

# Industrial Stormwater Benchmarks – Comparison of New Minnesota Benchmark Concentrations To Historic Industry-specific Testing Results

Loren J. Larson  
Managing Partner  
Caltha LLP, Minneapolis

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# Outline

- Background – Historical Context
- EPA Industrial Group Sampling
- Comparison of MPCA Benchmarks to Past Data
- Projection of Future Results
- Summary

# Key Historical Events

- 1972 Federal Water Pollution Control Act
  - » NPDES permit program
- 1977-85 NURP Studies
  - » Identified urban runoff as important factor impacting water quality
- 1987 Amendment to Clean Water Act
  - » Required stormwater discharge be addressed under NPDES permitting program



# Key Historical Events

- 1990 - EPA promulgates stormwater permit rules
  - » Requires industrial facilities to be permitted by Sept. 1992
  - » Publishes **Group Permit** option
- 1990-1992 - General permits drafted by EPA and States
  - » 1991 MPCA publishes general permit
- 1992 – Most facilities permitted under State or EPA general permit

# Group Permit Option

- Offered option to be covered under permit customized for industry sector
  - » Single company with multiple locations
  - » Multiple companies, trade associations
- EPA accepted Group Permit applications
- Applications required monitoring of stormwater discharge from selected group members
  - » Representative of group
  - » Wide geographic distribution

# Typical Group Monitoring Location



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# Group Permit Option

- Selected facilities conducted monitoring and submitted data to EPA
- By 1992, most facilities in Groups had State general permits available
  - » State permits were considerable less burdensome
- Ultimately Groups disbanded
- In Dec. 1995, EPA published Group data and ***benchmarks*** in Federal Register

# 1995 Group Data

- Divided in similar sector designations (A–AC) still used today
  - » More subsectors
- Some parameters represented by most sectors
  - » TSS, BOD, COD
- Some parameters represented by only a few sectors
  - » TP, metals, toxic organics
- Range of number of results for each sector
  - » 10 – 20, up to hundreds

# MPCA Benchmarks

- All industrial sectors have one or more benchmarks
- All sectors have benchmark for Total Suspended Solids (TSS)

# MPCA Benchmarks

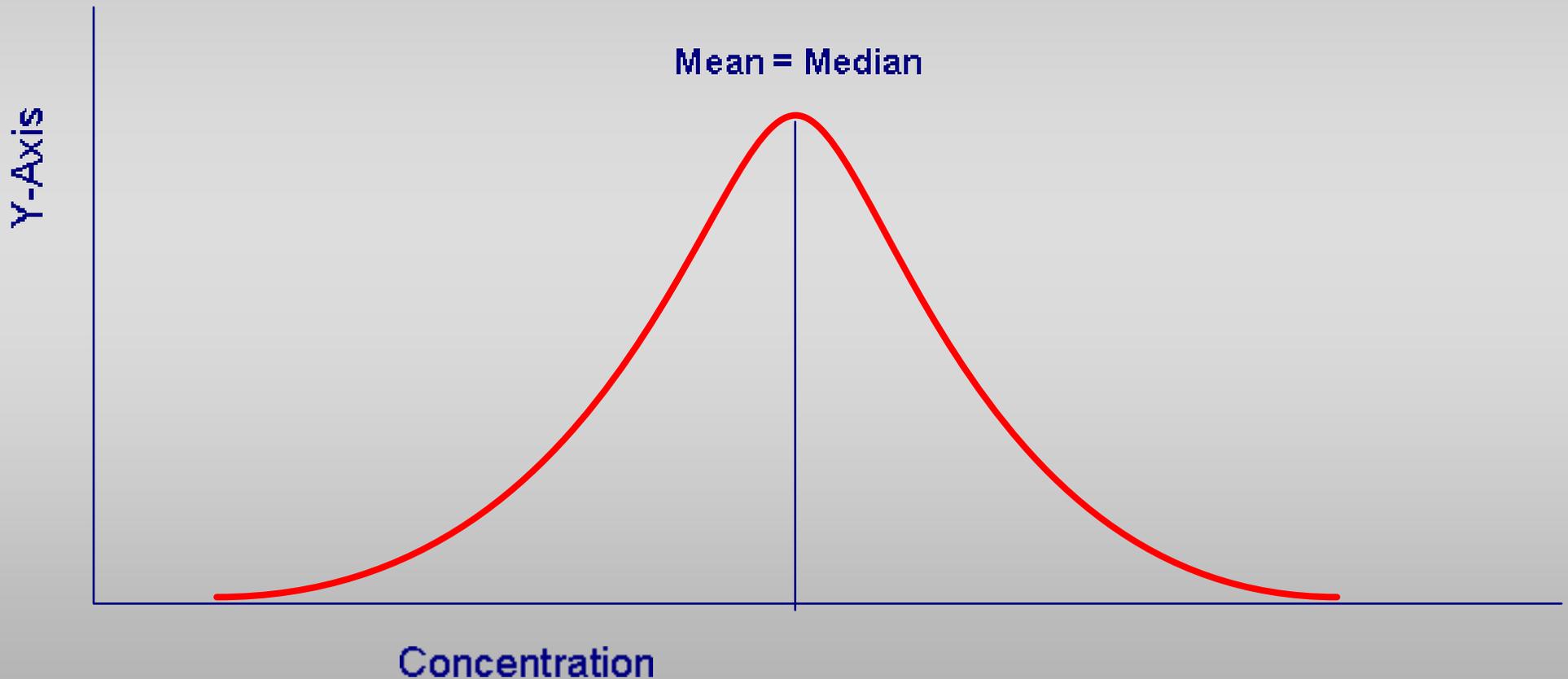
	1995 EPA Benchmark	2010 MPCA Benchmarks *	Basis for EPA Benchmark
<b>TSS</b>	100	100	Median of NURP Results
<b>BOD</b>	30	25	POTW Secondary Treatment Standards
<b>COD</b>	120	120	4x BOD benchmark
<b>TP</b>	2	1	NC State standards
<b>Nitrate</b>	0.68	0.68	Median of NURP Results
<b>Al, Pb, Hg, Ni, Zn</b>	Ambient water quality criteria	Many based on FAV in State standards Adjusted for hardness	Ambient water quality criteria
<b>Sb, Ar, Cd, Cu, Se, Ag,</b>	Detection Limit x 3.18	Many based on FAV in State standards Adjusted for hardness	Detection Limit x 3.18

\* Note: The same benchmarks are used by many States, therefore analysis and conclusions apply across US

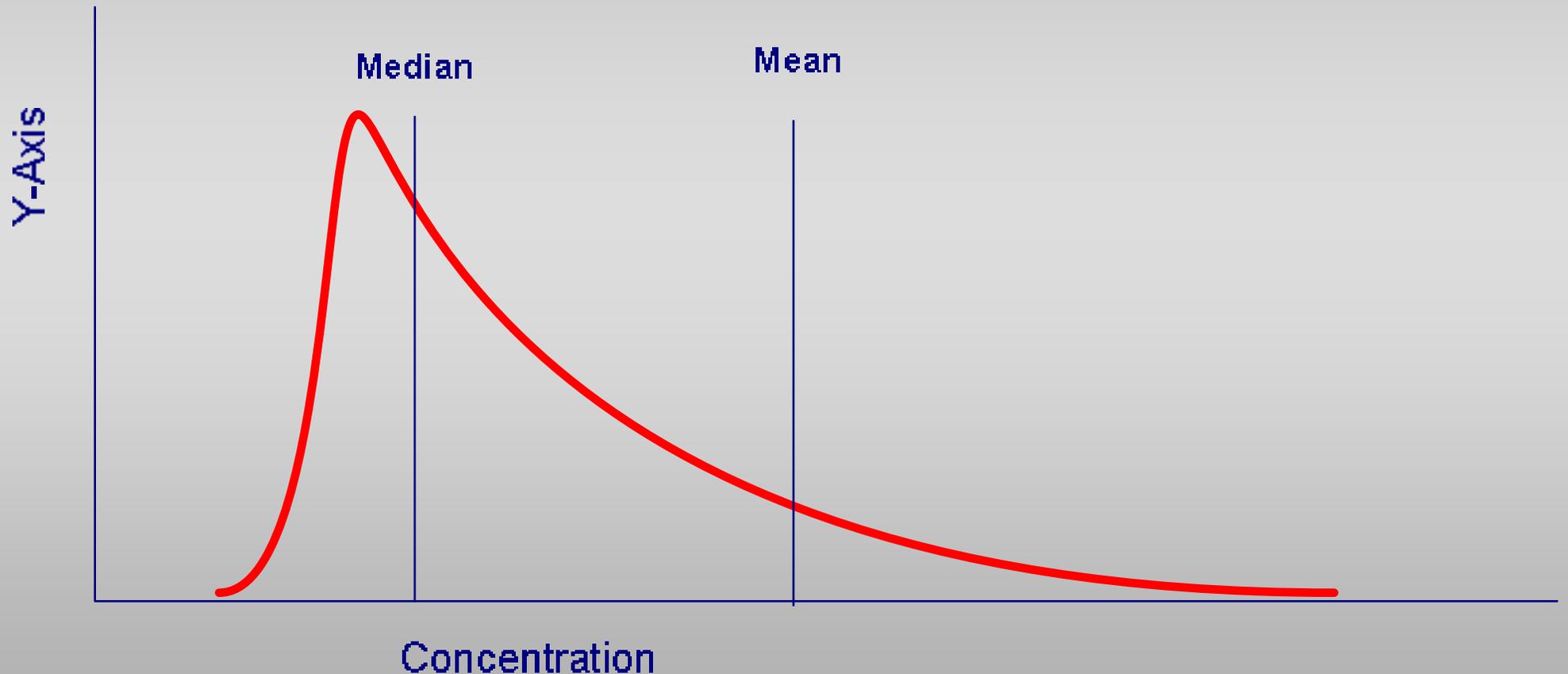


# Distribution of Data:

# Distribution of Data: Normal Distribution



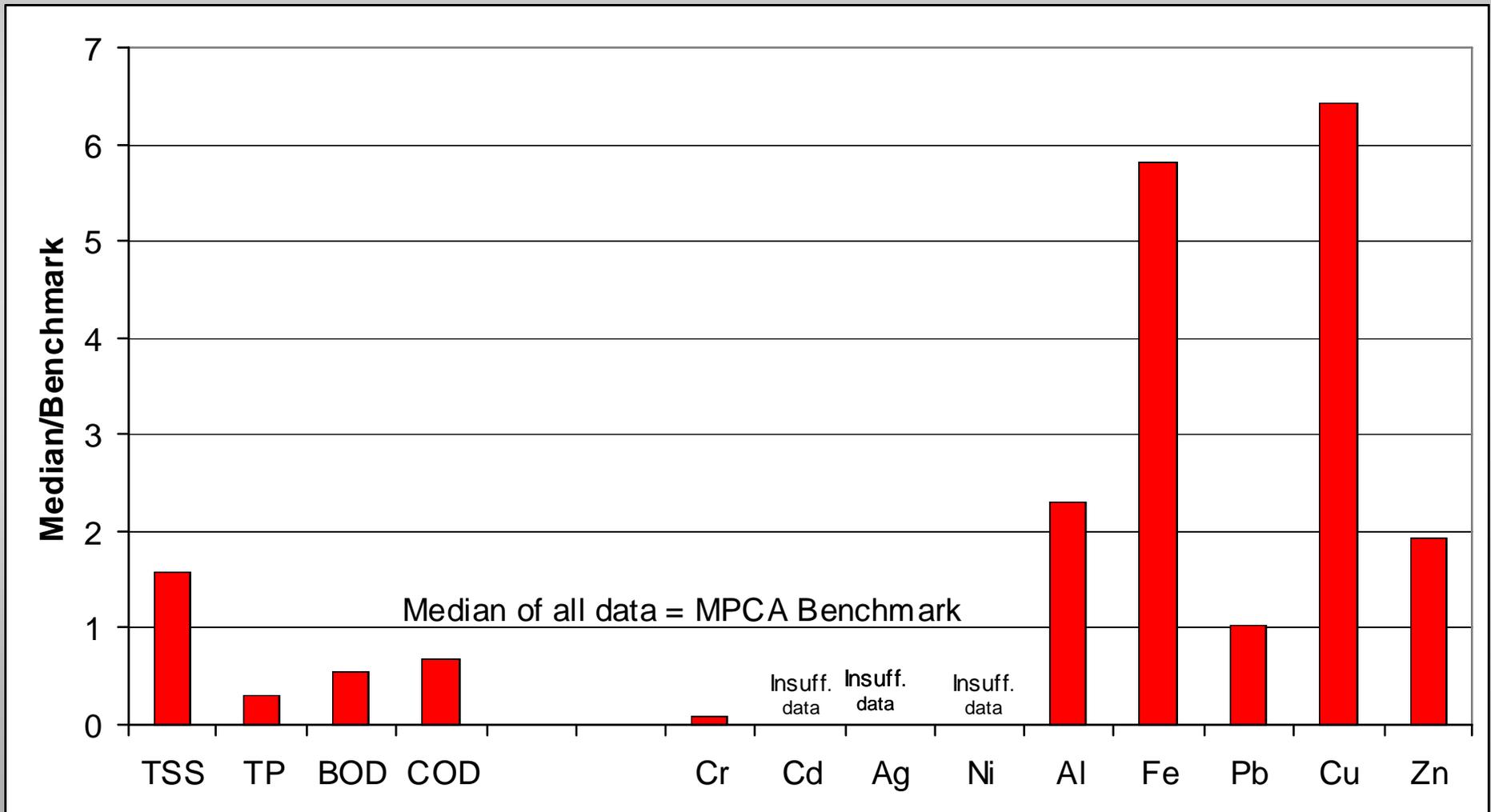
# Distribution of Data: Log Normal Distribution



# Comparison of All Sector Data To MPCA Benchmarks

- Combine all 1995 industrial sector data
- Compare MEDIAN to Benchmark  
Median (mg/L) / Benchmark (mg/L)

# Comparison of All Sector Data To MPCA Benchmarks

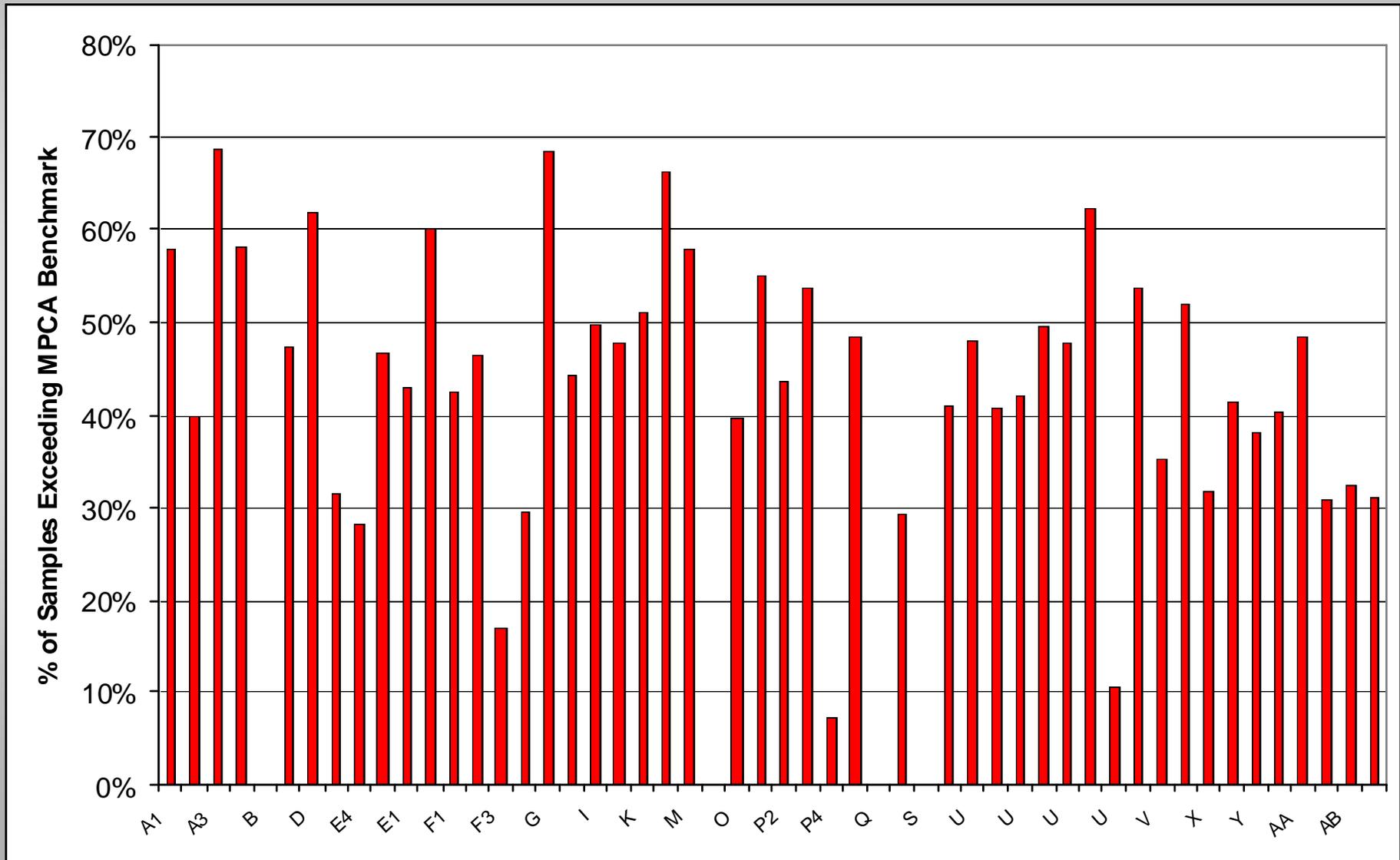


# Individual Sector Data

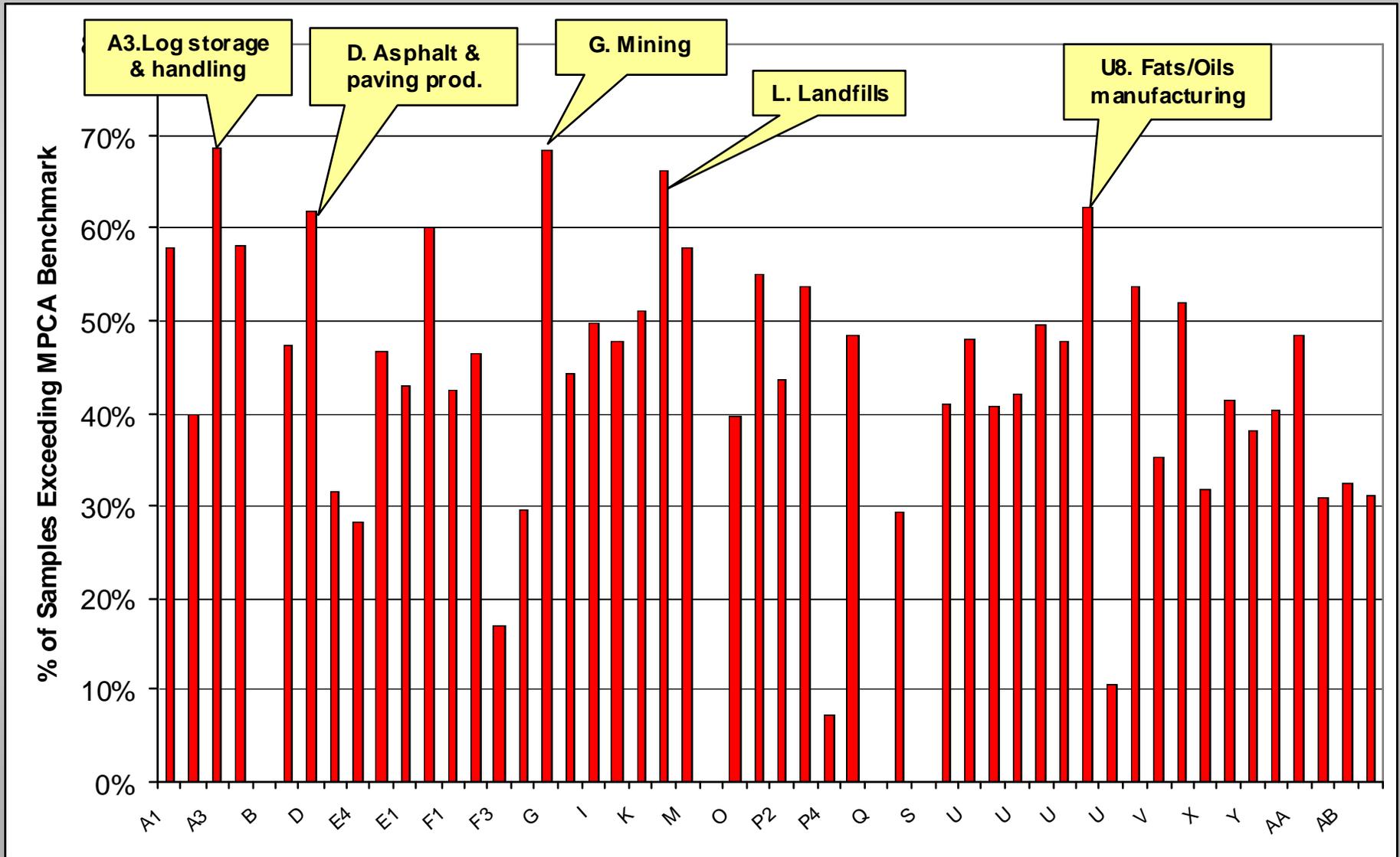
- Conventional Wastewater Parameters
  - » TSS, BOD, COD, TP
- Heavy metals
  - » Fe, Zn
- Data expressed as “% of sector individual results that exceed benchmark”
  - » e.g., probability that any one sample exceeds benchmark
- Only presenting results for sectors that are assigned that chemical benchmark



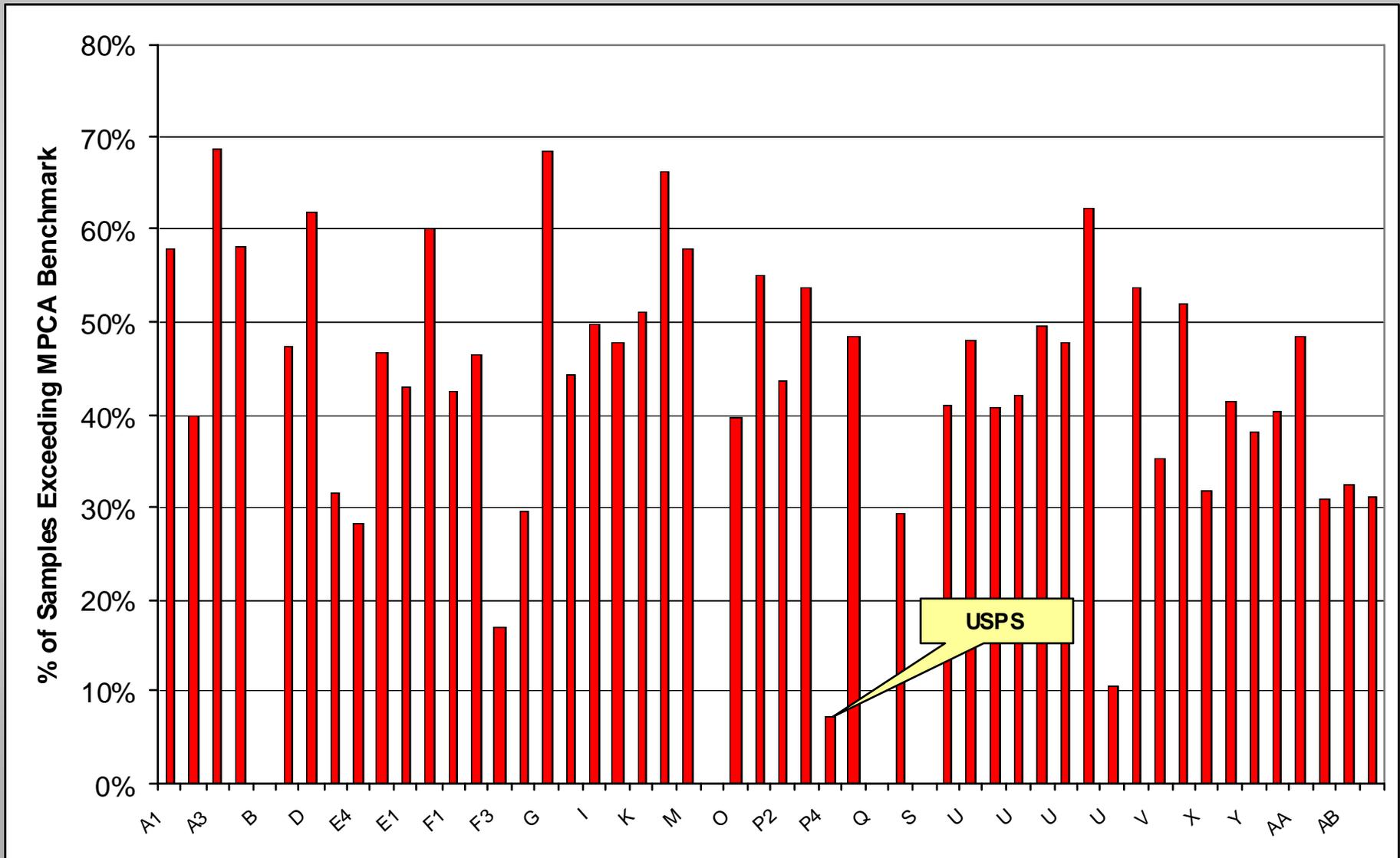
# Total Suspended Solids



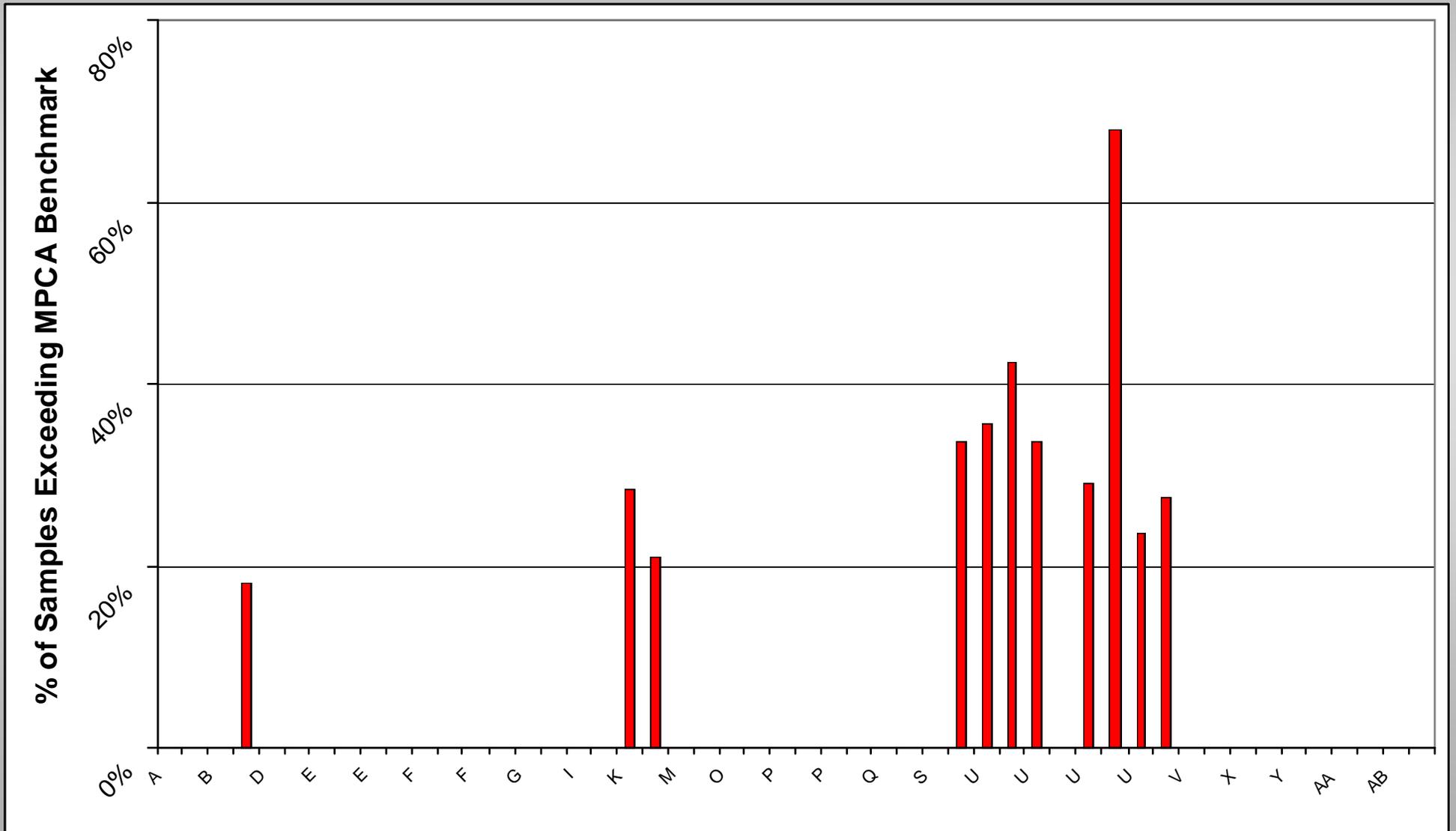
# Total Suspended Solids



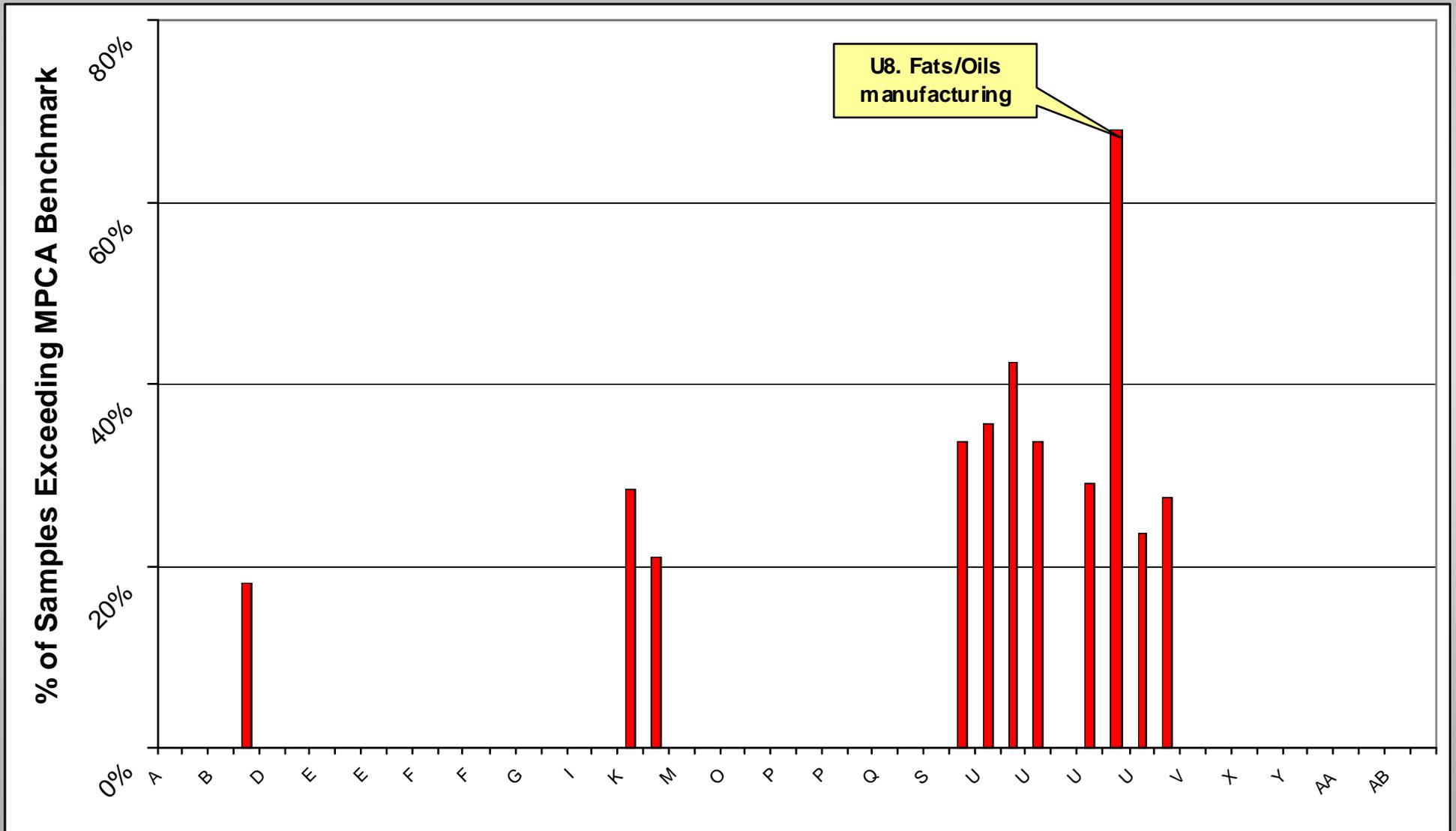
# Total Suspended Solids



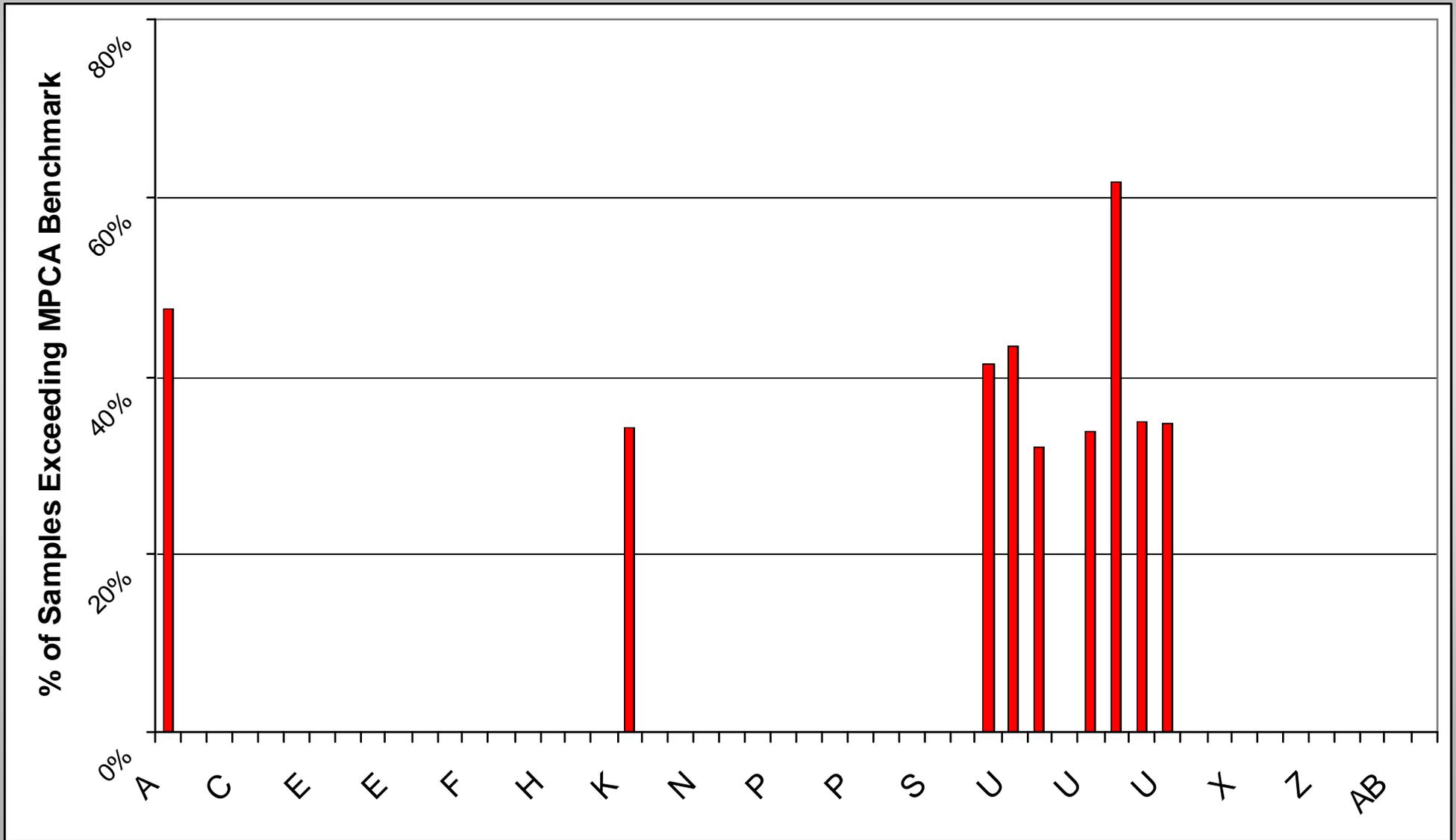
# BOD



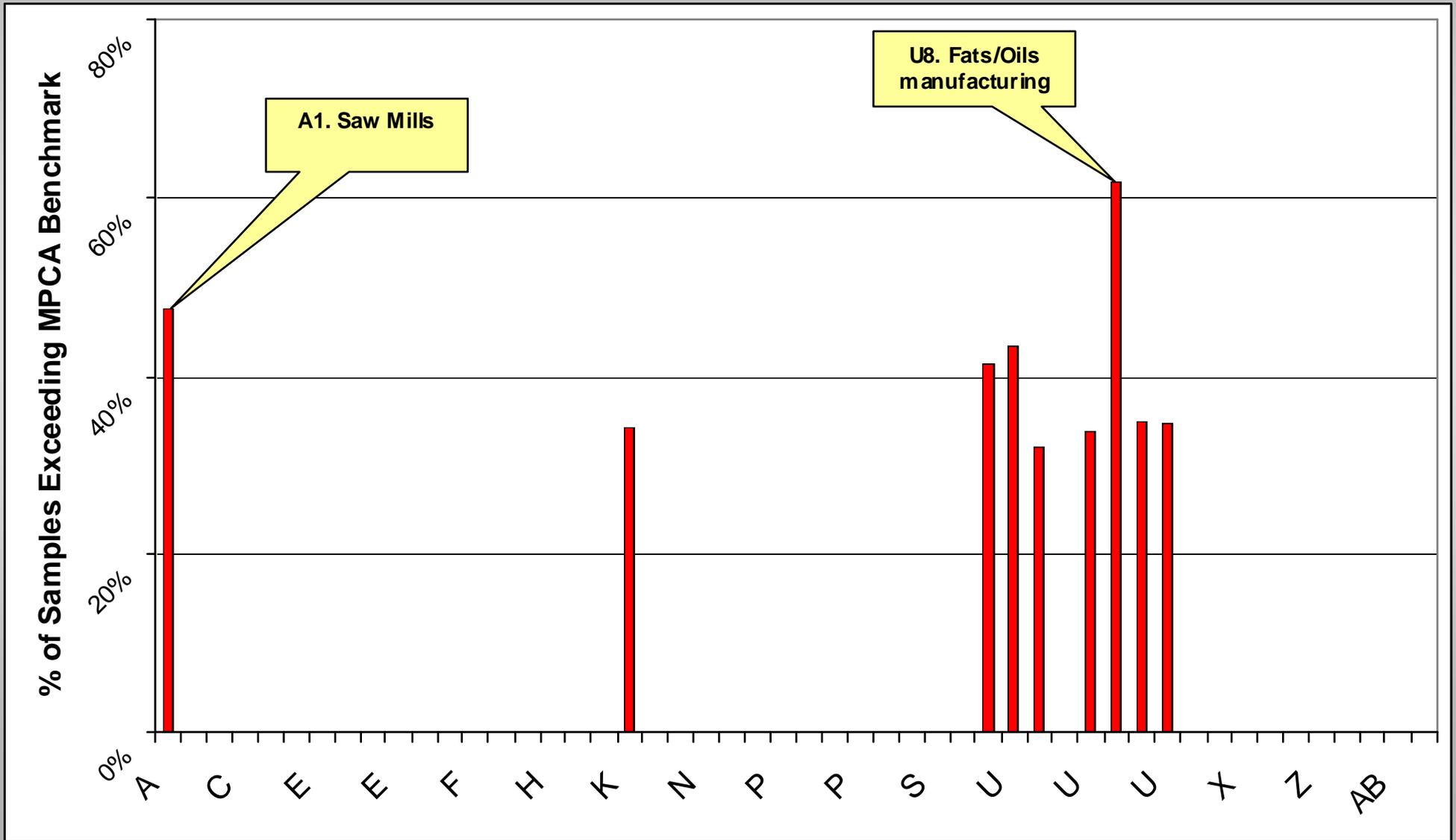
# BOD



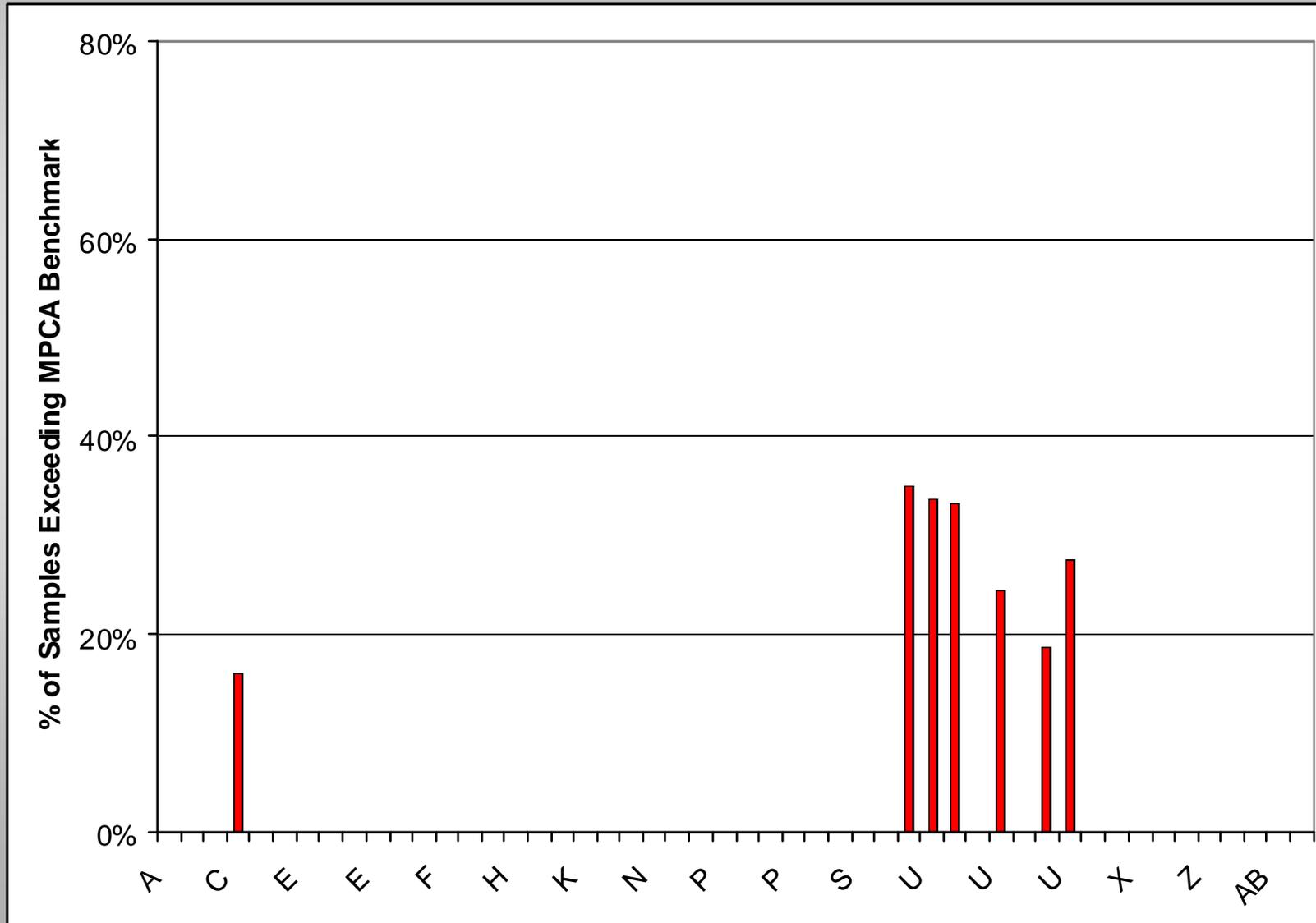
# COD



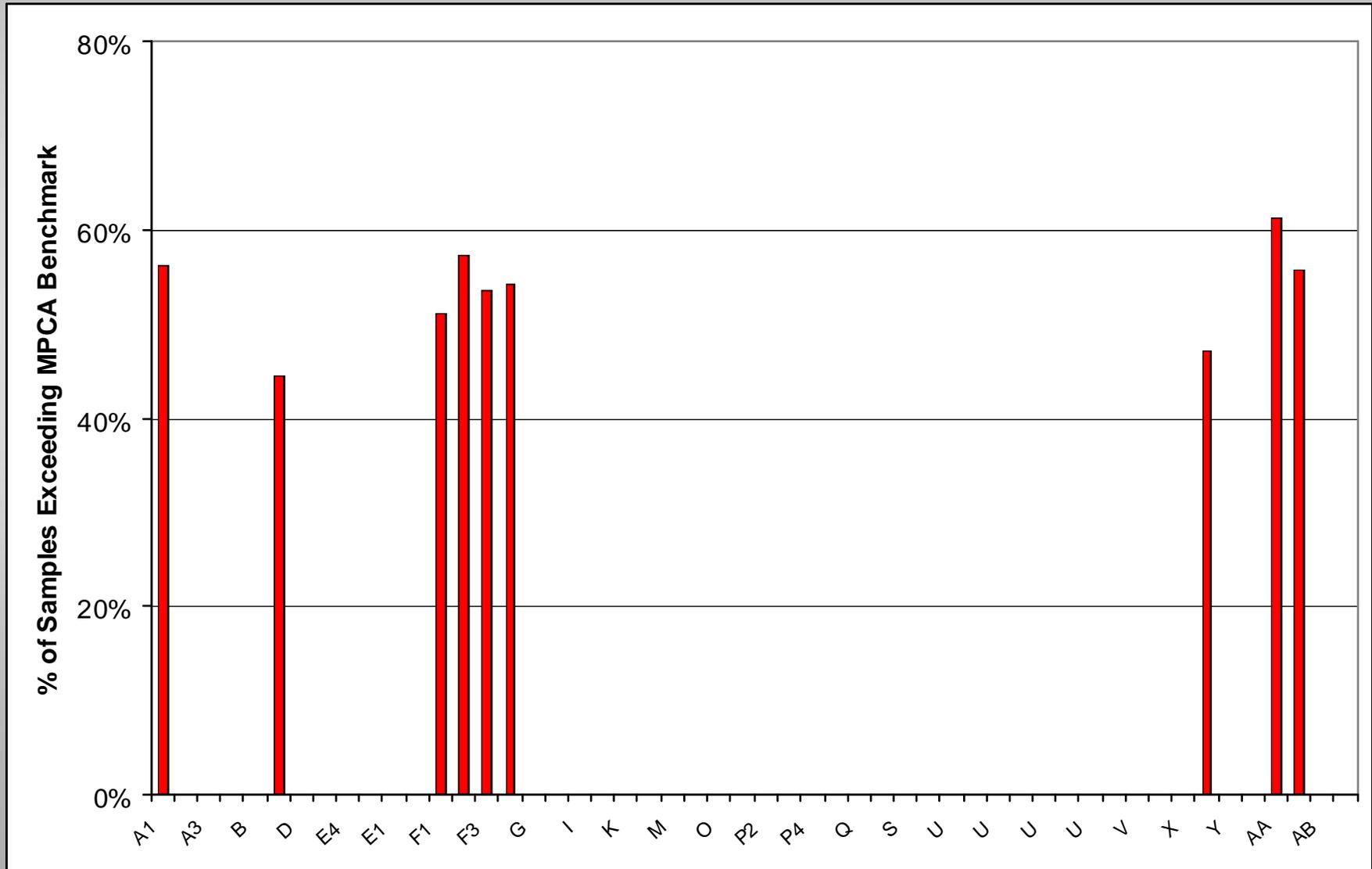
# COD



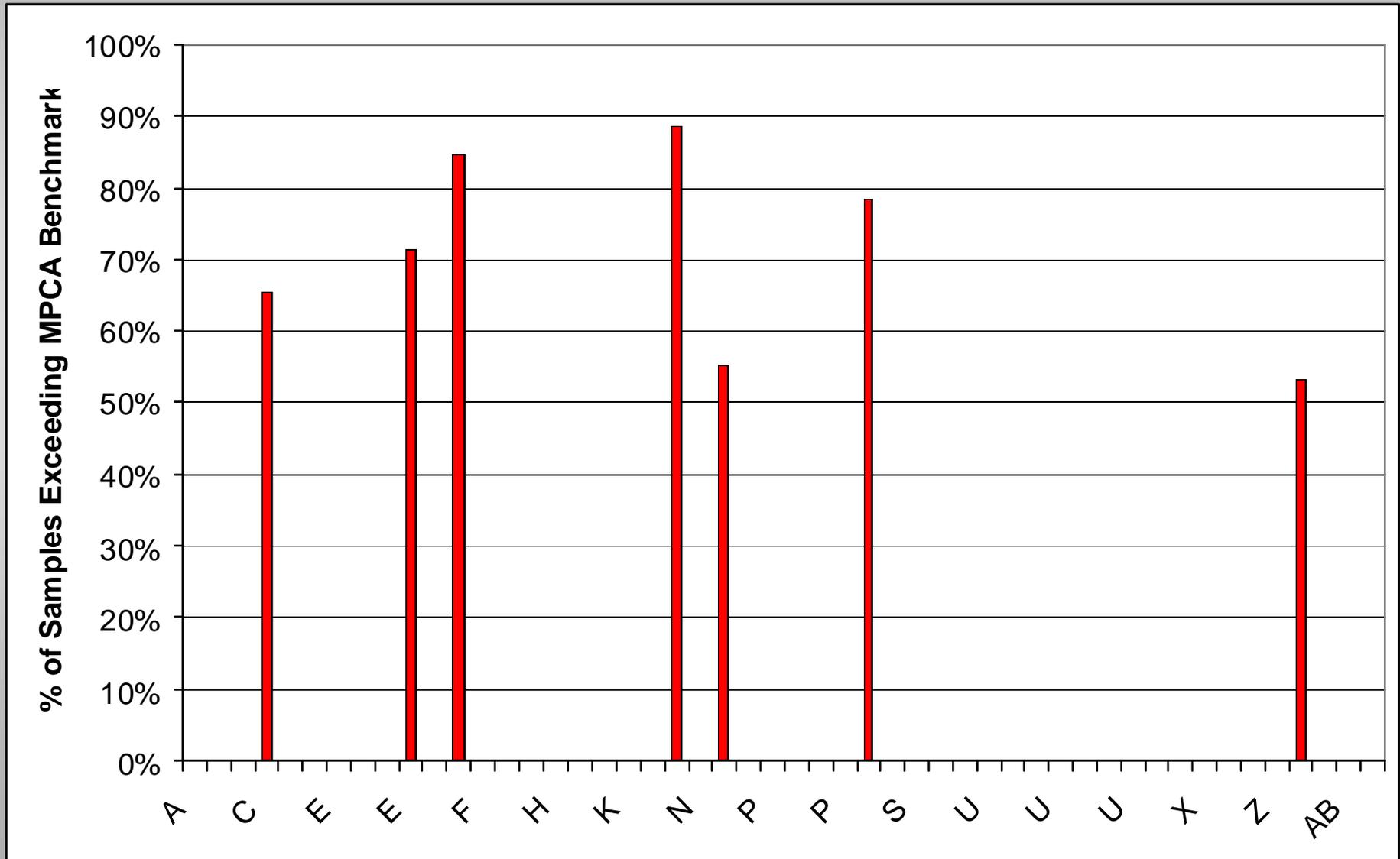
# Total Phosphorus



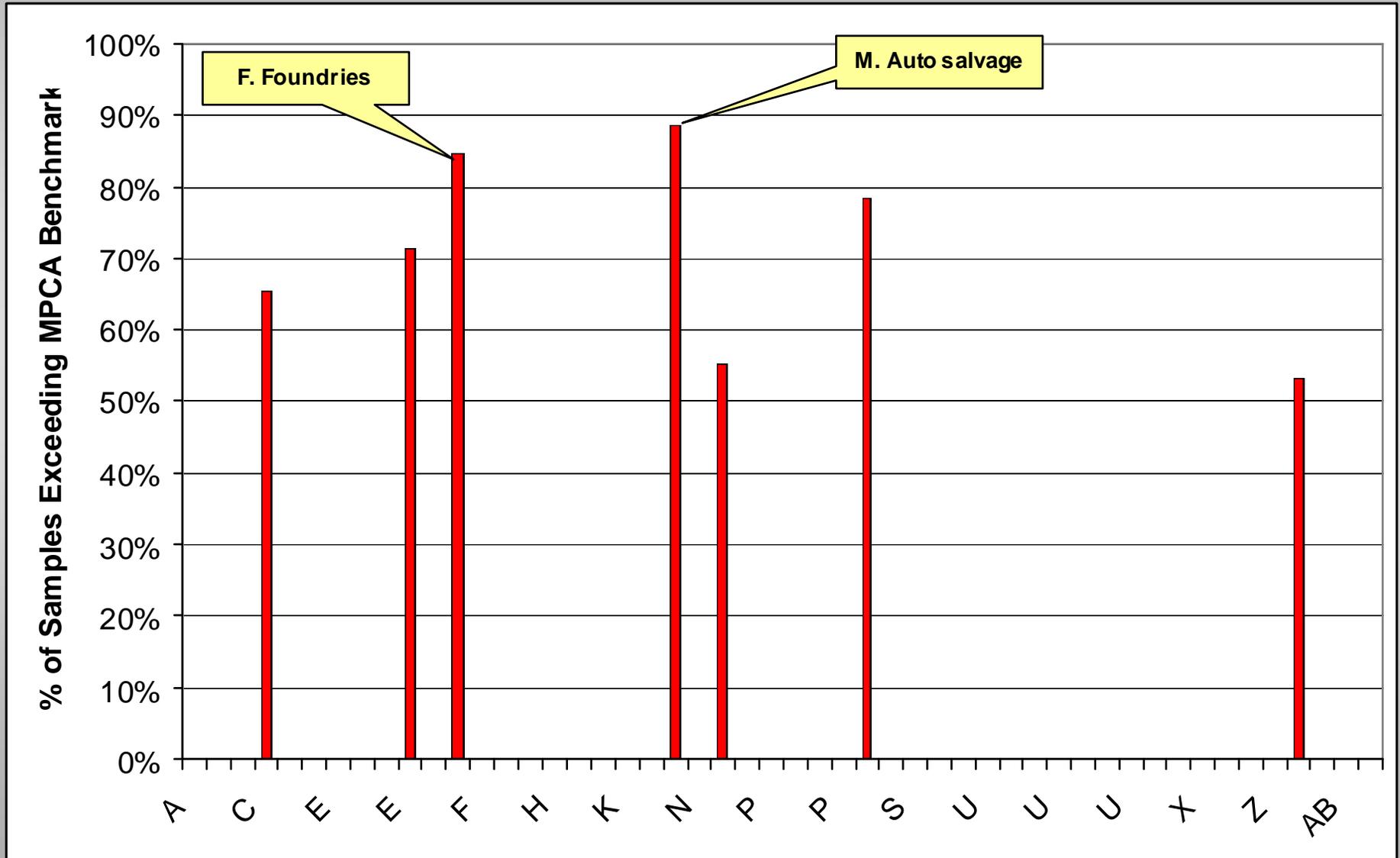
# Total Zinc



# Total Iron



# Total Iron



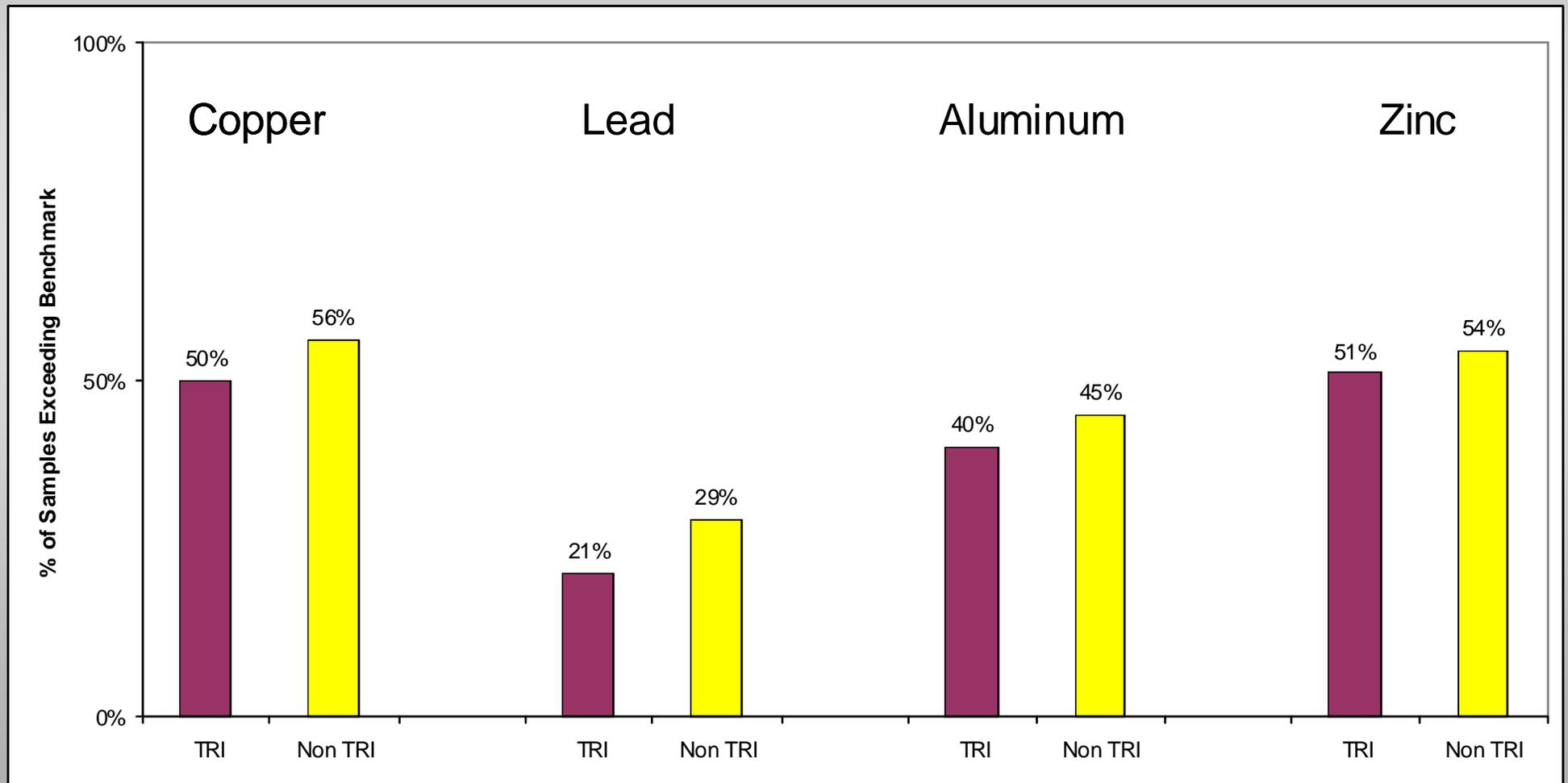
# Influence of On-Site Materials

Compared stormwater results within two subgroups:

1. TRI Reporters – facilities that process larger quantities of chemical
2. Non TRI Reporters - facilities that use small quantities or none of chemical



# Stormwater Results For TRI and Non-TRI Facilities



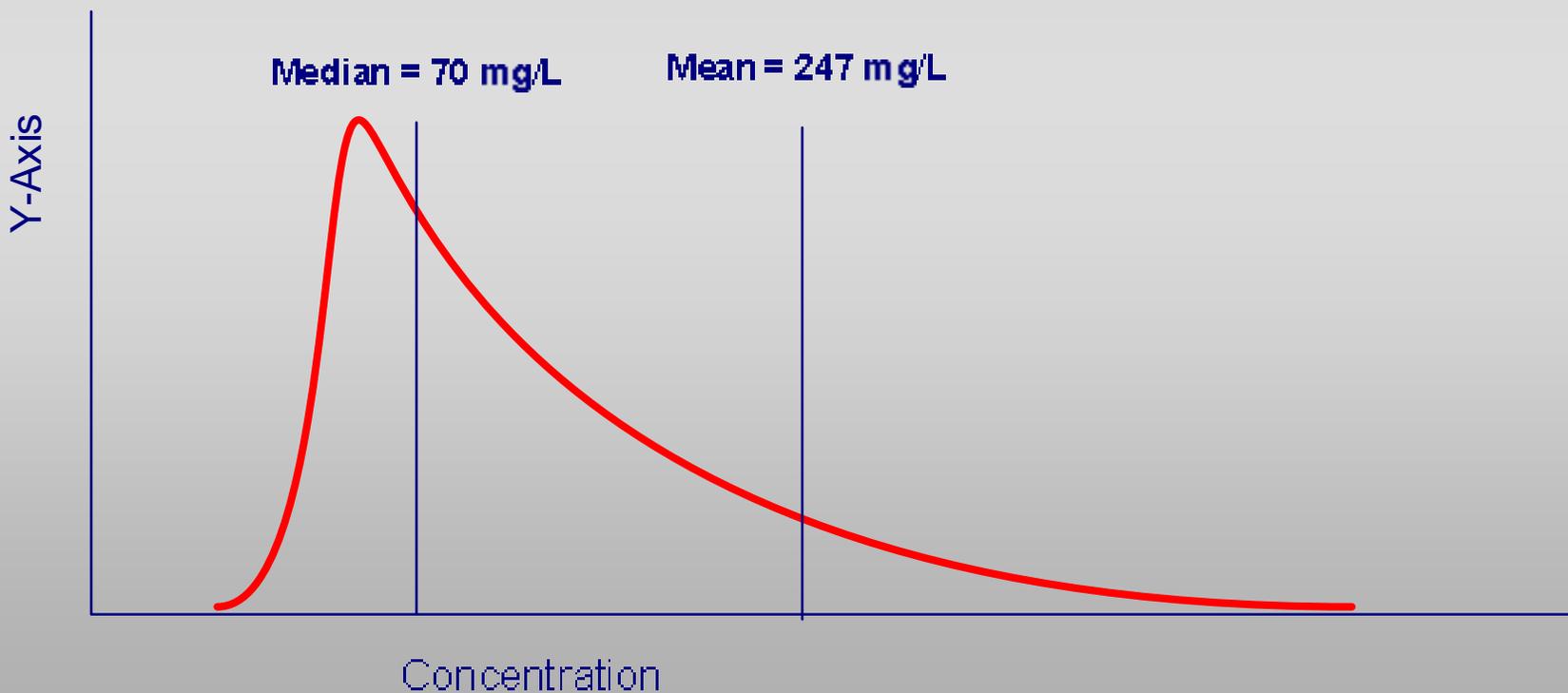
# What is the probability a facility will meet its benchmarks?

- Benchmarks are not compared to single values
- Minimum of four quarterly samples are collected
- Mean of all samples is compared to benchmark concentration

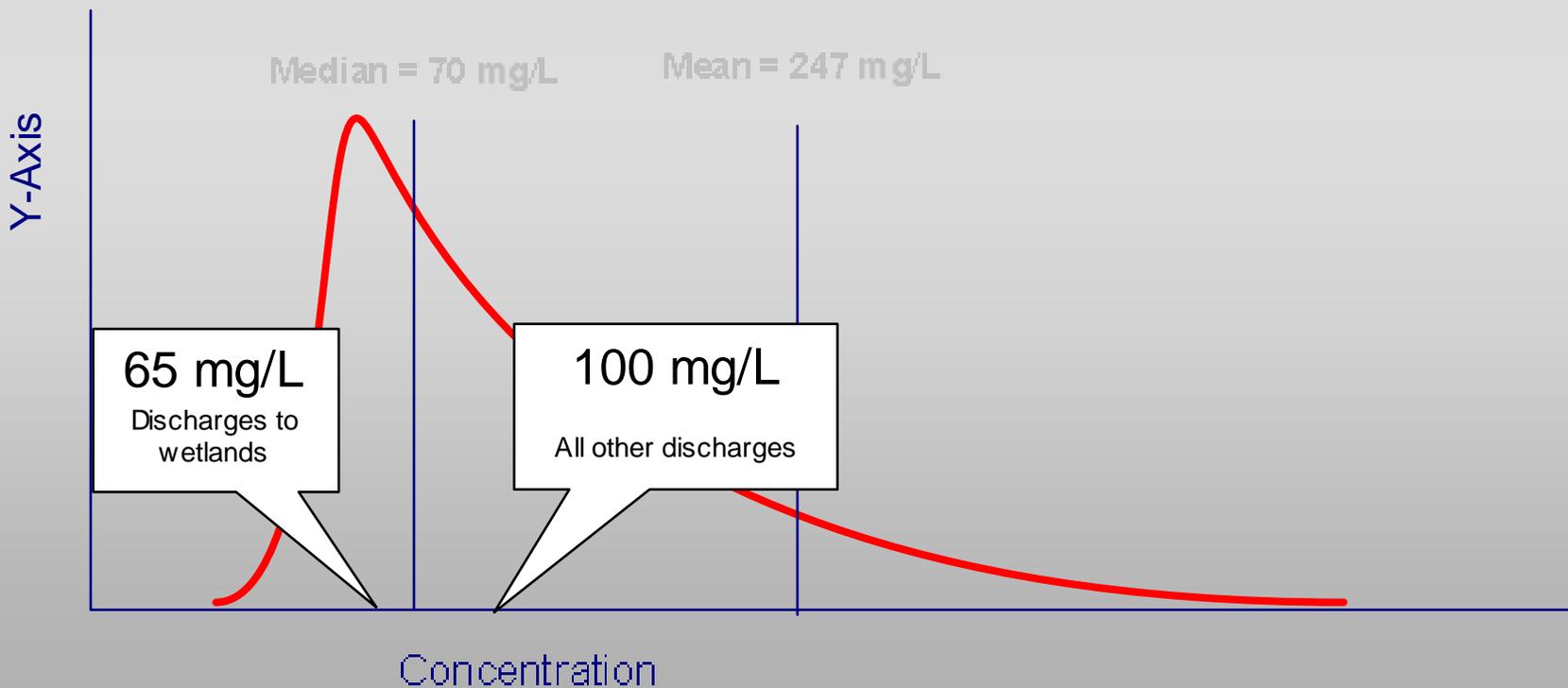


# Example 1995 Dataset: TSS

## Sector P. Transportation/Warehousing

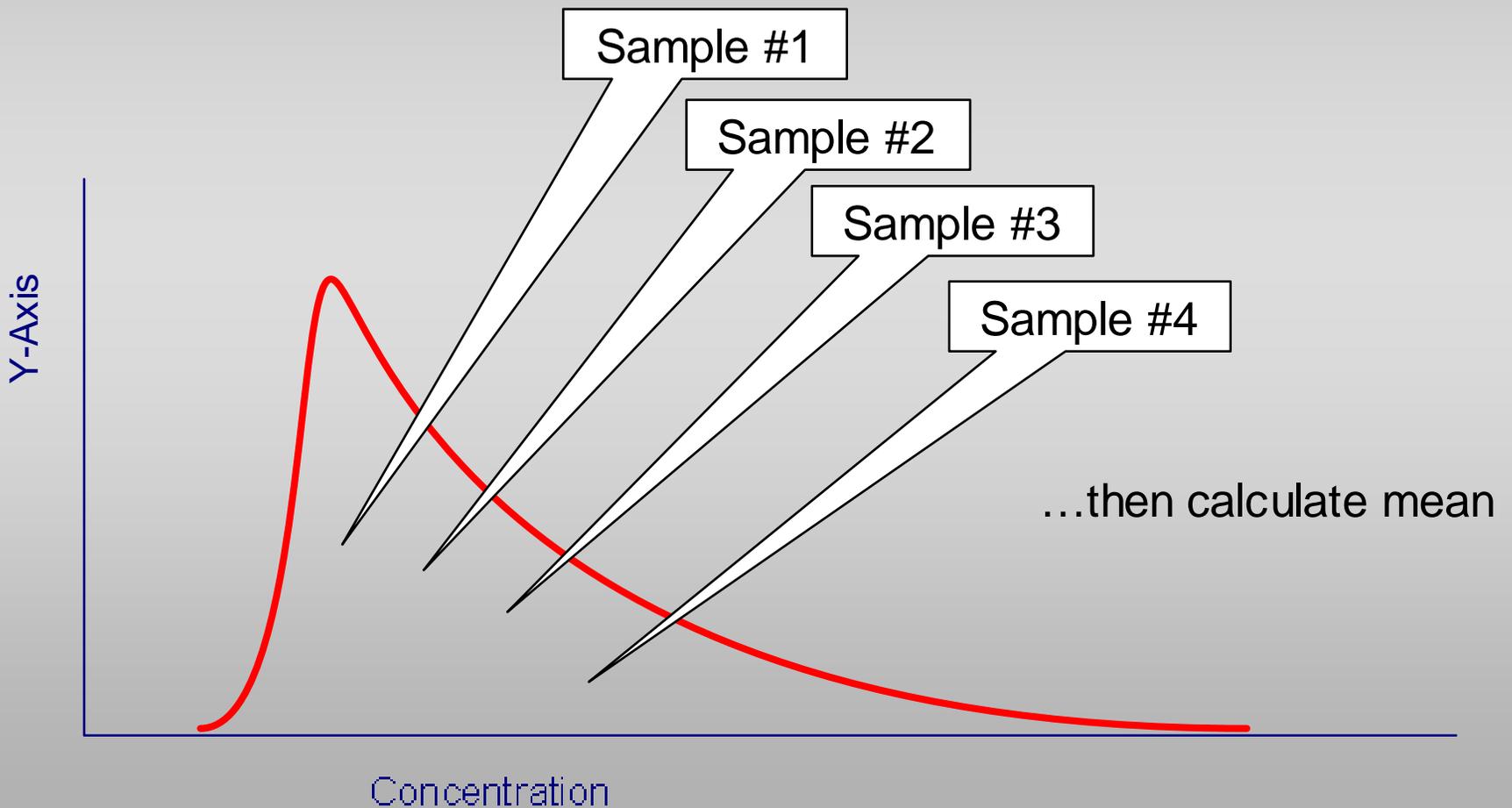


# Two Possible TSS Benchmarks



# Monte Carlo Simulation

Randomly draw four samples, then calculate mean; 1,000 trials

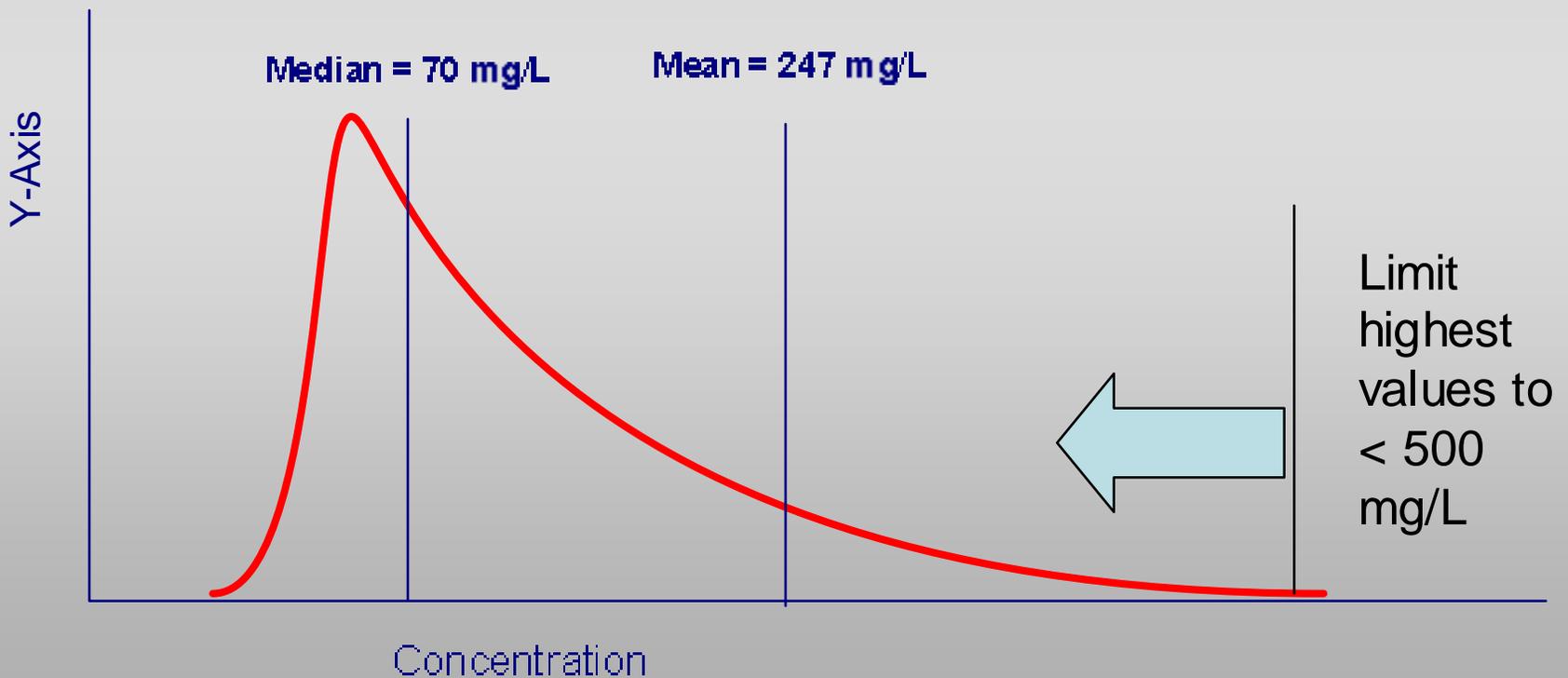


# Results

	% facilities meeting 100 mg/L benchmark	% facilities meeting 65 mg/L benchmark
Existing data set	<b>34%</b>	<b>19%</b>



# Scenario 2: Cut-off High Concentrations



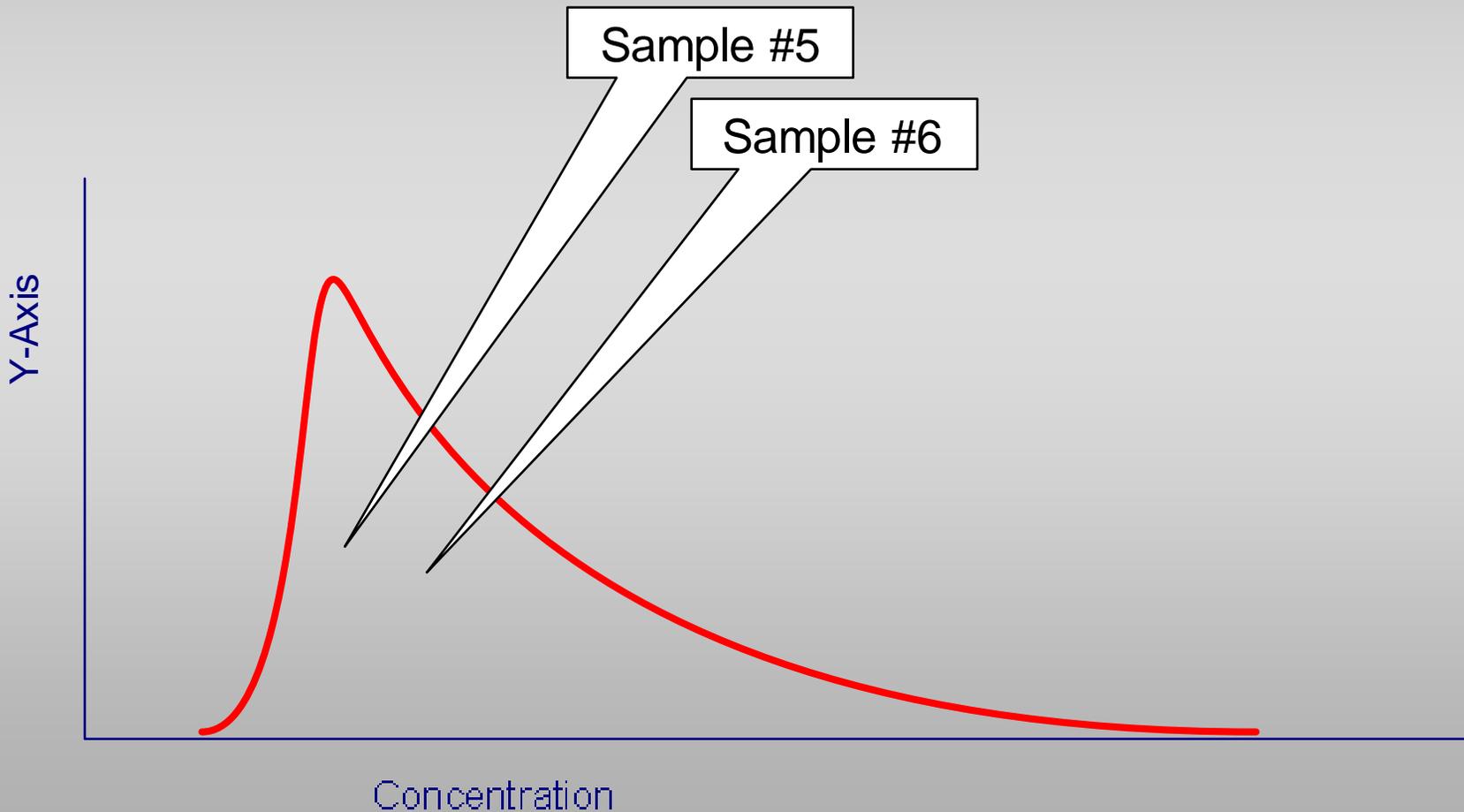
# Results

	% facilities meeting 100 mg/L benchmark	% facilities meeting 65 mg/L benchmark
Existing data set	<b>34%</b>	<b>19%</b>
Limit high values (<500 mg/L)	<b>44%</b>	<b>33%</b>



# Scenario 3: Resample

## Take two additional samples



# Results

	% facilities meeting 100 mg/L benchmark	% facilities meeting 65 mg/L benchmark
Existing data set	<b>34%</b>	<b>19%</b>
Limit high values (<500 mg/L)	<b>44%</b>	<b>33%</b>
Two extra samples	<b>36%</b>	<b>21%</b>

# Conclusions

- Benchmarks more likely to be exceeded are:
  - » TSS
  - » Metals, especially iron
- All industrial sectors are equally likely to exceed benchmarks for TSS
- For toxic chemicals and metals, volume of use or storage on-site is not a good predictor of meeting benchmarks



# Conclusions

- Certain industrial sectors are more likely to exceed other benchmarks
  - » Food sector – COD, BOD
  - » Sawmills – COD
  - » Primary metals/foundries – Fe, Cu
  - » Concrete plants – Fe
  - » Salvage yards – Al, Fe
- Improving chance of meeting benchmarks requires active prevention program
- Resampling without corrective action does not improve chances of meeting benchmarks



# Questions

Loren Larson

Caltha LLP

Minneapolis, Minnesota

[llarson@calthacompany.com](mailto:llarson@calthacompany.com)

(763) 208-6430



**Caltha LLP**

[www.calthacompany.com/?page\\_id=16](http://www.calthacompany.com/?page_id=16)