THEME 2

WATER QUALITY SURVEILLANCE

Paper 05
Surface Water Quality Assessment along the River Ma Oya and Its Effects on Water Treatment for Drinking

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INTRODUCTION

The quality of surface water is a very sensitive issue. The impressive growth of human population and economic development have resulted in the current worldwide deterioration in water quality. Water quality refers to the physical, chemical and bacteriological characteristics of water. Water treatment or the purification and sanitation of water vary as to the source and kinds of water. This study aims to assess spatial and seasonal variations of water quality of Ma Oya by analysing selected water quality parameters and assess the effects of these variations on the drinking water treatment processes.

HIGHLIGHTS

- Grab samples from three water intake locations were collected daily
- Jar test was conducted twice a day to determine Optimum Alum dosages
- Colour and Turbidity results varied seasonally and spatially
- Developed a nemogram to select the optimum Alum dosage

METHODOLOGY

Grab samples were collected from three water intake locations along the Ma Oya. Samples for pH, Turbidity and Residual Chlorine were collected daily. Sampling for other parameters mentioned in SLS 614, 1986 Part II was done once a month in the same day for easy comparison. Pollution sources were identified with collaboration of the MOH (Medical Officer Health) of area and these sites were visited with relevant MOH or Public Health Inspector of the area and grab samples were taken for waste water analysis. Sample preservation and pre-treatment was done as mentioned in Standard Methods for Water and Wastewater Analysis. 3 The Jar test was conducted twice a day to determine Optimum Alum dosages.

RESULTS

Bacteriological analysis results did not show any seasonal variation and at the same time it showed good spatial variation as shown in Figure 1. Colour distribution pattern in Ma Oya exactly reflected the rainfall pattern as shown in Figure 2. Turbidity results varied seasonally and spatially as shown in Figure 3. Electrical conductivity, pH, Chloride, Alkalinity and Hardness also indicated a spatial variation. Nitrate, Nitrite, Free Ammonia, Total Phosphates, Total Iron and Total Sulphates levels were not up to the detectable level of the measuring equipment throughout the year of sample analysis. Very high turbidity of water sample collected indicates the heavy pollution load of Ma Oya due to road construction activities. Ma Oya is also contaminated due to wastewater from hotels and households, timber waste and paint from timber shops and soaps and detergents from recreational use. Results of pollution source analyses are presented in Table 1. A nemogram was developed using the results obtained from the Jar testing to select the optimum Alum dosage at different Turbidity and pH levels as shown in Figure 4.

CONCLUSIONS

All the parameters tested show spatial variation, where concentration was increased along the river. Colour and turbidity (Physical parameters) exactly followed the rainfall pattern of the catchment.All the other chemical parameters including pH, EC, Chlorides, Alkalinity, and Total Hardness, does not match with the rainfall pattern.

There were several kinds of pollution sources along the river. According to SLS 722: 1985, BOD was the most important parameter that was needed to be considered. However river assimilative capacity is adequate to reduce the concentration to the allowable limits of SLS 722:1985. Some parameters were detected in non-detectable levels (Free Ammonia, Nitrate, Nitrite, Phosphates, Sulphates and Total Iron).

The nemogram was constructed for finding the optimum Alum dosage for water treatment using collected data.

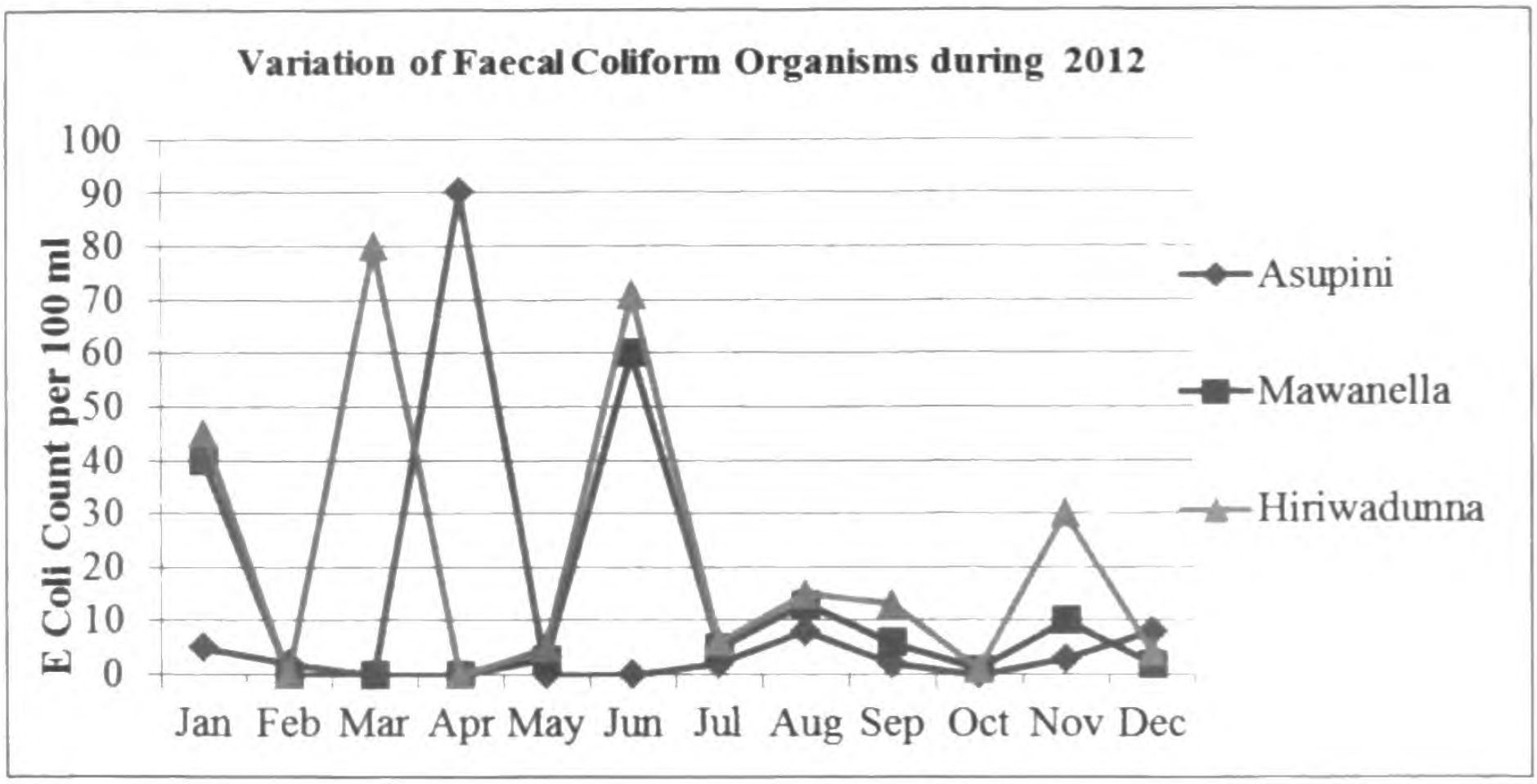

Figure 1:Variation of Faecal coliform Organisms throughout the year 2012

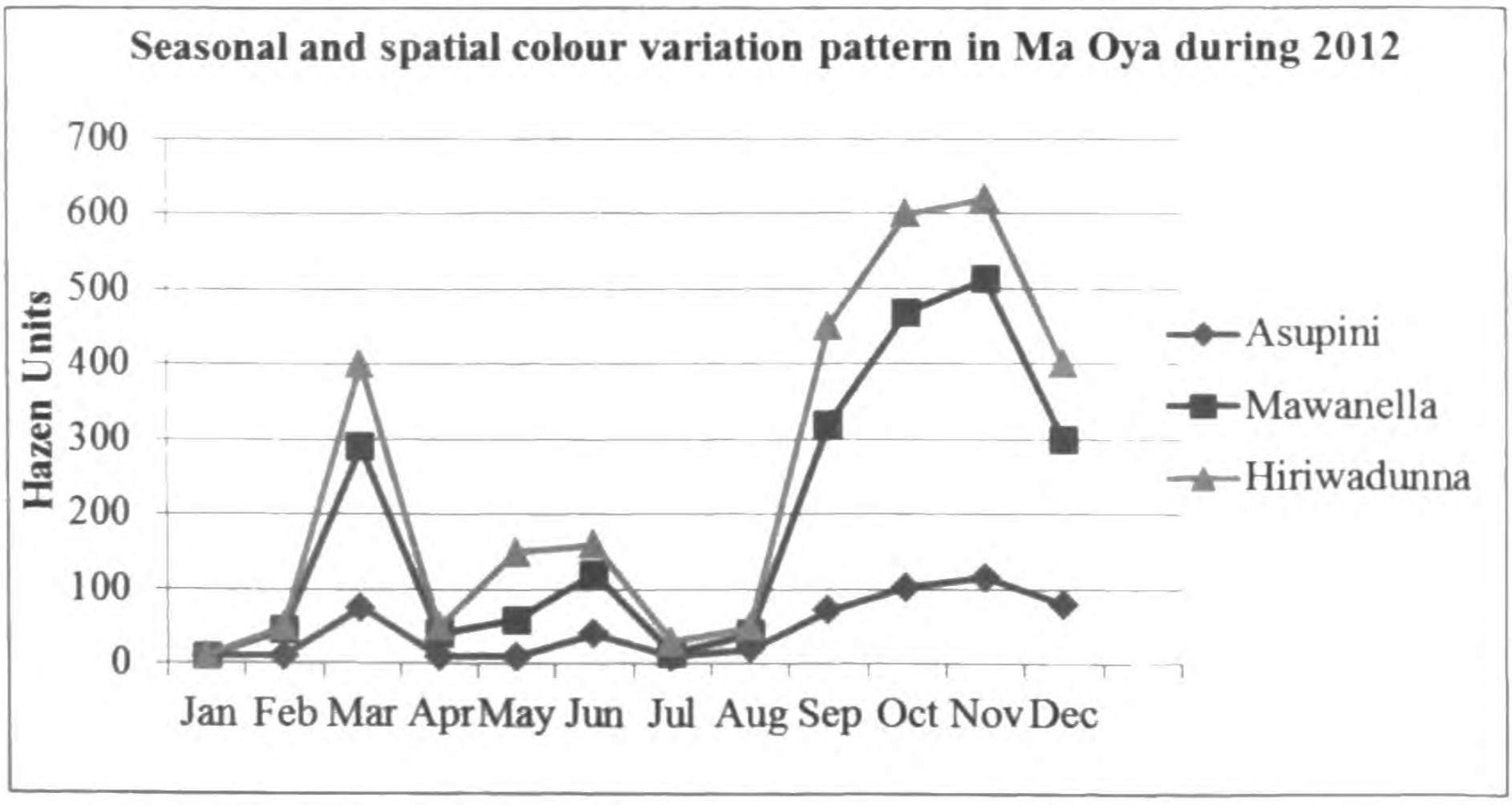

Figure 2: Seasonal and spatial colour variation pattern in Ma Oya during 2012

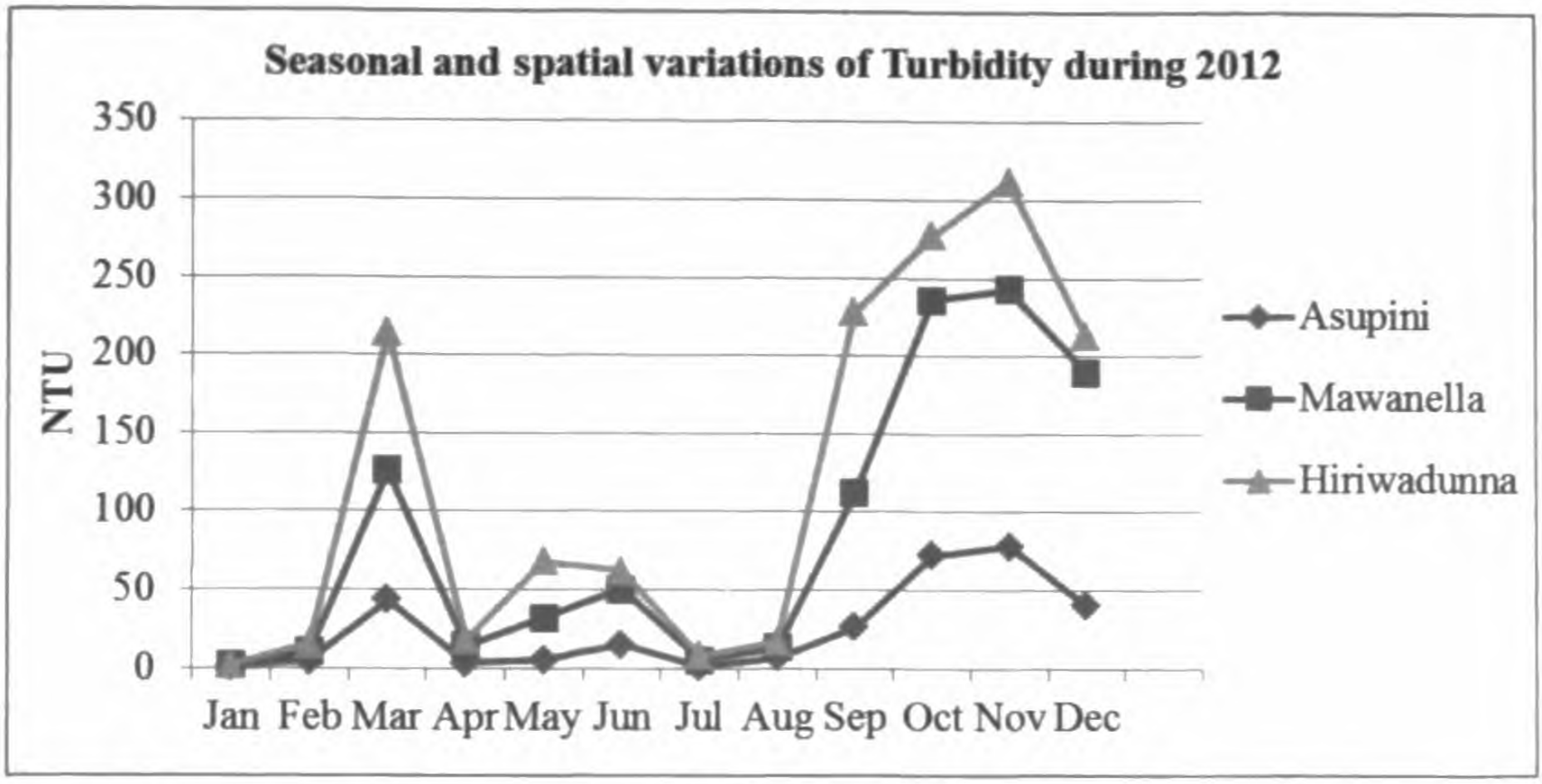

Figure 3: Seasonal and spatial variations of Turbidity during 2012

Table 1: Results of pollution source analyses

Type of pollution source	Exceeded water quality parameter according to SLS 722 : 1985 (Recommended level 6 -9 mg/L)
Road construction sites	-
Kitchen water dumping sites	BOD (Average BOD 15 mg/l)
Timber waste dumping sites	BOD (Average BOD 8 mg/l)
Bathing sites	-
Hotel construction sites	-
Solid waste dumping sites	BOD (Average BOD 7 mg/l)
Agricultural drainage sites	-
Toilet waste entering sites	BOD (Average BOD 11 mg/l)
Elephant baths	BOD (Average BOD 6 mg/l)

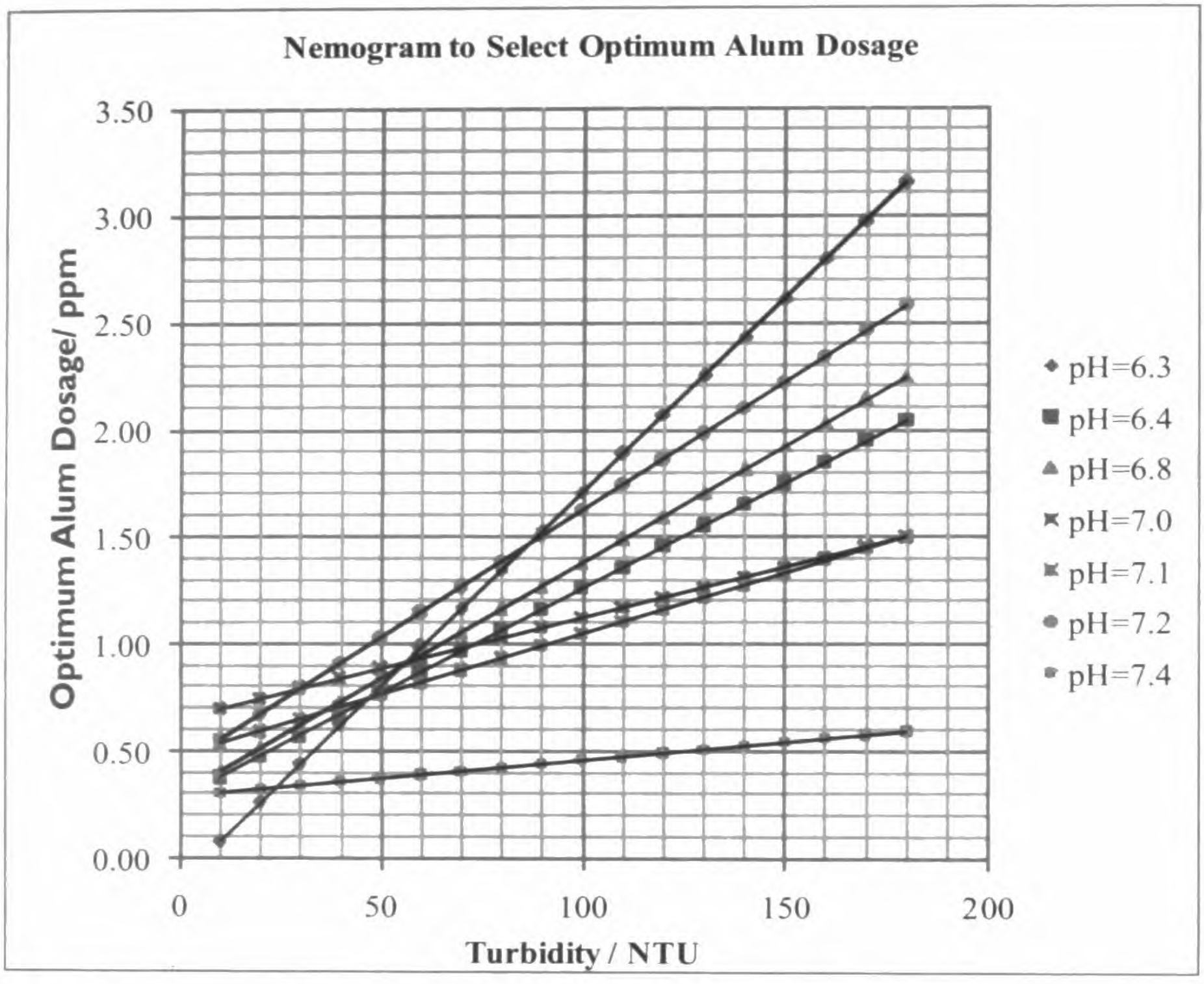

Figure 4: Nemogram to find the optimum Alum dosage in water treatment