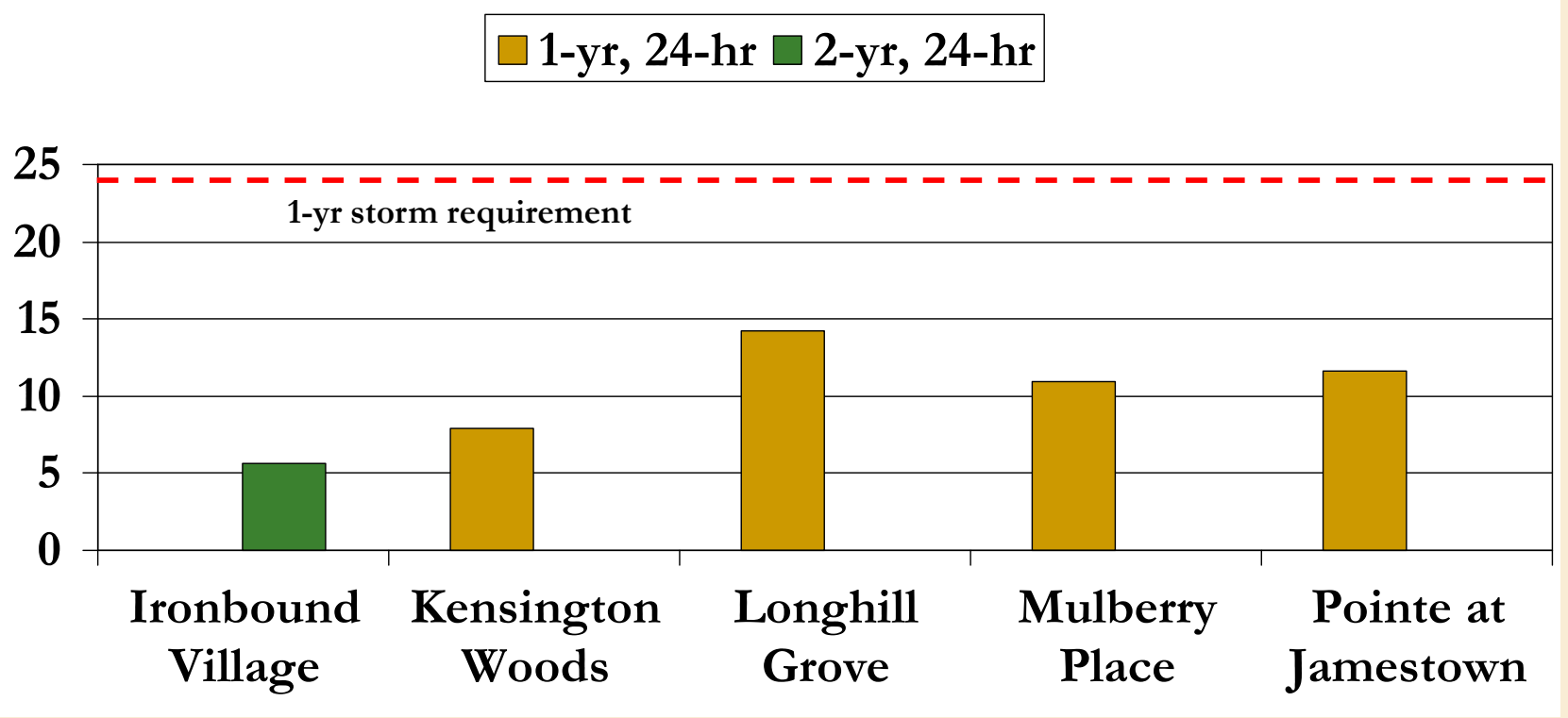
Design vs. Regulations

- Centroid Lag Time
  - Design hydrographs



Design vs. Regulations

- Centroid Lag Time
  - "Kerplunk" method, using orifice equation



Conclusions

- Peak inflows, peak outflows, and runoff coefficients at Mulberry pond appear to be greater than designs predict
  - Peak inflows and outflows in design seem to apply less accurately to higher rainfall volumes (where storm intensity and duration are more variable)
  - Maybe a result of inaccurate runoff curve numbers

- Mulberry Place pond appears *not* to function in compliance with James City County regulations
  - Likely due to incorrect calculations of 24-hour retention of 1-yr, 24-hr storm runoff

Conclusions

- Designs for James City County retention ponds appear *not* to be in compliance with county regulations
  - *Approved* pond designs not meeting stormwater retention requirements

Future Questions and Courses of Action

- Ensure that design calculations for 1-yr, 24-hour storm detention are based upon lag time between inflow and outflow centroids (not "kerplunk" method)

- Examine runoff curve numbers more in-depth (compare recent, detailed soil surveys and development plans to calculations)