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# **Data and Findings: Initial Evaluation of Fine Particle Siting Guidance Regarding Roadway Setback**



**Puget Sound Clean Air Agency  
Quality Assurance Department  
Air Monitoring Group**

- The traffic count along E. Marginal Way in Seattle has increased dramatically over the last 10 years. This calls into question our neighborhood scale site at the Duwamish parking lot. According to the siting criteria nomogram in “40 CFR 58 App. E Section 8 Particulate Matter Figure 2 Acceptable Areas for PM10 Micro, Middle, Neighborhood, and Urban Samplers Except for Microscale street Canyon Sites”, our site may no longer meet this siting guideline.
- **Is this really a significant problem?**

# PM-10 Roadway Setback Diagram

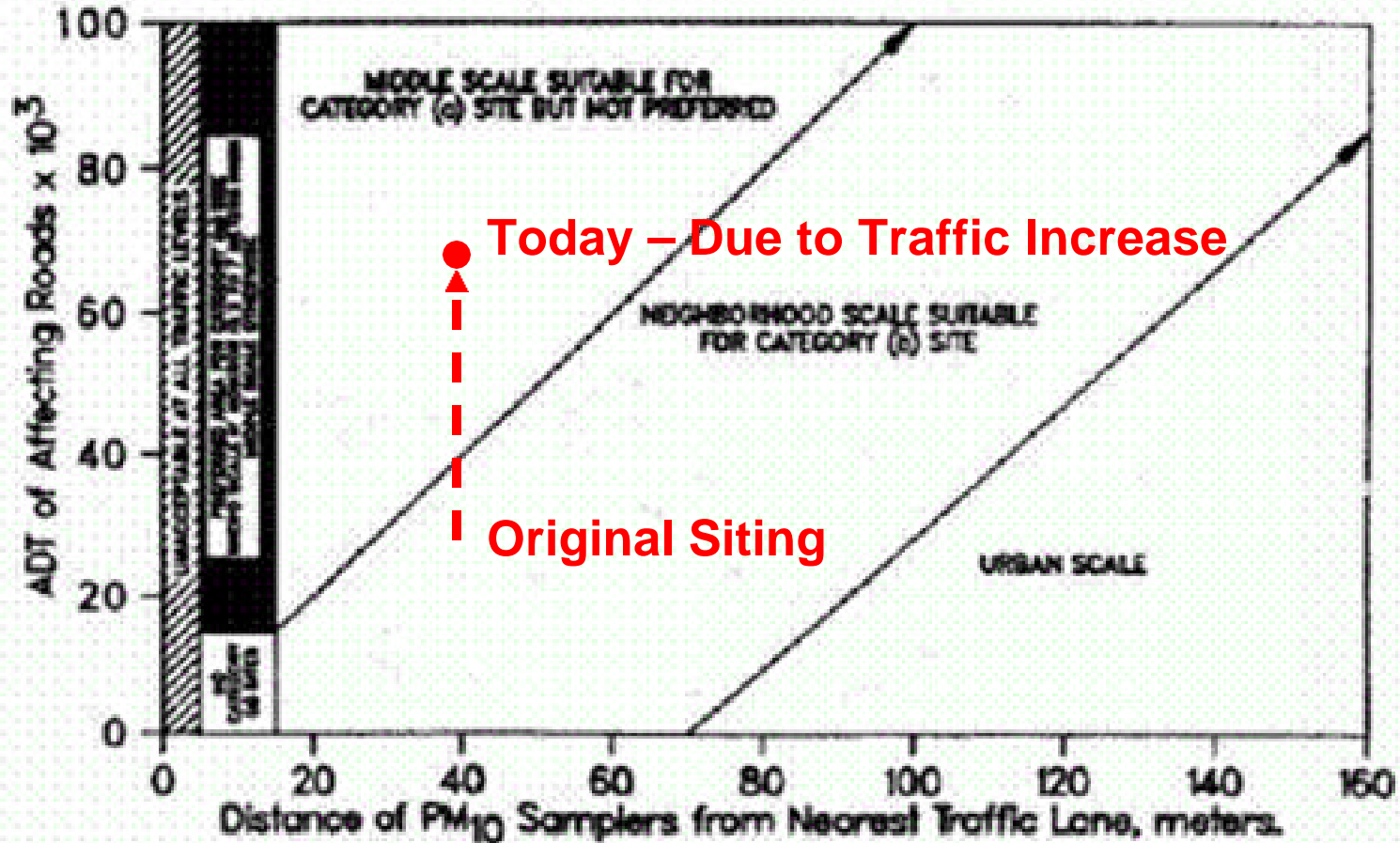
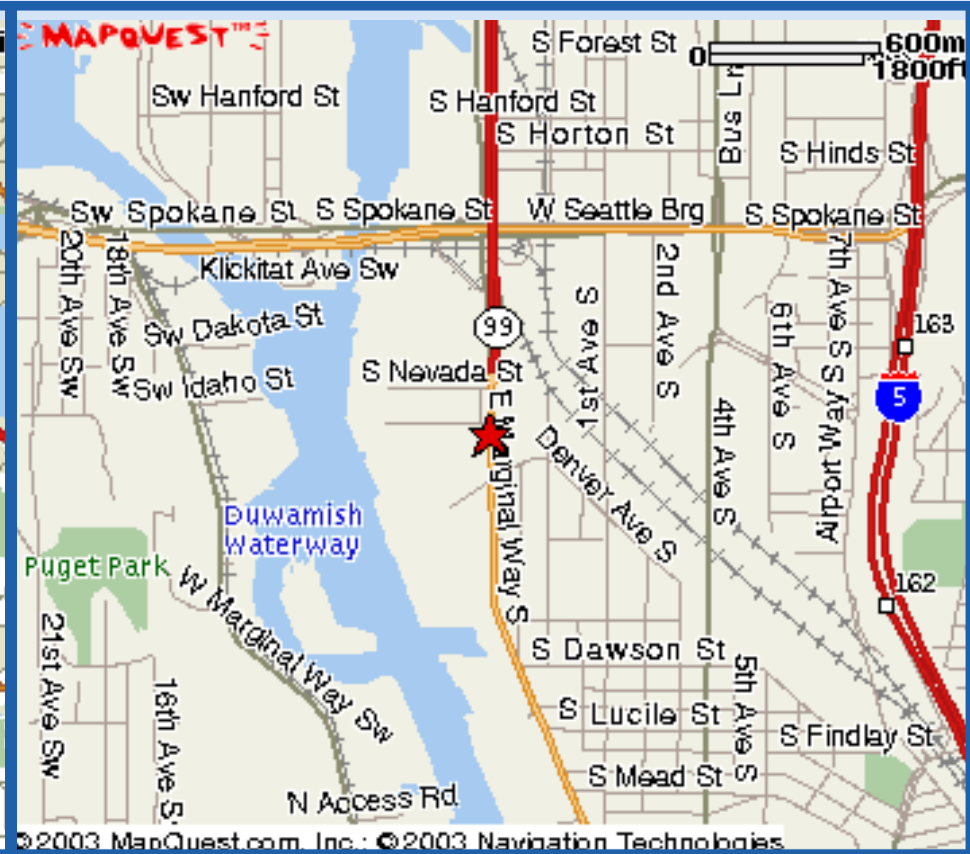
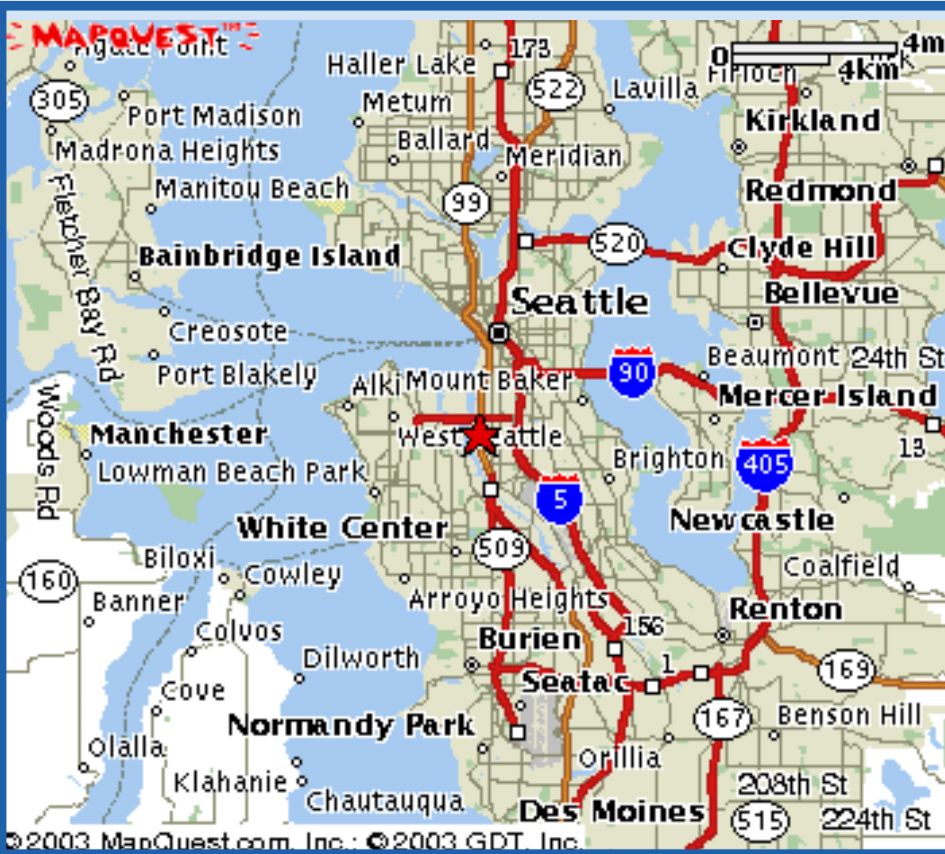


Figure 4-1 Acceptable areas for Micro, Middle, Neighborhood and urban samplers except for micro scale street canyon sites

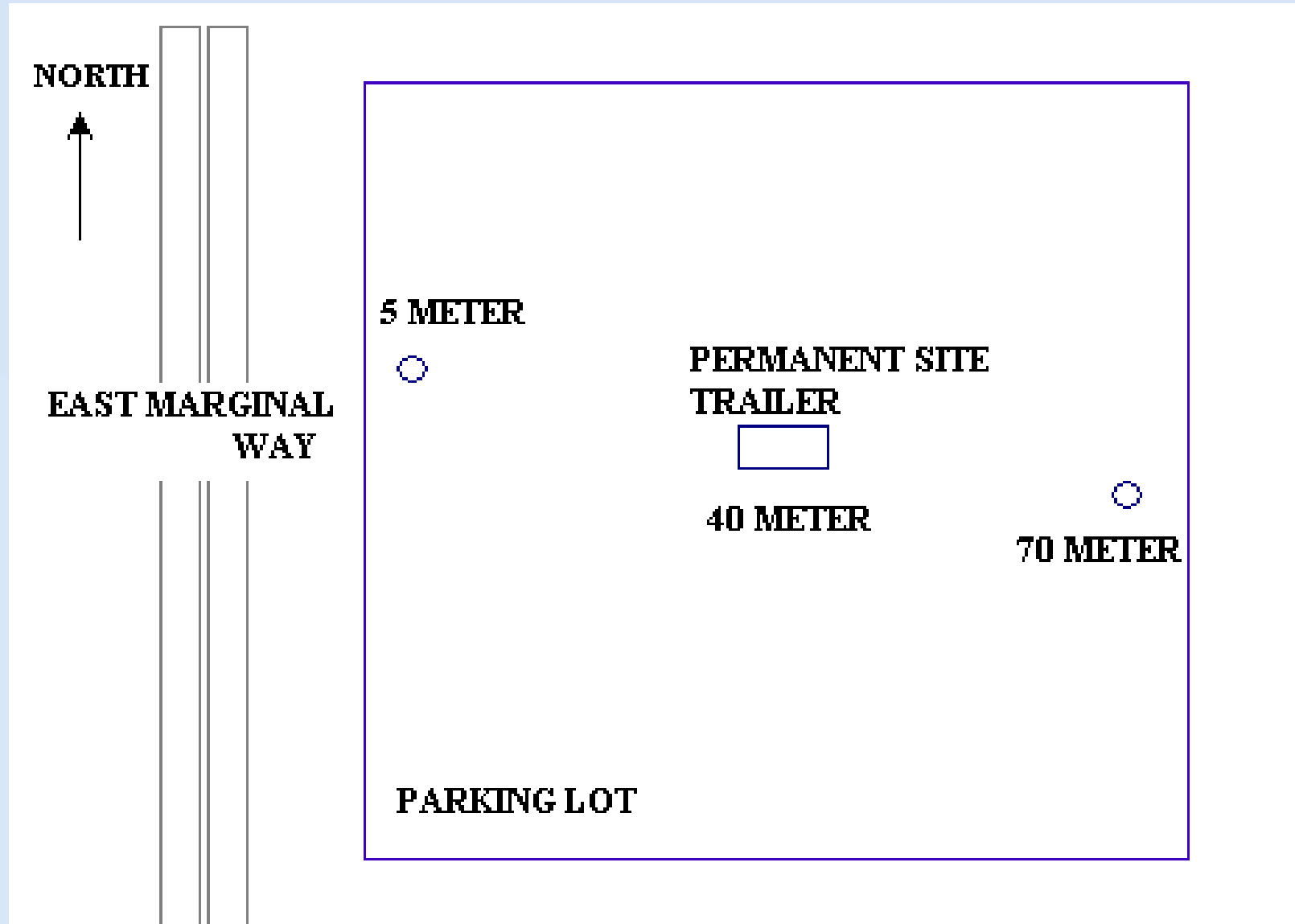
# Site Description - SEATTLE DUWAMISH



- **Industrial area**
  - 21 registered sources within 5 km
- **Site has been in operation for over 20 years**
- **WA State's Maximum Concentration PM Site**



# Duwamish Site Layout

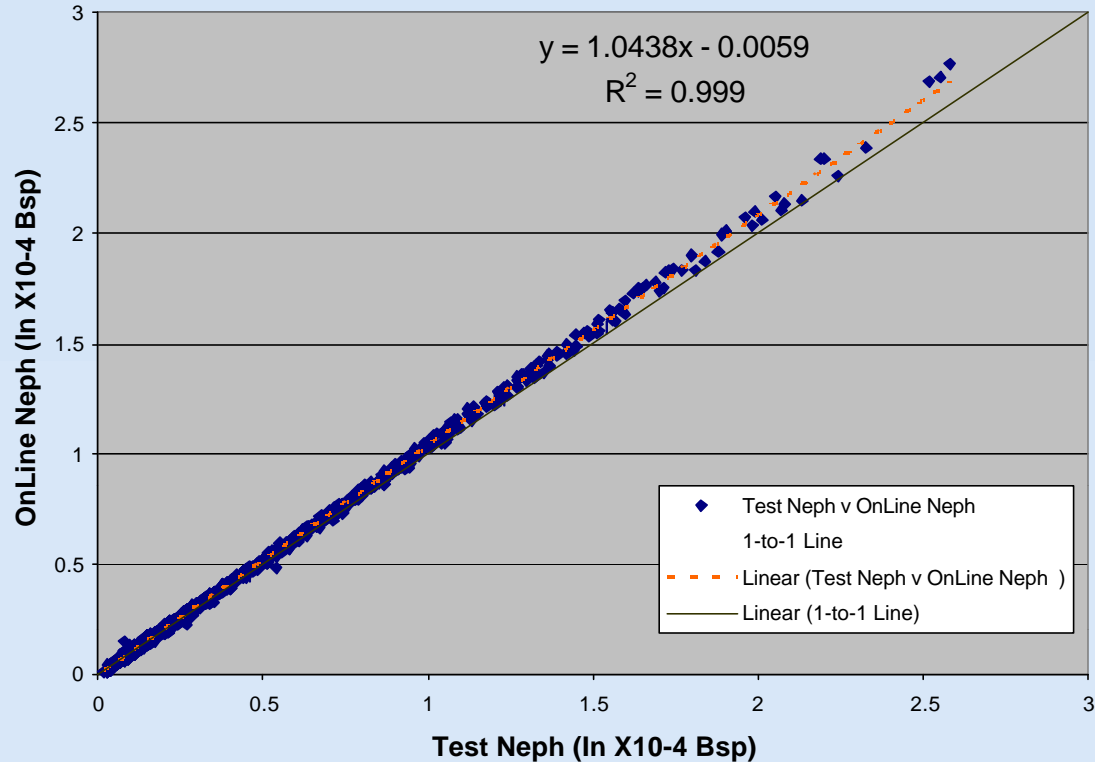


- **Control is the Permanently Sited Nephelometer (40 Meter Road Setback)**
- **70 Meter Experiment** places a Nephelometer at a 70 Meter Road Setback (Get 4 weeks of good data)
  - Data Comparison includes looking at 1 Hour Averages, 6 Hour Averages, 12 Hour Averages, and 24 Hour Averages.
  - Compare the Means to detect bias based on Distance from Road
  - Significant Bias will be defined as outside 4% based on historical analysis of collocated nephelometers.
- **5 Meter Experiment** places a Nephelometer at a 5 Meter Road Setback (Get a week of good data)
  - Compare to the 40 Meter Nephelometer in the same manner

# Collocated NephS at Lynnwood Site



Lynnwood  
Test Neph vs OnLine Neph  
Jan 1 - Mar 21, 2000



Significance defined as 4% based on previous experiments similar to this one.



- **Temporary siting required use of a car battery to power the Nephelometer**
- **Data was milked, rather than telemetered**
- **Was able to obtain a month of good data for the first experiment (70 Meters), but was only able to obtain 4 days of good data for the 5 Meter Roadside experiment**





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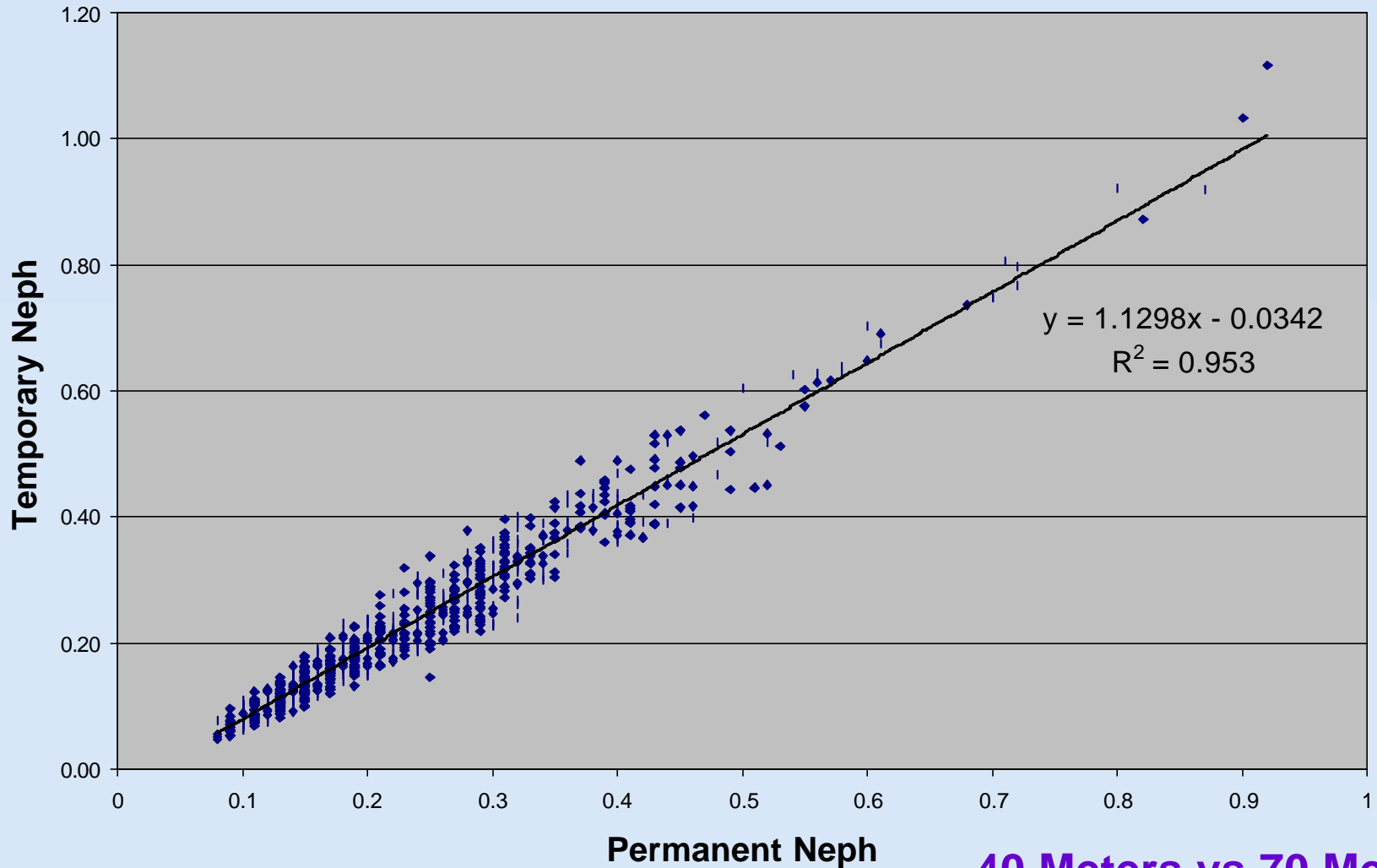
# First Experiment: 40 Meters vs 70 Meters



# Regression based on 1 Hour Averages

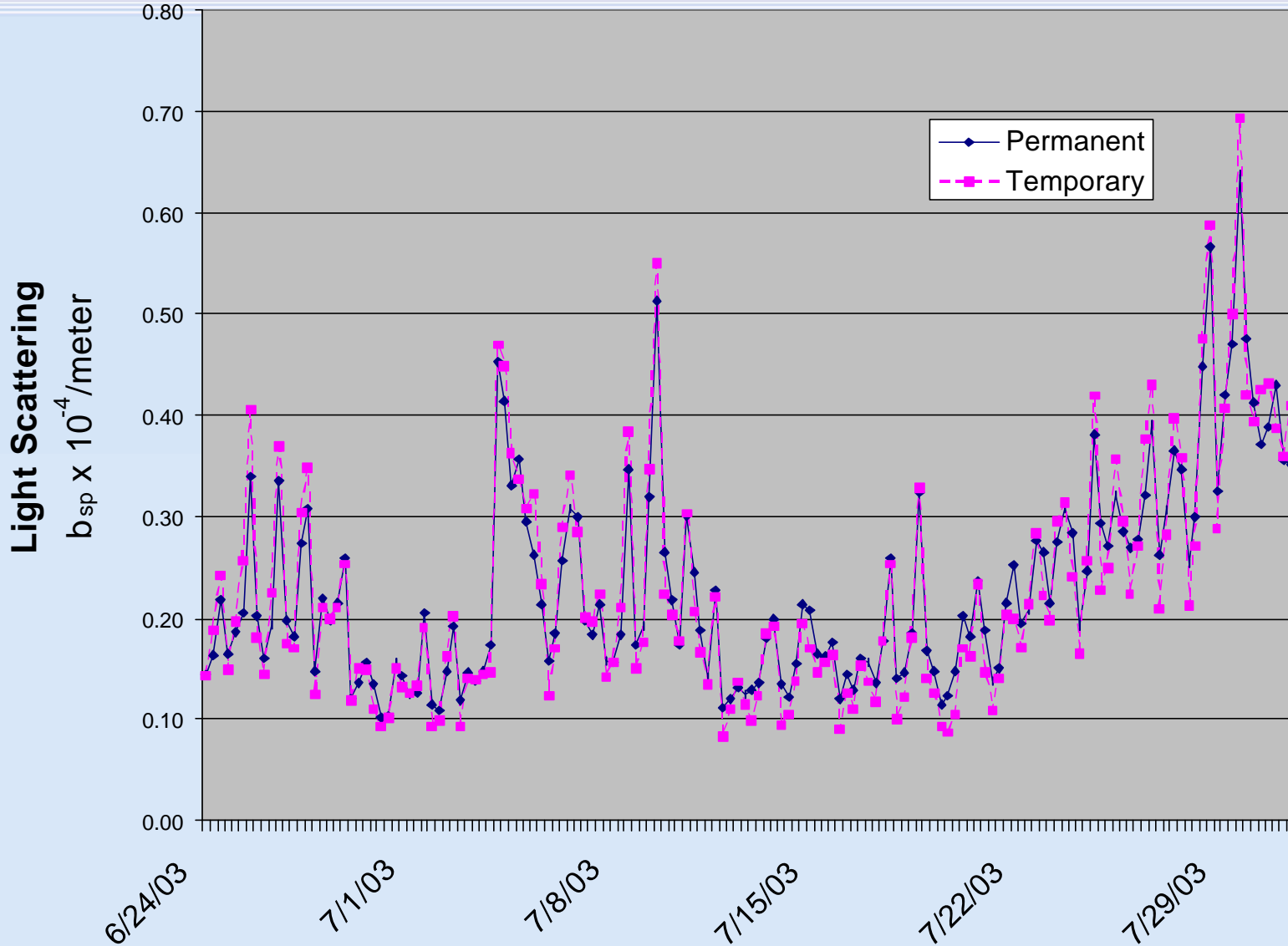


## Duwamish Neph Comparison



# Duwamish Neph Comparison

## 6 Hour Average

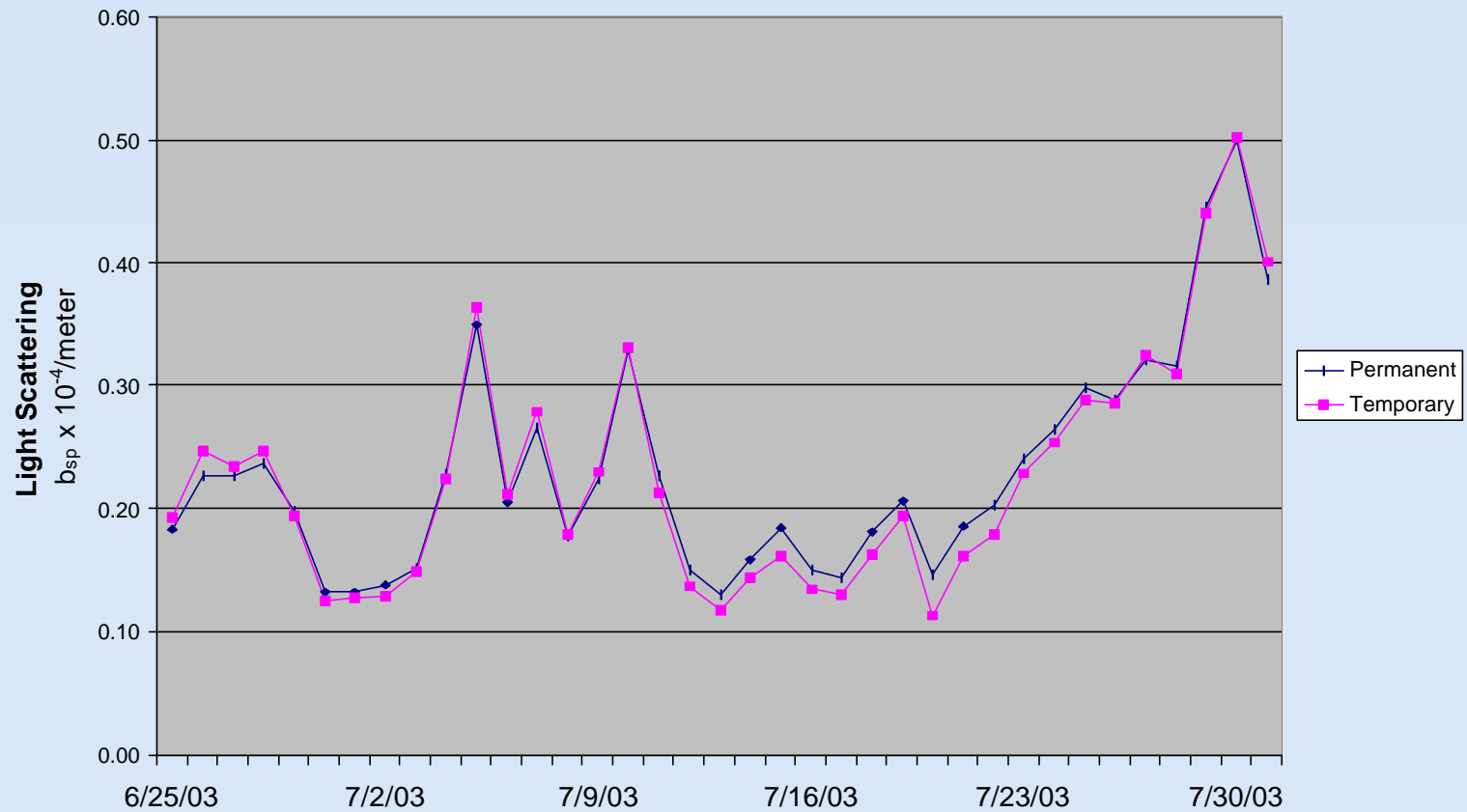


40 Meters vs 70 Meters

# 24 Hour Averages



## Duwamish Neph Comparison 24 Hour Average



40 Meters vs 70 Meters

# Data Comparison



<b>Setback Experiment</b>	<b>Temp Neph</b>	<b>Permanent Neph</b>
<b>Distance from Road</b>	<b>70 m</b>	<b>40m</b>
<b>Mean bsp(x10<sup>-4</sup>)</b>	<b>0.2271</b>	<b>0.2315</b>
<b>Standard Error</b>	<b>0.009</b>	<b>0.008</b>
<b>St Deviation</b>	<b>0.116</b>	<b>0.102</b>
<b>Sample Variance</b>	<b>0.013</b>	<b>0.01</b>
<b>Range</b>	<b>0.61</b>	<b>0.54</b>
<b>Min</b>	<b>0.08</b>	<b>0.1</b>
<b>Max</b>	<b>0.69</b>	<b>0.64</b>
<b>Count</b>	<b>149</b>	<b>149</b>

**40 Meters vs 70 Meters**



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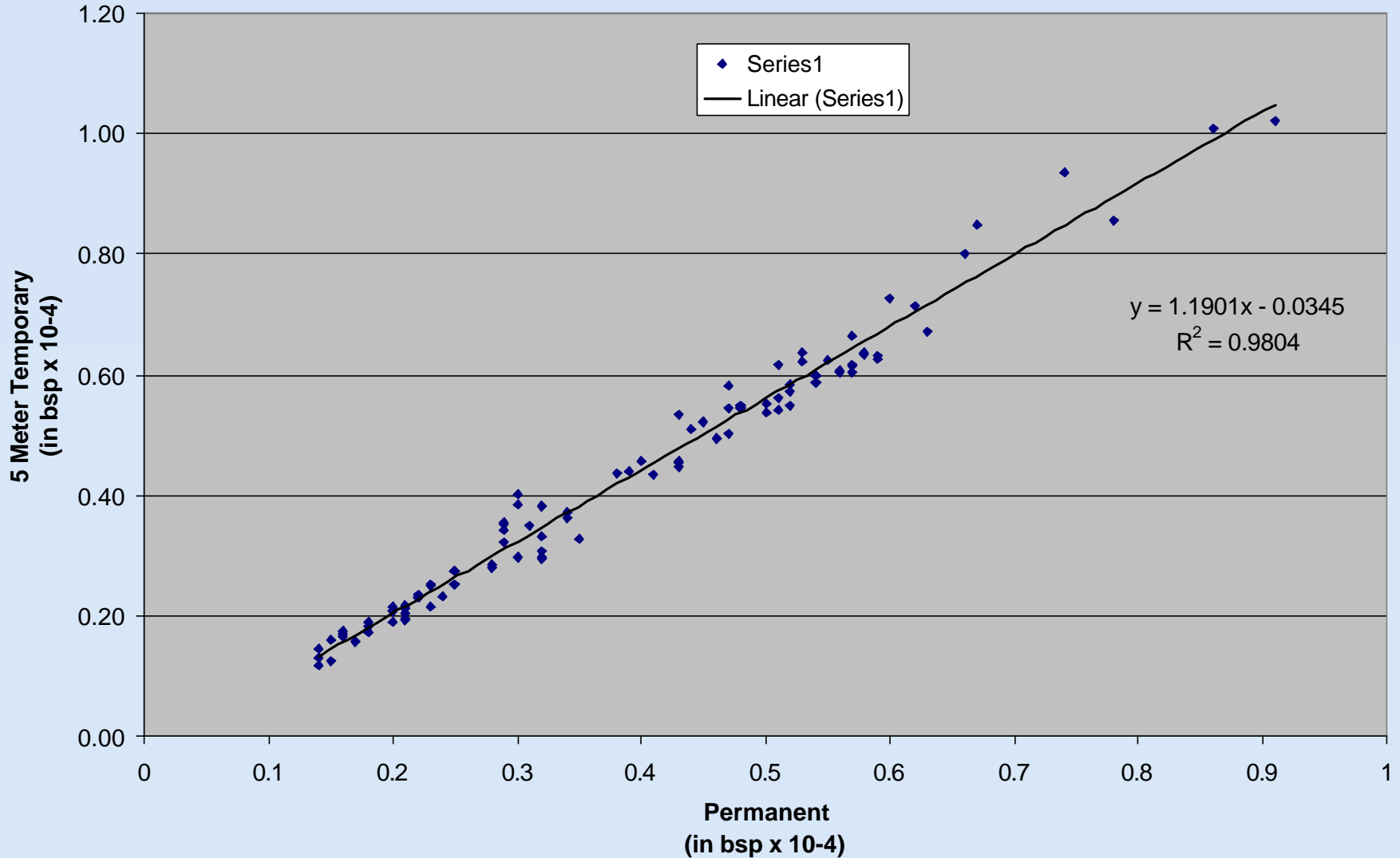
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# Roadside Experiment: 40 Meters vs 5 Meters



# Duwamish Roadside Neph Comparison (5 Meter Setback vs 40 Meter Setback)



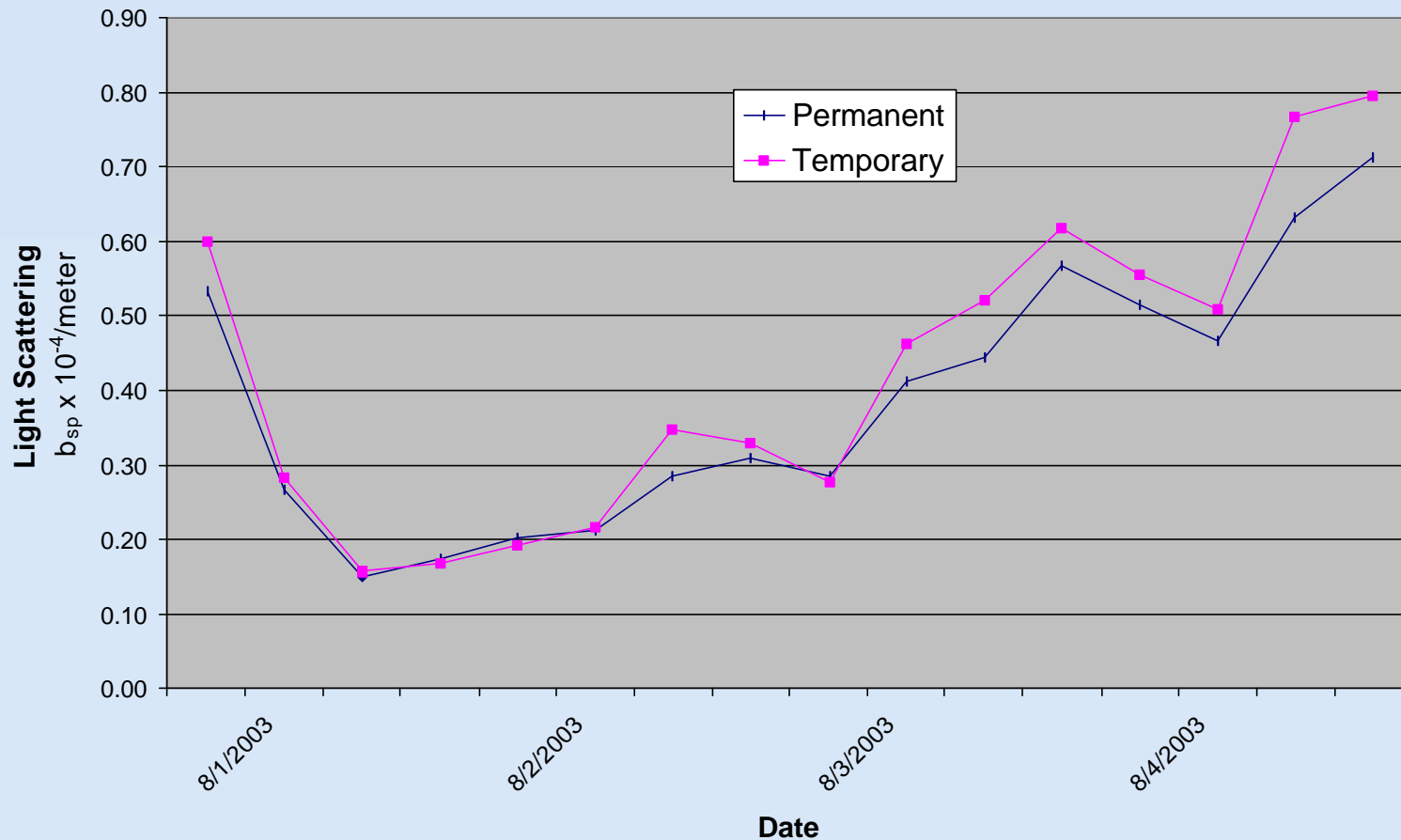
40 Meters vs 5 Meters



(6 Hour Averages)



## Roadside Neph Comparison Permanent at 40 Meters vs Temp at 5 Meters



40 Meters vs 5 Meters

# Roadside Neph Comparison (1 Hour Avg)

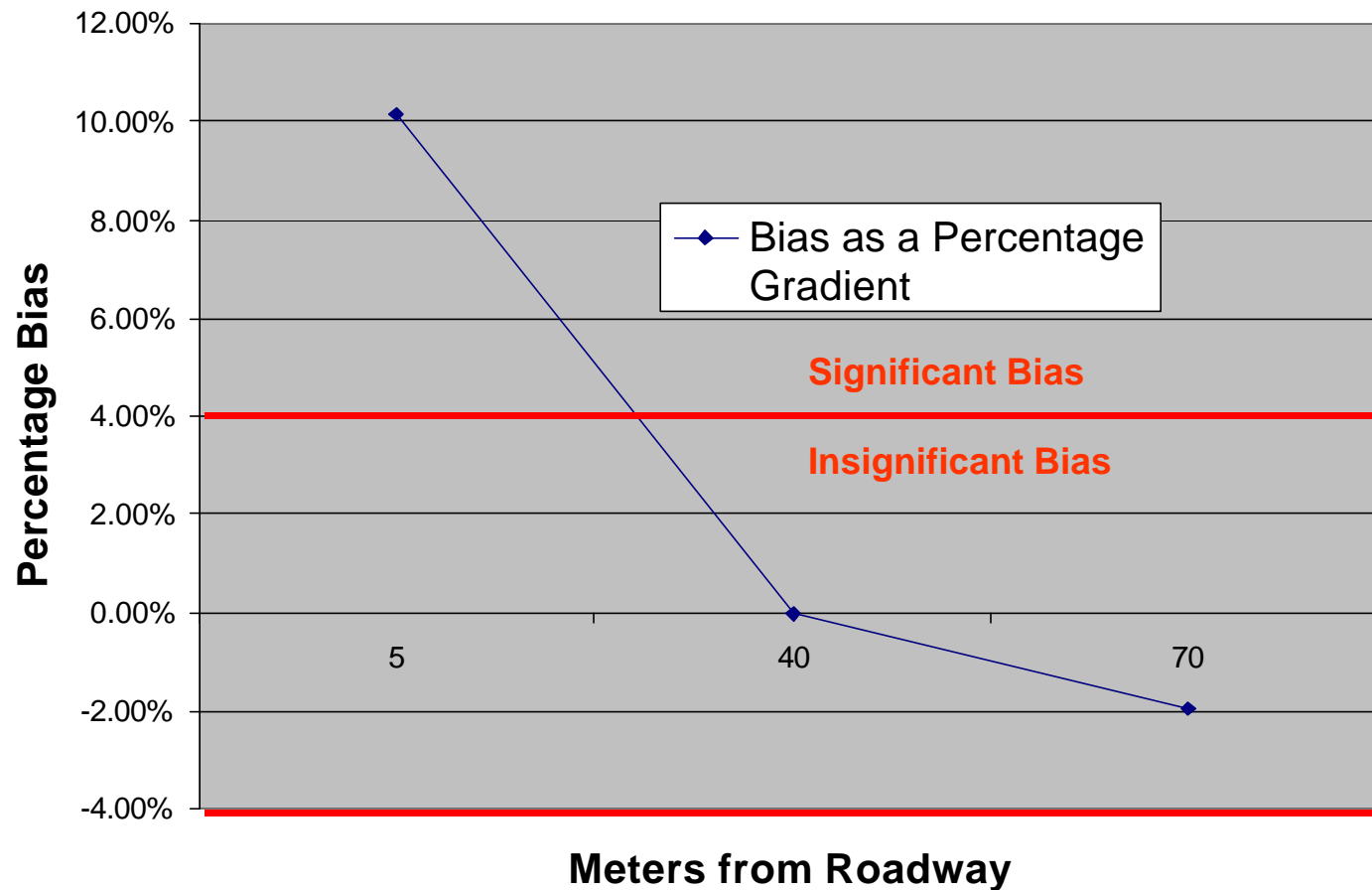


Roadway Experiment	Roadway Neph	Permanent Neph
Distance from Road	5m	40m
Mean bsp( $\times 10^{-4}$ )	0.4249	0.3858
Standard Error	0.022	0.018
St Deviation	0.214	0.178
Sample Variance	0.046	0.032
Range	0.9	0.77
Min	0.12	0.14
Max	1.02	0.91
Count	96	96

Data Chart using 1 hour averaged data

40 Meters vs 5 Meters

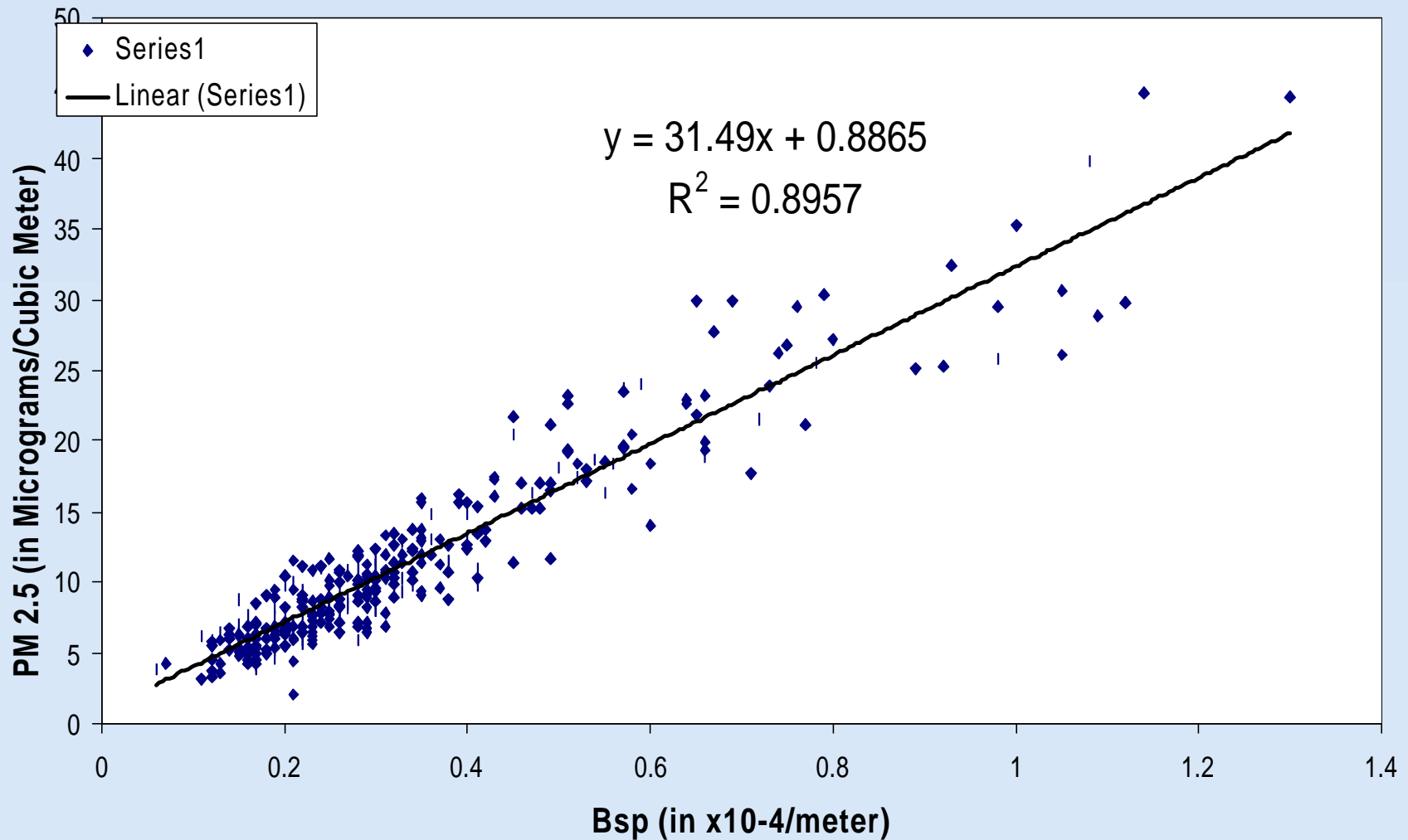
## Bias as a Percentage Gradient



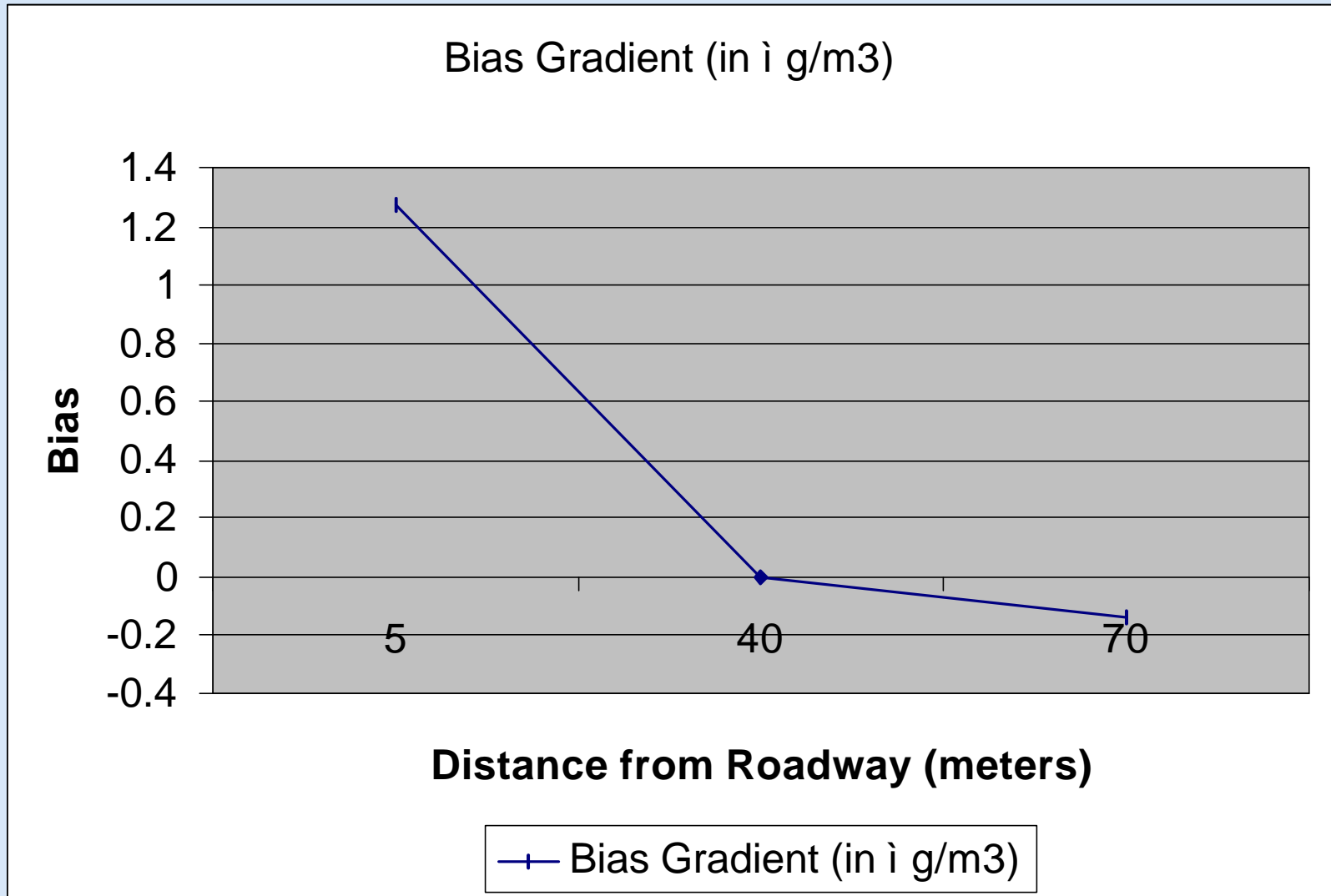
# Bsp relates to Micrograms/Cubic Meter



## Seattle, Duwamish 2002



# Bias - (Micrograms/Cubic Meter)



- **Bias found between the 40 Meter and the 70 Meter site is not significant.**
- **The findings of this experiment call the Roadway Setback graph for PM-10 into question as it applies to PM-2.5.**
- **For PM-2.5, we think that the nomogram may be too constraining and may not add to the quality system.**
- **Our findings suggest that our Duwamish Site is still adequate for our Neighborhood Scale siting applications.**

- **No final conclusions should be drawn from this short series of experiments.**
- **Recommend EPA conduct a more complete assessment of the set back requirements for PM 2.5 monitoring.**
- **Recommend that EPA consider this assessment to support future PM (coarse and fine) siting issues.**