

King County Biosolids Truck Odor Mitigation Study

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engineered**COMPOST**systems



King County

Preview

- Who is ECS
- King County's Goals
- Air Flow Study
- Biosolids Truck Odor Analysis (7 Day Test)
- Odor Control Technology Selection
- Demonstration System Design
- Demonstration System Testing and Results

ECS Overview

- Seattle Based (est. 2000)
- Consulting Services
- Aerated Composting System & Controls Design
- Complete or Partial System Supply
- Long-Term Service Support
- Over 55 Client Facilities

ECS Client Facilities

Westport, WA WTP
Biosolids Composting



Lynden, WA WTP
Biosolids Composting

ECS In-Vessel System Options

Kelowna-Vernon, BC
Biosolids Composting



Arlington, WA WTP
Biosolids Composting

ECS In-Vessel Systems



ISHPEMING, MI WTP
BIOSOLIDS COMPOSTING



LIVINGSTON, MT
BIOSOLIDS COMPOSTING

ECS Biofilter Floor Options



Truck Odor Mitigation Study Background

- King County owns fleet of 33 trucks and trailers
- Can emit offensive odors while parked in Georgetown facility (particularly in summer months)
- King County WTD, ECS, Kennedy/Jenks, and Davido investigating capture and treatment options to mitigate odors



Creating Negative Pressure Under Truck/Trailer Covers

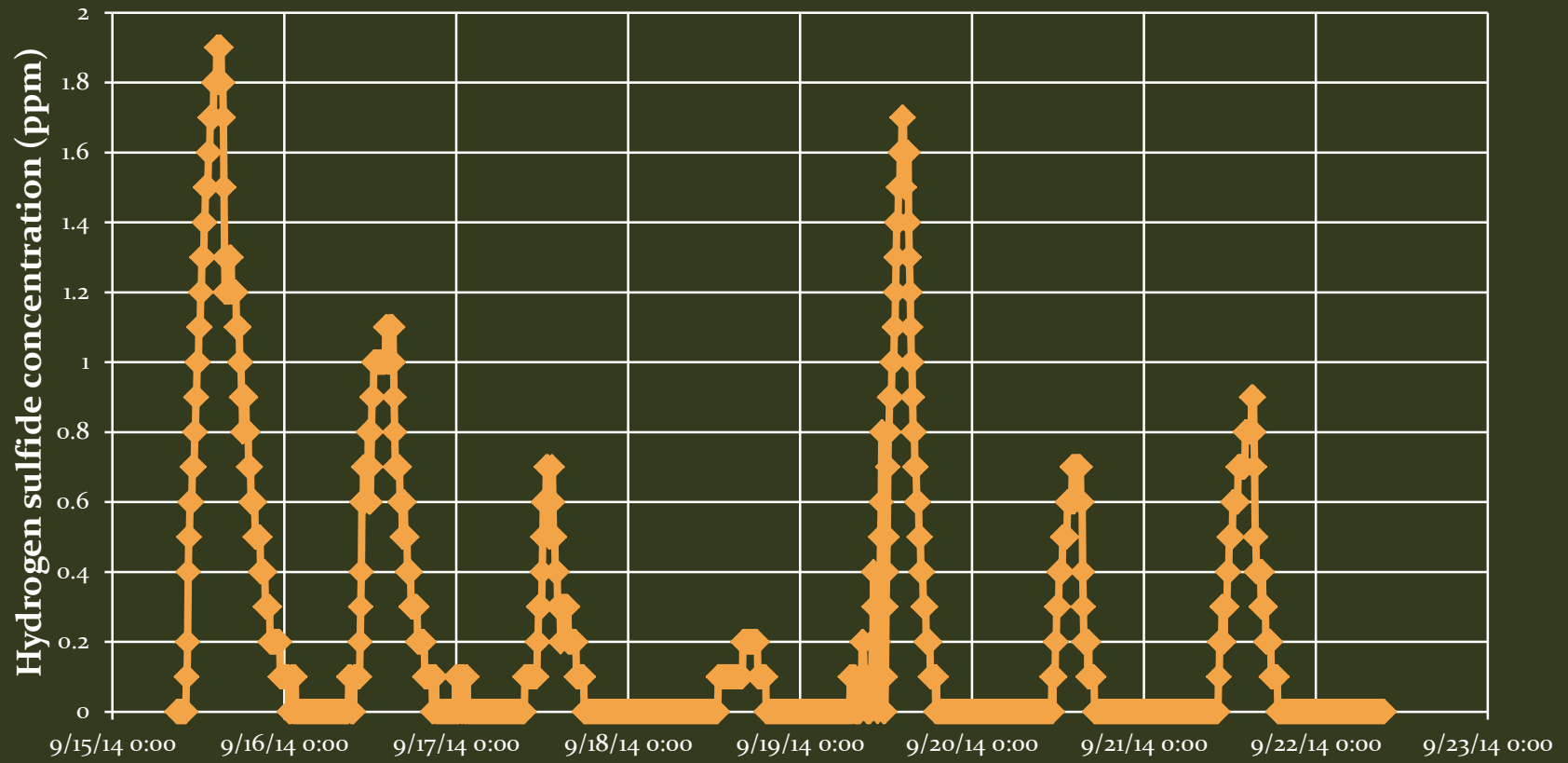


Sample	Headspace Pressure (in H2O)	Headspace Flow (CFM)	H2S(ppm) at 10 minutes
Pup Trailer EWPT03, Empty	-0.5	63	0.2
Truck Box EWT103, Empty	-0.5	60	0.1
Pup Trailer EWPT15, Day old load from South	-0.14 ¹	84	0.2
Truck Box EWT115, Day old load from South	-0.25 ¹	99	0.2
Pup Trailer EWPT06, Fresh load from Westpoint	-0.5	58	0.3
Truck Box EWT106, Fresh load from Westpoint	-0.5	28	13.6

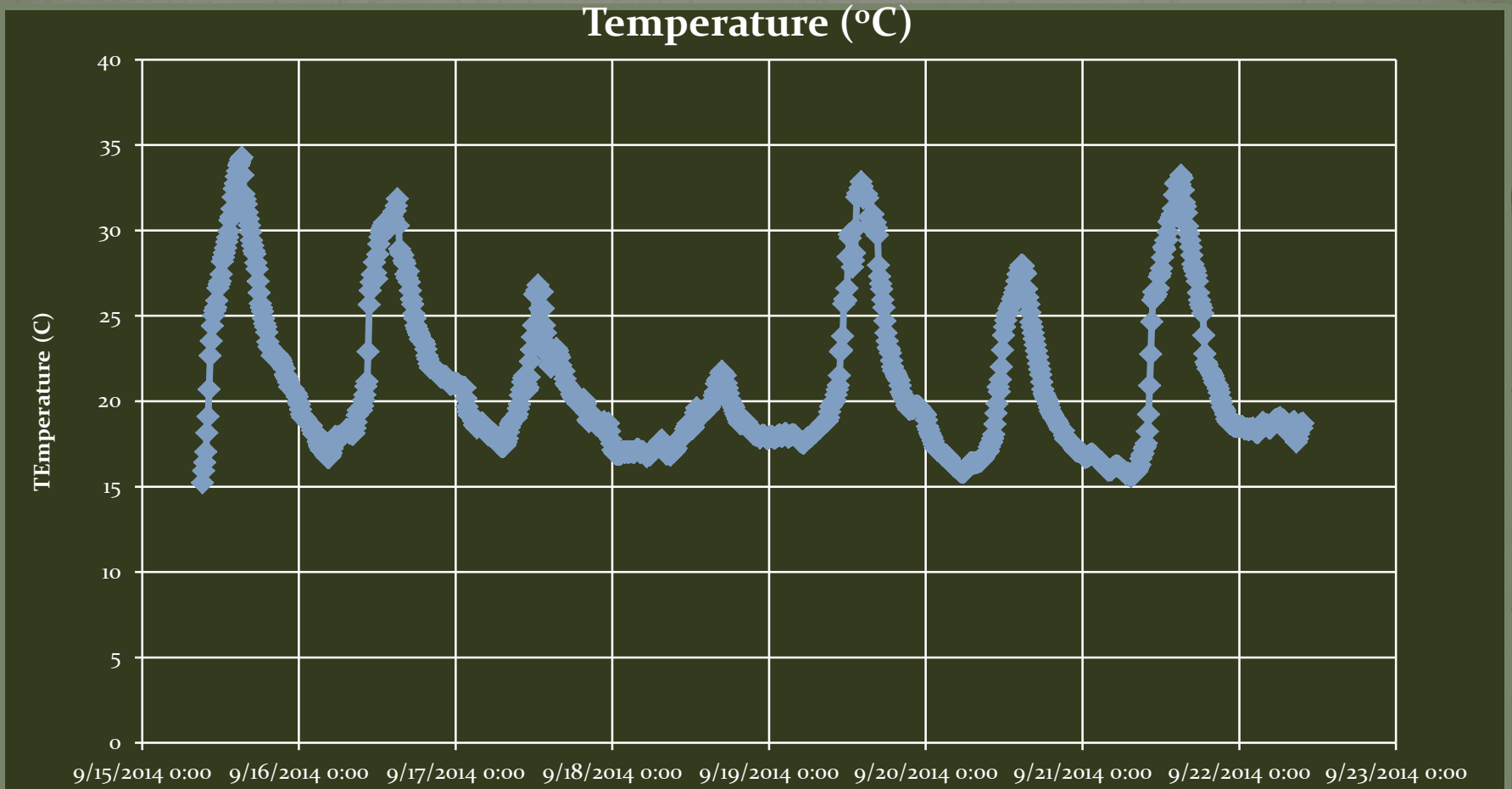
Biosolids Truck Odor Analysis (7 Day Test)



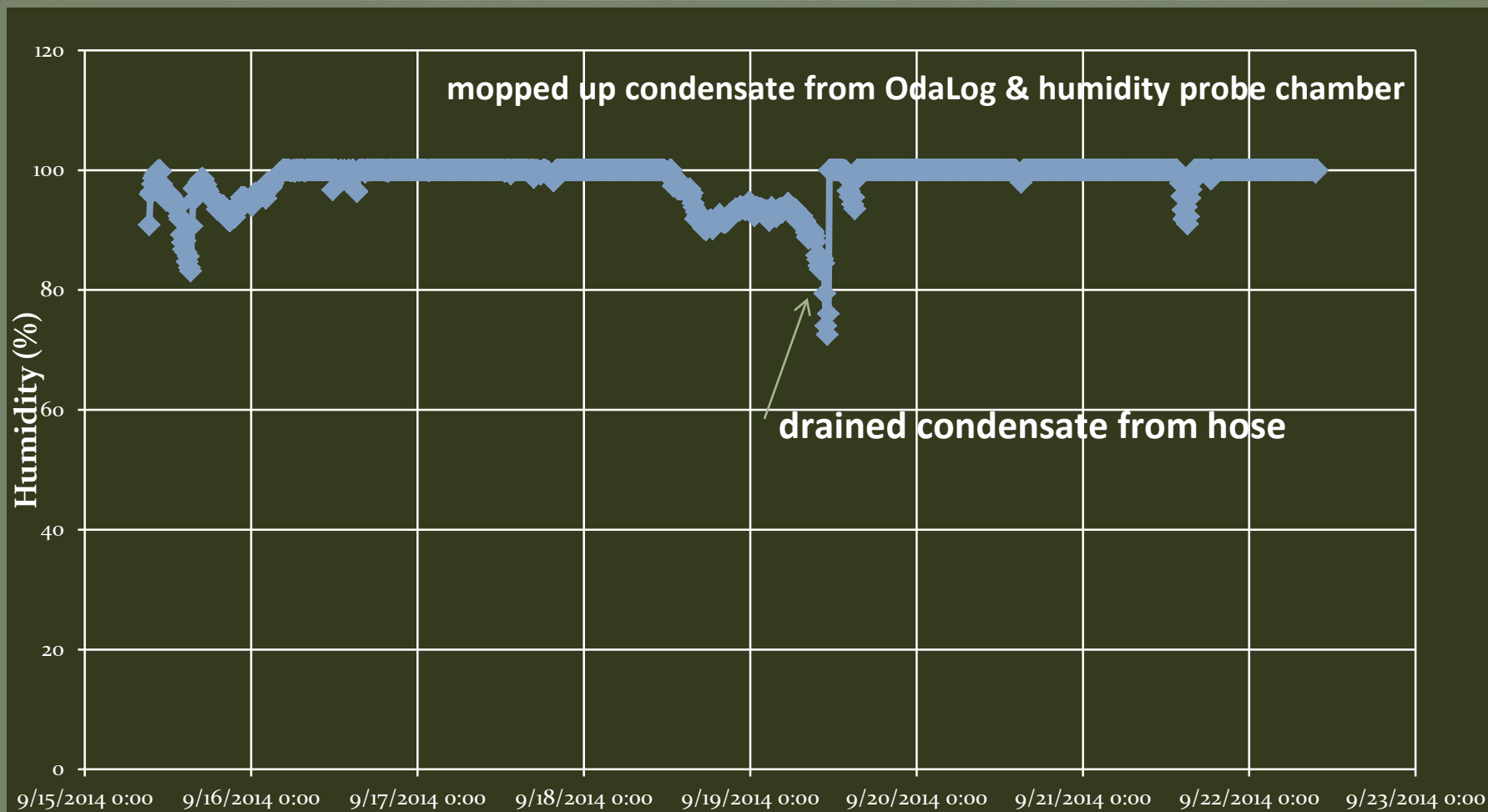
Biosolids Truck Odor Analysis (7 Day Test)



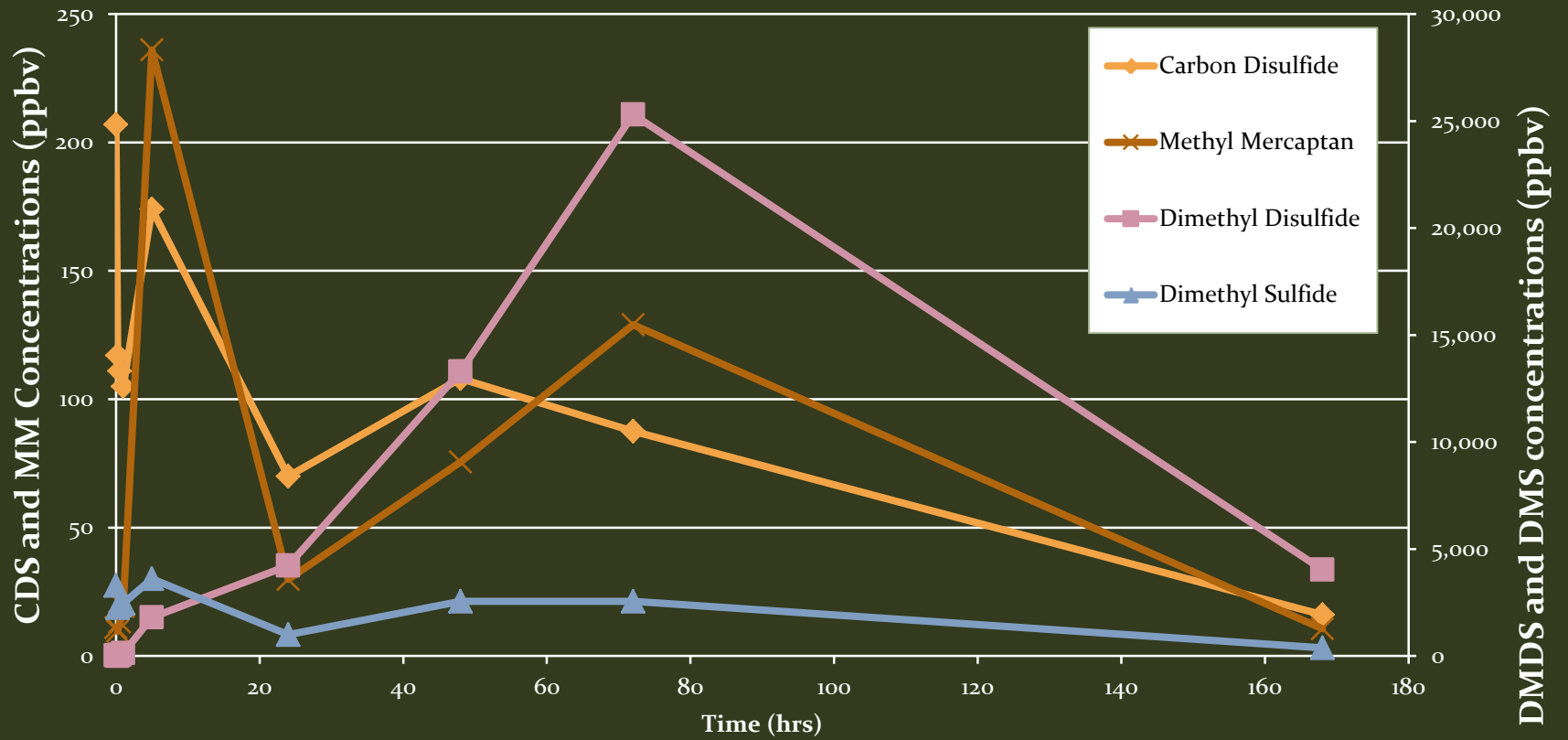
Biosolids Truck Odor Analysis (7 Day Test)



Biosolids Truck Odor Analysis (7 Day Test)



Biosolids Truck Odor Analysis (7 Day Test)



Survey of Odor Treatment Technologies

- Reviewed 13 Odor Treatment Technologies – looking at capital and operating costs, power requirements, waste generated, efficacy based on application, etc.
- Analyzed organic media Biofilter and Granulated Active Carbon (GAC) media filter, and Photoionization for demonstration testing.

Full-Scale System Comparison

Scrubber Option	Estimated Equipment Cost	Estimated Annual Costs	Estimated Power Usage	Notes
Biofilter	\$60,000	\$2,200	4 kW	Requires water (400 gal/day). Media replaced annually.
GAC	\$100,000	\$4,500	10 kW	400lbs GAC media replaced every 2 years
Photoionization	\$375,000	\$8,600	11 kW	Annual replacement of lamps and catalyst

Full-scale system connects to 12 trucks/trailers

Demonstration System Technology Selection

- Selected Biofilter and GAC for demonstration testing based on capital costs, operating costs, and expected efficacy.

Biofilter Design



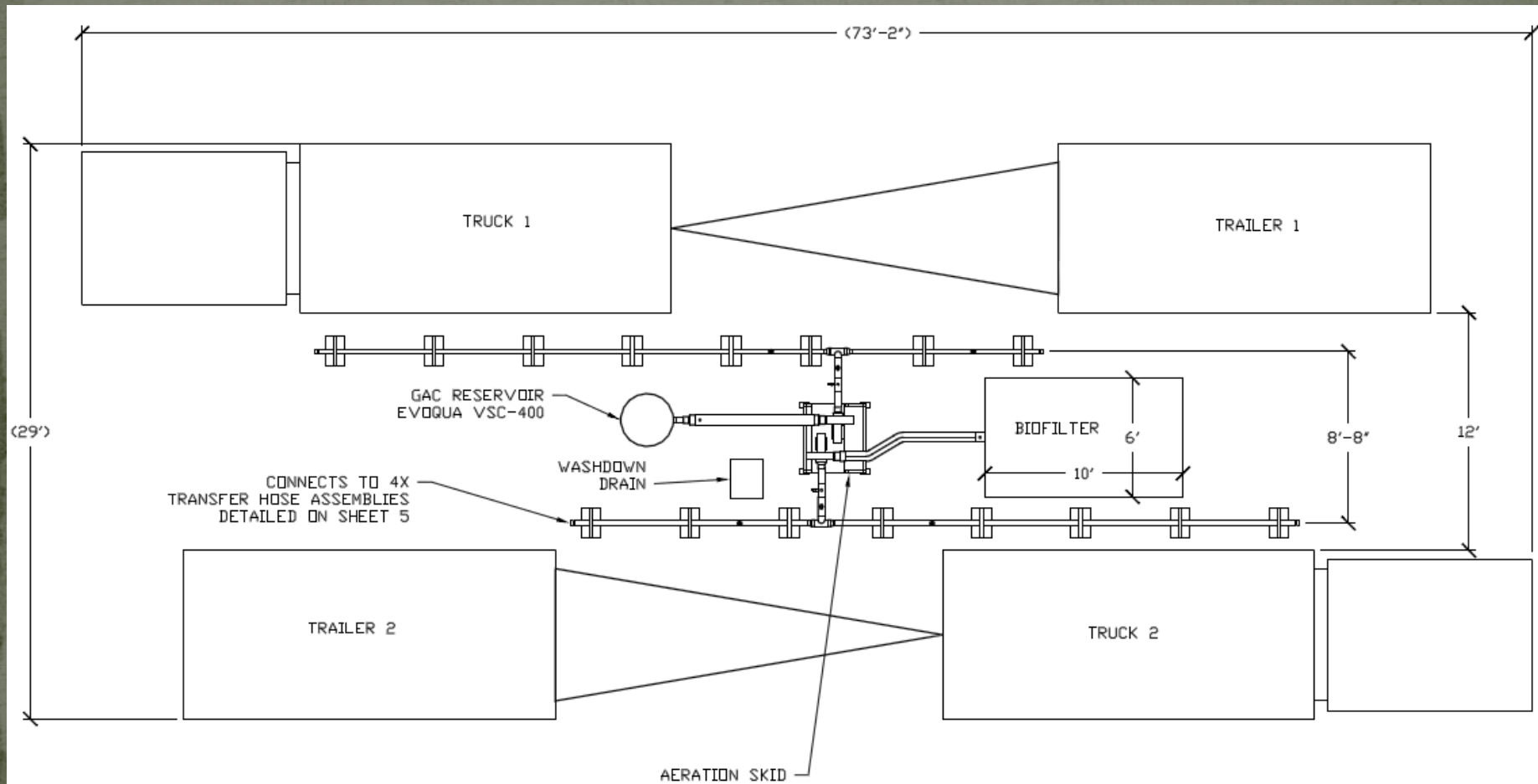
- Basis of Design:
 - 160 cfm (truck & trailer)
 - 60 sq ft
 - 90 sec residence time with 48 inches settled height of biofilter media
- As Built:
 - 160 cfm (truck & trailer)
 - 60 sq ft
 - 75 sec residence time with 40 inches settled height of biofilter media

GAC Filter Design



- Basis of Design:
 - 160 cfm (truck & trailer)
 - 400 lbs 4mm Midas GAC
 - 1 year media life with <math><10\text{ppm H}_2\text{S}</math>

Demonstration System Design



Demonstration System



Demonstration System



Demonstration System



Demonstration System Sampling



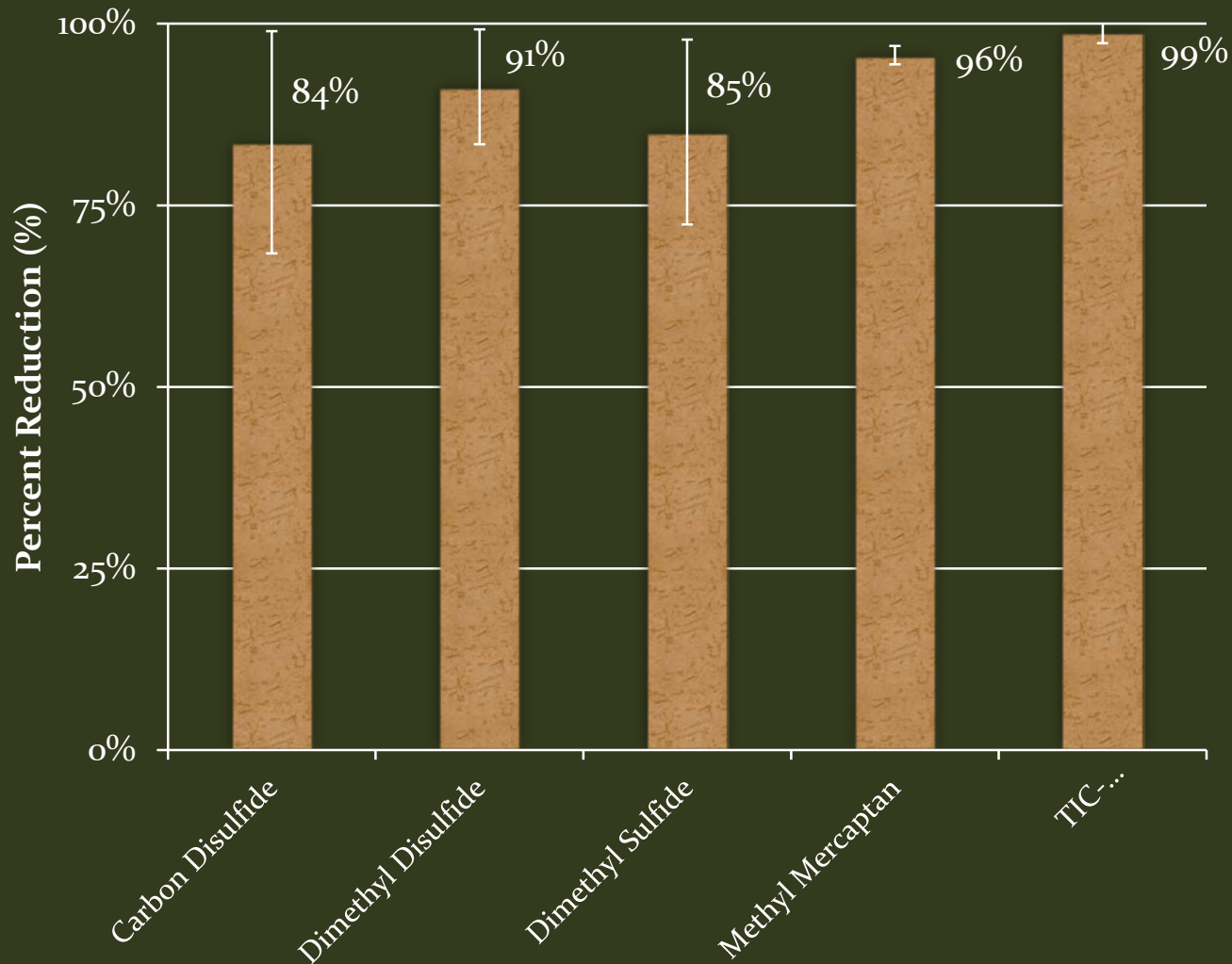
Maximum Influent Concentrations

Analytes	Influent - ppbv
Carbon Disulfide	64.6
Dimethyl Disulfide	3,420.0
Dimethyl Sulfide	4,100.0
Methyl Mercaptan	127.0
TIC - Trimethylamine	5,250.0

All maximums associated with Biofilter

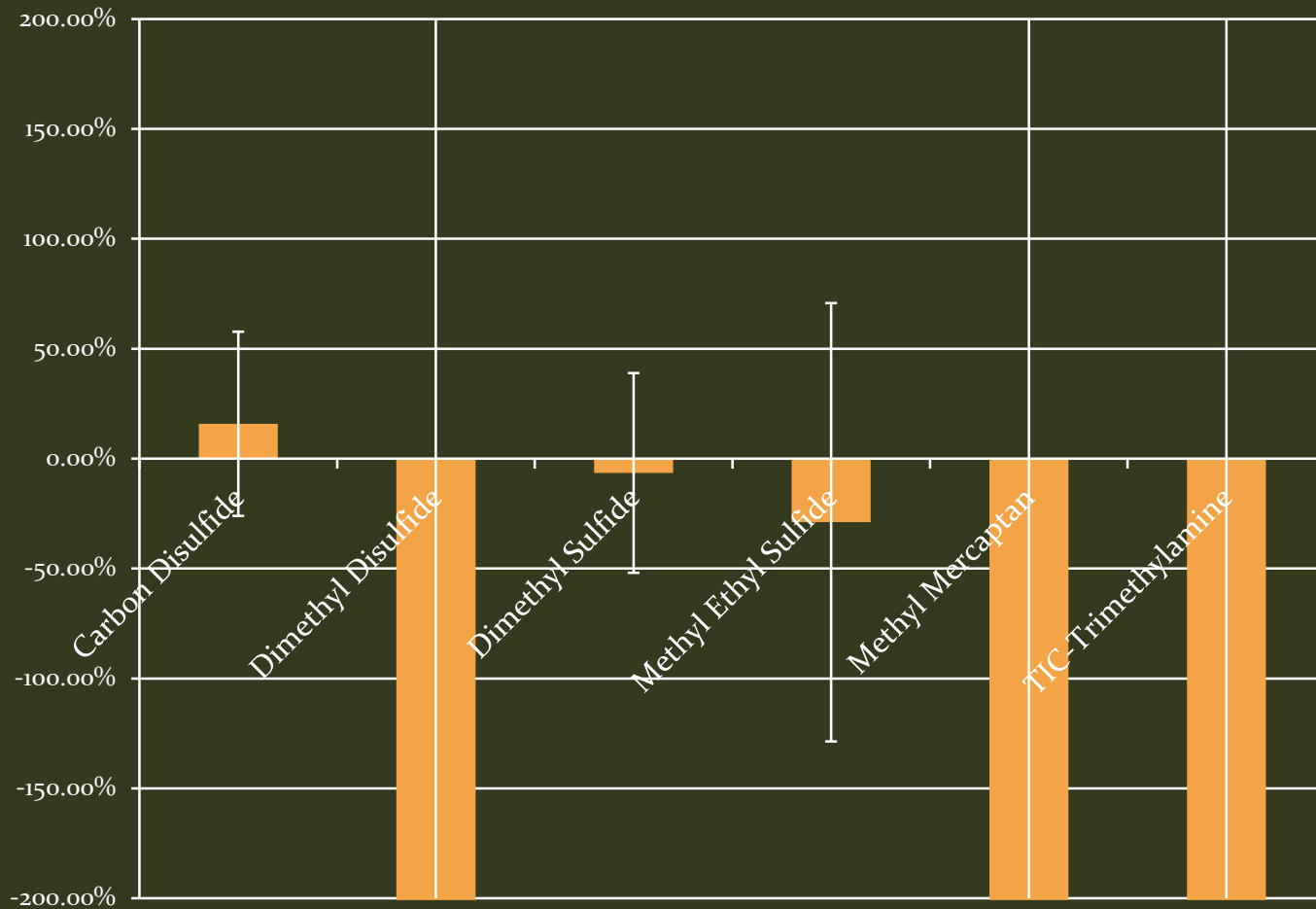
Demonstration System Test Results

Biofilter Removal Efficiency



Demonstration System Test Results

GAC Removal Efficacy



Demonstration System Test Results

Observations and Conclusions

- Biofilter performing well. Continue to gather data.
- GAC not performing as expected – moisture causing material breakdown and densification leading to anaerobic conditions?



Demonstration System Testing

Further Testing

- 3+ Day “Extended Hold” Test was repeated 9/14/15 – 9/17/15 (waiting for lab analysis)
- Evoqua GAC removed and replaced with coal based GAC from Brightwater WTP for 3+ Day test (waiting for lab analysis)
- Continue collecting data for “Typical Operations” through 9/25/15
- Possible testing of two truck/trailers connected to Biofilter

King County Biosolids Truck Odor Mitigation Study

- Thanks to Kate Kurtz and the rest of the King County WTD staff! (and the Blue Angels)

