Response to Stipulation #18 of the Request for Information and Compliance Order by Consent, Docket Number CWA-10-2009-0083

By June 30, 2009, Respondent shall submit to United States Department of Environmental Protection (EPA) a plan to improve the reliability of the disinfection system for the Elliott West Combined Sewer Overflow (CSO) Treatment Plant. The plan must include recommendations and select an alternative(s) for changes that will improve the reliability, operation and maintenance for the facilities' disinfection system.

In January 2007, King County contracted with a consultant, to address deficiencies in the chlorination and dechlorination systems at the Elliott West Combined Sewer Overflow (CSO) Control Facility. The consultant has assessed the existing system deficiencies and recent improvements implemented to address deficiencies discovered since the operation of the facility began in 2005. In addition, it has evaluated alternatives to address additional deficiencies in order to achieve regulatory permit requirements. King County has selected the preferred actions and is putting projects in place to implement those actions.

The detailed evaluation of the chlorination system found that current chlorine demand measurement and manual dosing adjustment result in sodium hypochlorite being consumed at a rate significantly higher than necessary, resulting in excessive consumption of sodium bisulfate. As identified in the table below, corrective actions include the measurement of chlorine demand by installing a sampling pump and chlorine residual analyzer and modifying the dose control program. The injection of sodium hypochlorite will also be improved by installing a multiple-pipe diffuser system with carrier water to provide efficient injection of chemical to the CSO flows. In addition, measures of sodium hypochlorite concentration, which are not currently monitored, will be taken into account in the future dose control program.

The analysis also found that the dechlorination system will require modification. The system, which is designed to use a 38 percent strength sodium bisulfite solution, has experienced crystallization. The project will evaluate whether a 25 percent strength sodium bisulfite solution will be adequate after implementing the multiple changes to the system. Should the need for higher concentrations be indicated, the project will explore the option of providing on-site storage and dilution of 38 percent strength bisulfite.

Several of the proposed remedies require design, bidding, and installation so the first wet weather season for operations will not occur until 2010. King County proposes two years of commissioning to determine the adequacy of the remedies because of the infrequent operation of the facility. We propose to provide three reports to EPA and the Washington State Department of of Ecology (Ecology) to report on the status and compliance of the remedies in June 2010, June 2011, and June 2012. The following table lists the multiple modifications to the chlorination/dechlorination system needed and the timetable for these actions:

SUMMARY TABLE
SUMMARY OF DISINFECTION SYSTEM DEFICIENCIES AND CORRECTIVE ACTIONS

Deficiency	Corrective Action	Estimated Date of Completion
Sodium Hypochlorite Dosage		
Immediate chlorine demand is not measured to ensure adequate dose.	Measure immediate chlorine demand by installing a sampling pump and chlorine residual analyzer immediately after sodium hypochlorite injection.	Install September 2010, commission 2011 & 2012 (two wet seasons)
Sodium hypochlorite dosage is set manually. There are no provisions for adjusting dosage based on contact time or chlorine residual. The result is that sodium hypochlorite is consumed at a rate much higher than required to achieve disinfection level at low flows. An excessive chlorine dose consumes more sodium bisulfite.	Change dose control program to the Collins mathematical model. Program the chlorine dose algorithm to achieve target residual after immediate demand is satisfied and residual chlorine concentration at dechlorination vault is maintained, using an immediate or chlorine residual analyzer.	Install September 2010, commission 2011 & 2012
Sodium Hypochlorite Storage		
Concentration of sodium hypochlorite in storage tanks is not measured to check for degradation prior to injecting.	Establish a maintenance task to monitor sodium hypochlorite solution strength once prior to the CSO season and monthly during the CSO season and adjust dosage to account for degradation of sodium hypochlorite. Establish low concentration for disposal of hypochlorite based on empirical dosage rate.	Install September 2010, commission 2011 & 2012 (two wet seasons
There are no direct provisions for draining sodium hypochlorite storage tanks to the Elliott Bay Interceptor.	Provide a 2-inch isolation valve and piping from the sodium hypochlorite injection manifold to the pump discharge channel or to the returned water chamber adjacent to the dewatering pump discharge pipe that conveys flow to the EBI.	Install September 2010, commission 2011 & 2012 (two wet seasons)
Sodium Hypochlorite Injection and Mixing		
Sodium hypochlorite is introduced via 1.5-inch open-ended hose. Low feed rates do not provide sufficient velocity gradient to inject sodium hypochlorite in mixing chamber.	Install multiple-pipe diffuser system sized for the recommended velocity gradient and jet velocity through the diffusers at low and peak flows or valved injection system on each main pump discharge pipe. Evaluate providing carrier water to maintain minimum velocity of 10 feet/second through diffusers at low dosing feed rates.	Install September 2010, commission 2011 & 2012
Sodium Hypochlorite Dosing Pumps		
Signal sent from float switch in mixing chamber to auto-start switch of sodium hypochlorite dosing pumps may be providing erratic reading on pump start-up, causing failure of auto-start for the pumps.	Modify sodium hypochlorite dosing pump control system. Use level measurements in the pump discharge channel in lieu of in the mixing chamber to ensure timely auto-start during CSO treatment.	Implement September 2010, commission 2011.
Actual quantity of sodium hypochlorite being delivered at the point of injection is not known.	Install a magnetic flow meter to monitor flow of sodium hypochlorite actually applied.	September 2010

SUMMARY TABLE CONT. SUMMARY OF DISINFECTION SYSTEM DEFICIENCIES AND CORRECTIVE ACTIONS		
Deficiency	**Corrective Action**	**Estimated Date of Completion**
Sodium bisulfite dosing based on a fixed chlorine residual (25 mg/L) and a ratio-control algorithm.	Modify sodium bisulfite control algorithm to use pre-dechlorination chlorine residual measurement in compound dose control, also using residual measurement from the transition structure.	Implement October 2010
Sodium Bisulfite Transfer and Storage		
Lower solution strength (25%) used requires greater volume of sodium bisulfite than facility was designed to handle.	Evaluate need to store 38-percent sodium bisulfite after modifications to the bisulfite control algorithm are implemented. Should higher concentration of sodium bisulfite be required, evaluate options for maintaining solution above freezing point.	Implement Summer 2009
Unreliable local supply of 25-percent sodium bisulfite.	Local supply of 38 percent is available and reliable. Therefore, provide an on-site system for dilution of 38 percent solution to 25 percent.	Implement Summer 2009
Actual sodium bisulfite being delivered at the point of injection is not known	Install magnetic flow meter to monitor flow of sodium bisulfite actually applied.	Install September 2010, commission 2011 & 2012 (two wet seasons)
Sodium Bisulfite Injection and Mixing		
Low volumes in dechlorination vault at low flows make it difficult to provide adequate mixing.	Issue addressed as part of the July 2008 emergency upgrades. Created a fixed backwater volume in the dechlorination vault to allow the sodium bisulfite solution to be injected using reoriented induction mixing equipment to achieve a constant velocity gradient at low flows.	Commissioning 2009 & 2010
Induction mixers oriented upward, approximately 3 feet above the invert of the structure.	Issue addressed as part of the July 2008 emergency upgrades. Repositioned induction mixers to improve chemical dispersion especially at low flows. Evaluate performance of the induction mixers and make appropriate corrective actions to address observed short circuiting.	Commissioning 2009 & 2010
Pre-Dechlorination Sampling Pump		
Existing sampling pump deteriorated and inoperable.	Issue addressed as part of the July 2008 emergency upgrades. A new sampling pump and piping where designed and installed in the dechlorination vault.	Commissioning 2009 & 2010
Sample conveyance pipeline does not have a means for cleaning and preventing slime buildup that could interfere with chlorine residual measurement.	Issue addressed as part of the July 2008 emergency upgrades. Provisions were installed for cleaning sample conveyance pipeline by maintaining a minimum velocity of 10 feet per second.	Commissioning 2009 & 2010