

To: Sam Monella

From: [REDACTED]

Date: 14 April 2011

Subject: Coagulation & Flocculation of the Drain, OR Public Water Supply

Mr. Monella,

To address the increased turbidity in Elk Creek during the spring freshet it is advisable to add a coagulation/flocculation system to the Drain drinking water treatment facility. Based on the scale of the operation either alum or ferric sulfate are the recommended coagulants. Several jar tests were conducted to determine the optimal concentrations of **40 mg/L** and **30 mg/L** for **alum** and **ferric sulfate**, respectively. Based on these concentrations and the average daily flow, the system would require **37.4 lb/day** of **alum** and **28.9 lb/day** of **ferric sulfate**.

Both alum and ferric sulfate perform best at a slightly acidic pH range. The pH of the source water is 6.0, and the pH of the jar tests was 6.0, therefore, 6.0 will be the target pH. Since both alum and ferric sulfate consume alkalinity it will be required to add a base such as soda ash to maintain a pH of 6.0. From the calculations shown in the appendix section it was determined that **69.4 lb/day of soda ash** would be required for an **alum system** as compared to **44.6 lb/day of soda ash** which would be required for a **ferric sulfate system**.

Based on the average daily flow and a retention time of 30 seconds the volume of a cylindrical rapid mixer with baffles would need to be 140 L. A rapid mixer **height of 0.355 m**, a **tank diameter of 0.710 m** and an **impeller diameter of 0.497 m** are recommended. Based on these dimensions and the average flow rate, the rapid mixer would consume **136 watts (0.182 hp)** of power with an impeller rotational rate of **17.1 rpm**. Note that this rapid mix tank design is based on a system which employs alum as the coagulant; however, the ferric sulfate rapid mix design would be comparable.

Shown below in Table 1 is a comparison of the cost per day of the two coagulant options.

Table 1
Cost Per Day Comparison of Alum and Ferric Sulfate Systems

	Alum	Ferric Sulfate	Soda Ash	Total Cost
Alum System	\$22.44	-	\$15.27	\$37.71
Ferric Sulfate System	-	\$21.68	\$9.81	\$31.49

Best Regards,

