Evaluation and Refurbishing Passive Treatment Systems

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Presentation Outline

- Evaluation/Problem – Tim Danehy
- Practical Rehab – Ryan Mahony

Is It Working?

- What are the current conditions?
- What was the system designed to accomplish?

Why isn’t my 30 gpm System Removing Mn?

- Design Flow: 30
- Design Mn Load: 14 lb/day
- Actual flow ~200 gpm
  - (Two 3” pipes flowing full)
- Mn in: 15.4 mg/L
- Mn Out: 8.4 mg/L
- Mn Load Removed: 17 lb/d
- System “over performing” 20%
- “Normal” Mn out: ~2 mg/L

The Discharge is Bad!

- 5 pH
- 96 mg/L acid
- 56 mg/L Fe
- 6 mg/L Al

But What is it Supposed to Do?

- Design Flow: 110 gpm
- Actual Flow: 196 gpm (178%)
  - (Previous measurement >400 gpm)
- Design Acid: 309 lb/day (max)
- Design Acid: 123 lb/day (avg)
- Actual Acid In: 669 lb/day (217%)
- Actual Acid Out: 226 lb/day
- Acid Removed: 443 lb/day
- OVER PERFORMING BY 43%

Don’t Panic! (Let’s do some science.)

- Passive systems have static performance limits
  - You can’t turn up rocks!
- Take samples!
  - Field pH is just a part of the picture. (total & dissolved metals)
- Measure Flow!
  - Passive systems are designed using Flow & Load data
    - Load is calculated using FLOW
      - Measure the flow BEFORE you design the system
        - Measure the flow AFTER you install the system
          - Measure the FLOW
            - The FLOW
              - MEASURE it.

Measure the Flow – Set a Pipe!

Measure the Flow – Install Weir (with staff gauge)

Measure the Flow – H Flume (with transducer)

Practical Rehab

- Sludge management
- Treatment pond underdrain upgrades
- Treatment media replacement

What to do with all of the sludge?

- Gravity drain to settling ponds
- Pump to sediment ponds for storage if available
- Construct sediment ponds if there is room on site
- On site land application where permitted
- Sediment filter bags
- Dry sludge for off site disposal/landfill
- Vacuum trucks
- Use as a resource?

North Fork Montour Run built in 2008

North Fork Montour Run 2013

Diesel powered 6 inch trash pump with intake hose

North Fork Montour Run 2013 Sludge Pump

Upgrade to 6” hydraulically driven shredder pump

North Fork Montour Run 2013/2018 Sludge Pump

System design improvement- sludge drying pond

North Fork Montour Run 2018 Test Pits

Jennings-type vertical flow pond test pits

Bear Hill PTS 2013 Maintenance & Improvements

Auto-flushing (siphon) limestone pond with underdrain, stirred and washed

Bear Hill PTS 2013 Limestone

Wash or replace the media?

Bear Hill PTS 2013 Broken Underdrain

PVC pipe is a challenge to work around during maintenance

Bear Hill PTS 2013 Replaced Underdrain

Replaced SDR35 underdrain with perforated HDPE DR-17 (shielded ferncos)

Bear Hill PTS 2013 New Underdrain- HDPE

T-posts to mark pipe junctions

Bear Hill PTS 2013 Stir/Wash Limestone

Stirring stone with equipment versus washing with pumps?

Erico Bridge HFLB installed 2003

HFLB bed with perforated outlet header

Erico Bridge HFLB Air Backflush 2013

Erico Bridge HFLB Air Backflush 2013

Erico Bridge HFLB 2015

Erico Bridge HFLB Rehab 2015

Erico Bridge HFLB Rehab 2015

Pumping clean water to flush clogged limestone

Erico Bridge HFLB Rehab 2015

Erico Bridge HFLB Rehab 2015

Erico Bridge HFLB Rehab 2015

Erico Bridge HFLB Rehab 2015

Manganese plugged ½” perforations, pipe eliminated as much as possible

Erico Bridge HFLB Rehab 2015

Limestone was “clean” under the first 6-8”

Erico Bridge HFLB 2015

Jennings 2011 Rehab- Old Media Plugged

System put online September 1997

Jennings Rehab- Old Media Removed

Jennings Rehab- Old Media Encapsulated

Jennings Rehab- Non-calcareous underdrain stone

Jennings Rehab- Improved Underdrain Piping

Jennings Rehab- New Media Installed

Jennings- Surpassed Design Life!!!

- 1997-2012
- #9 limestone/compost replaced with AASHTO #8 limestone, compost, and wood chips
- Even at the end of life, water passing through the old media experienced a high level of treatment
- Decreased permeability was more of an issue than exhaustion of the media

Design Improvements/ System Rebuild 2009

Maintenance 2010

Continued Maintenance 2011

Continued Maintenance 2012

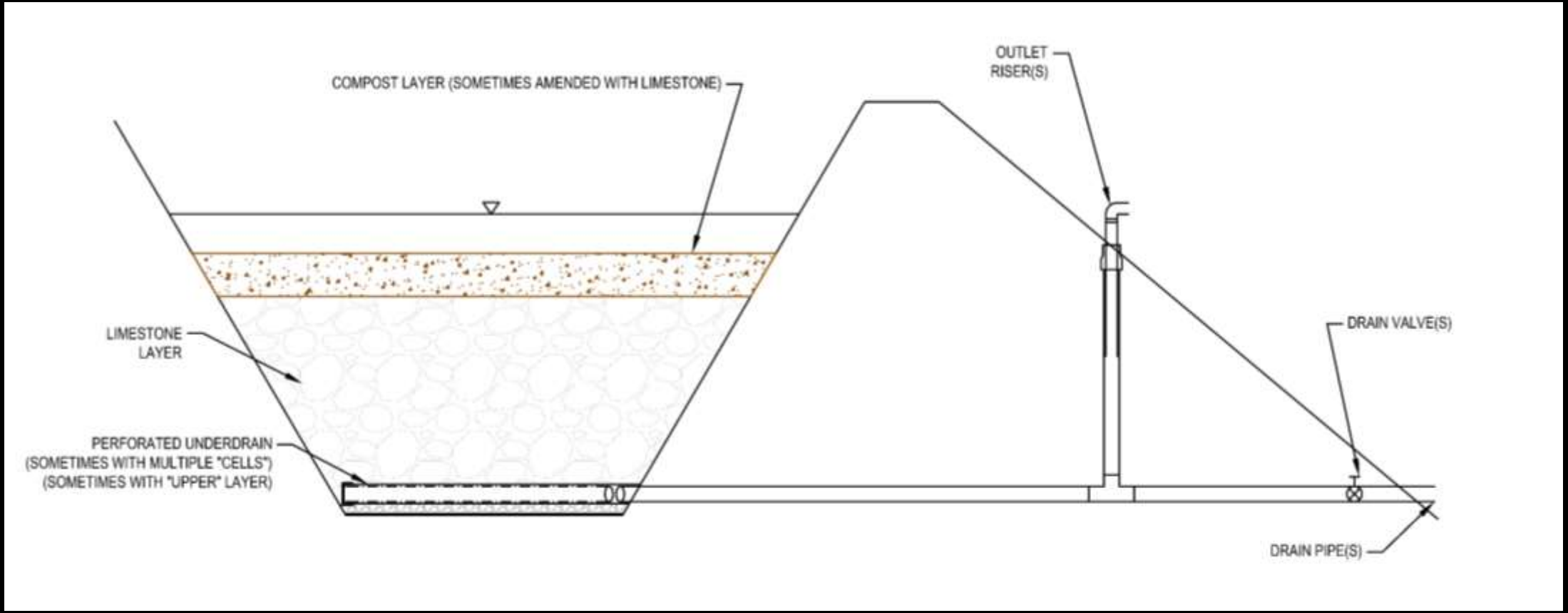
Continued Maintenance 2013/2014

Continued Maintenance 2015/2016

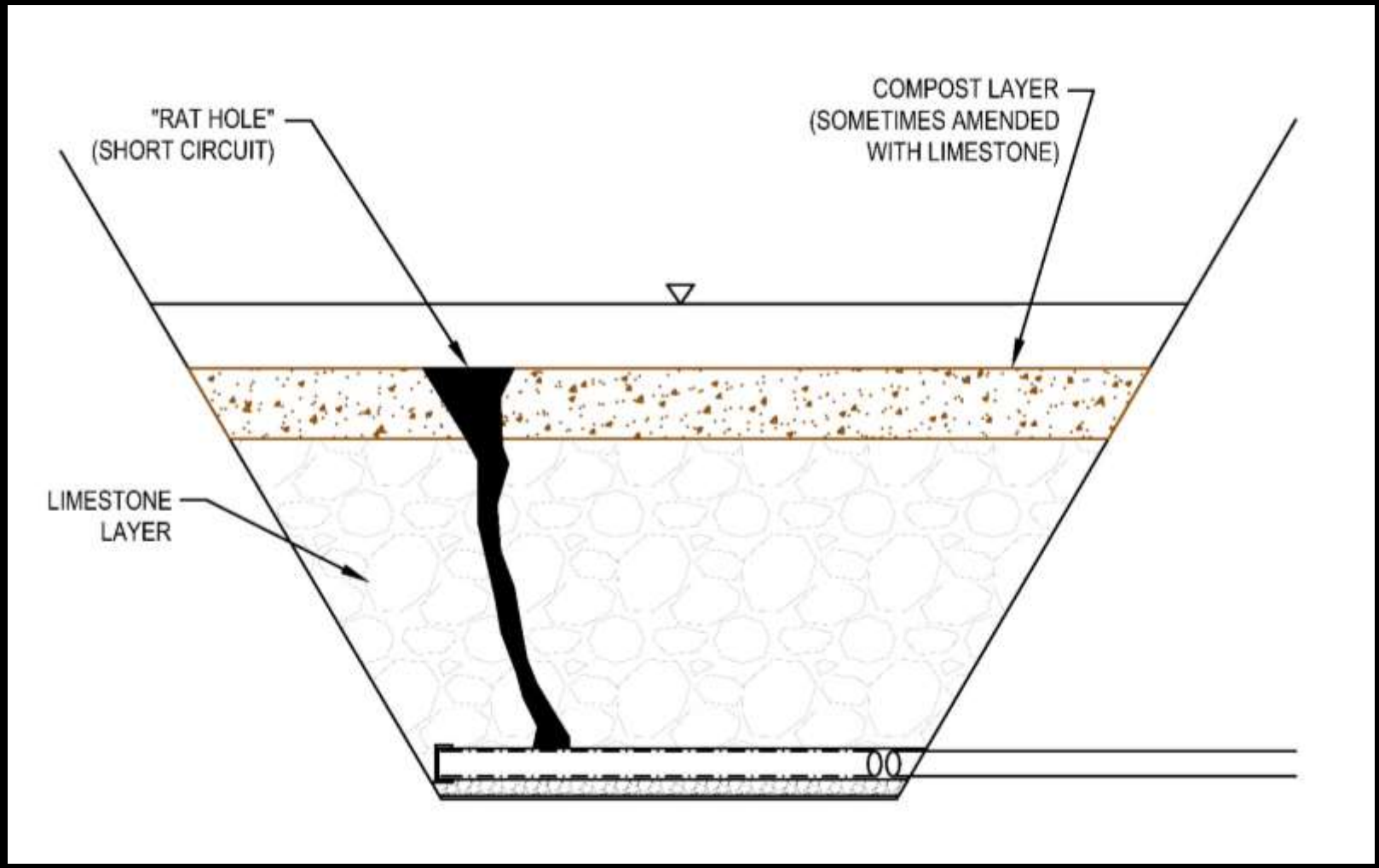
Continued Maintenance 2017/2018

Continued Maintenance 2018

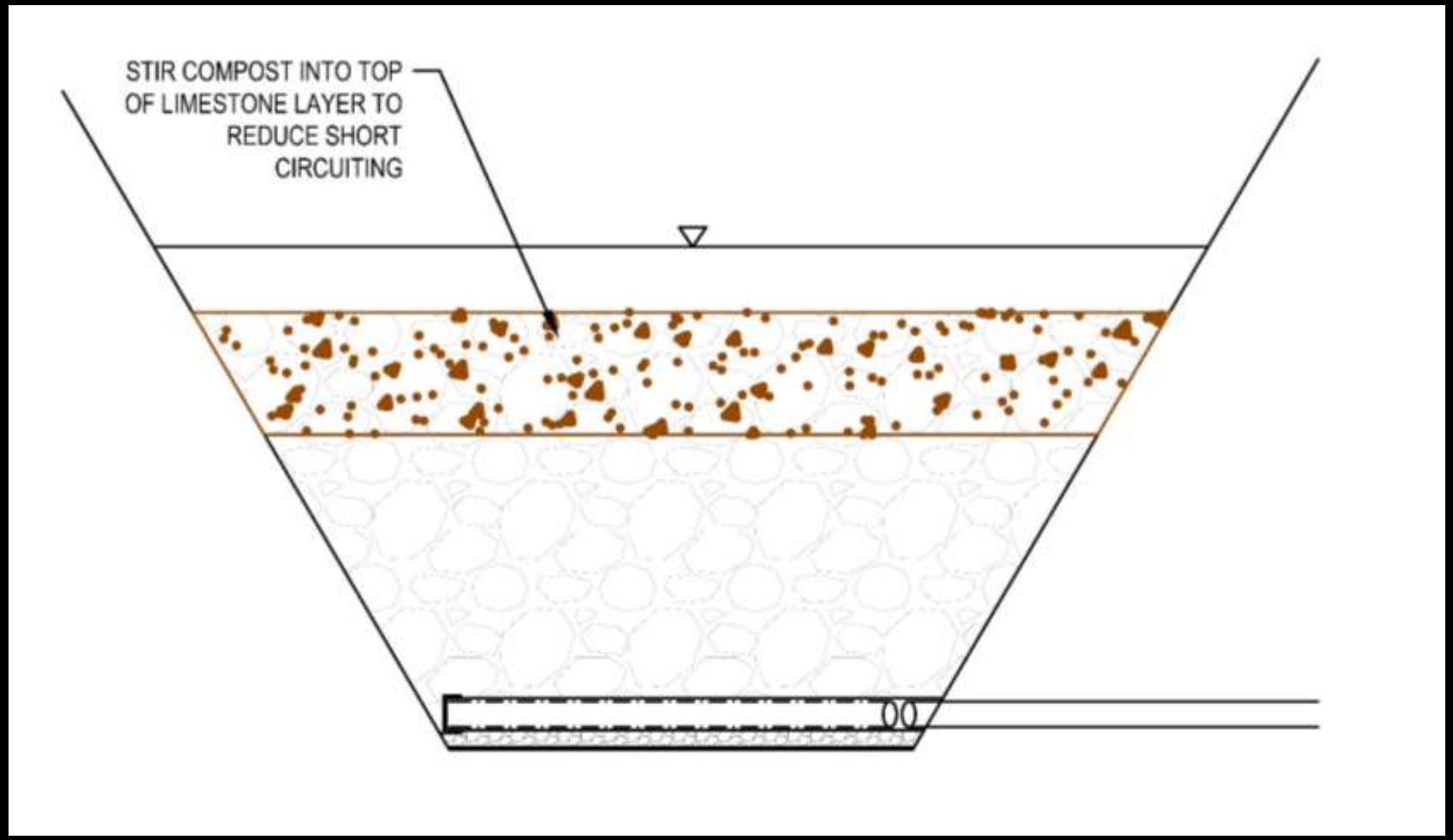
Typical Vertical Flow Pond (VFP)



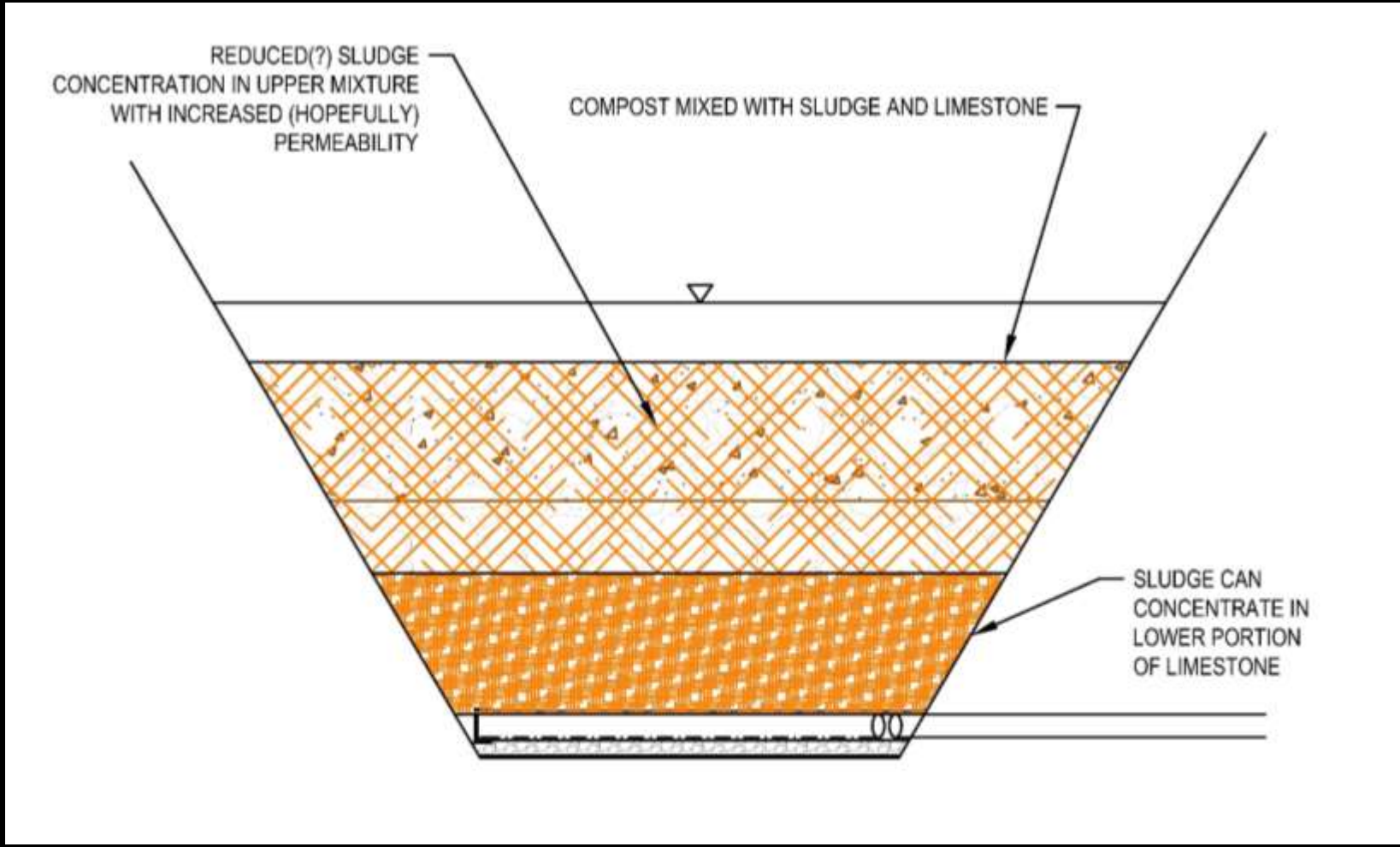
Typical VFP “Rat Hole”



VFP Rehab – Compost Mixed In



VFP Rehab – Limits to “Stirring”



Thank you!

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