

# CASE STUDY

DISINFECTION BY-PRODUCTS  
REDUCTION USING CLEARITAS®

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## INTRODUCTION

Blue Earth Products is the leader in innovative approaches to water quality standards. Our suite of products reduces chlorine demand and disinfection by-products (DBP) in water systems by eliminating organic laden deposits, enabling utilities to comply with EPA Stage 2 rules.

Blue Earth Products has been working with the municipality of South Jackson County (SJC), West Virginia, since the fourth quarter of 2008 to improve disinfection by-product levels in their distribution system by using Clearitas to remove organic laden deposits and reduce chlorine demand. Clearitas is a formulation of oxidized chlorine that is added to drinking water distribution systems. Used in conjunction with existing disinfectants, Clearitas has been shown to effectively lower chlorine demand and improve DBP levels in many municipal settings.

The municipality of Ripley, West Virginia, supplies SJC's water. Their water system uses a combination of conventional treatment and microfiltration. The main problem encountered in SJC had been high levels of disinfection by-products, which seem to be aggravated by long distribution distances. Clearitas feeding was started January 7, 2008, at 20-30 ppm (as product). On June 4, 2009, the city stopped prechlorination and only added chlorine after treatment. The finished water chlorine residual currently is 1.9-2.2 ppm (free). Distribution system chlorine residuals have not changed significantly, despite the termination of the prechlorination.

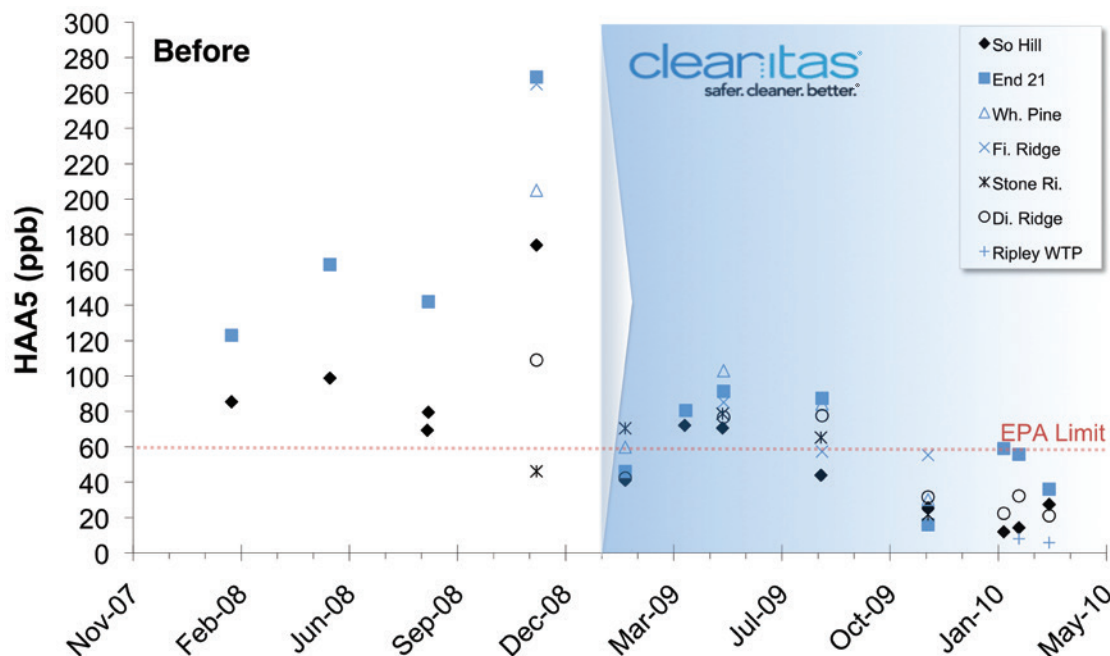


Figure 1 - HAA5s before and after the addition of Clearitas

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## RESULTS

During this study, DBPs were measured at six points within the distribution system (one of the sites was the incoming water). SJC's water operator provided all of the data collected to Blue Earth Products. Figure 1 is a plot of the haloacetic acid (HAA5) levels before and after the addition of Clearitas. Clearly, the HAA5 levels go down very quickly after the addition of Clearitas and stayed down through the entire year.

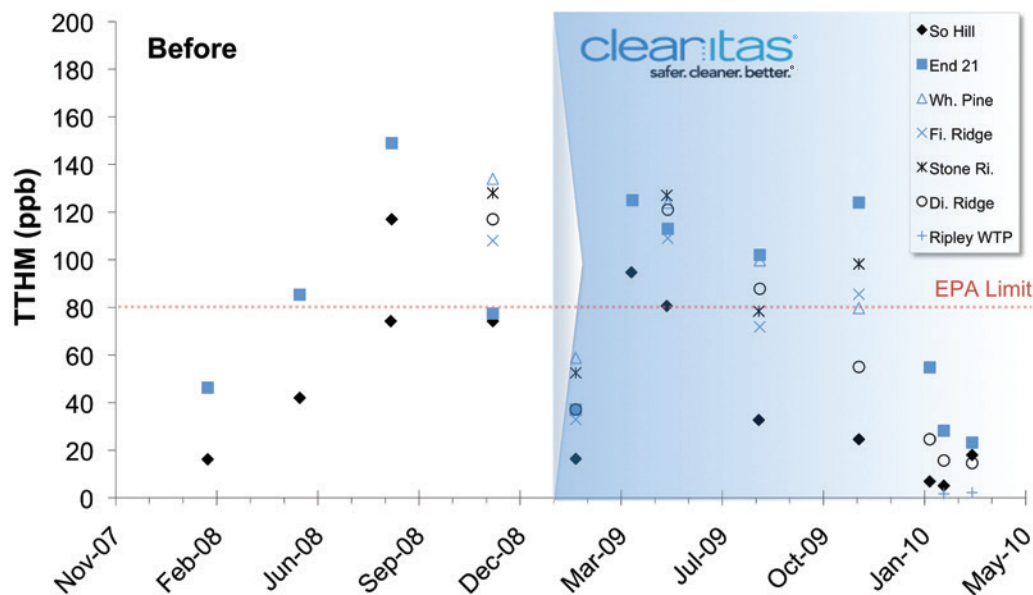


Figure 2 - TTHMs before and after the addition of Clearitas

Figure 2 is a plot of the total trihalomethane (TTHM) levels over the course of this study. In this case, it is not so clear what the effect of Clearitas and/or the change in prechlorination is having on the trihalomethane (THM) levels. Thus, we compared the before and after values at each individual sampling points and present those numbers in Table 1. Each sampling site is unique in a number of ways, including distance from the inlet point, flow rate, water chemistry, etc. Thus, it is important to look at the DBPs at each point as compared to itself.

In this study, the HAA5 levels went down at five of the six sites after the addition of Clearitas. The Stone Ridge site started off fairly low and did go up. Further reduction in the HAA5 values occurred at all sites after the change in prechlorination. For the THMs, four of the six sites saw THM reductions after the addition of Clearitas (about 30%). The South Hill data is actually from the tank that feeds the entire SJC system, and End 21 is the point furthest away from that tank. As with the HAA5 values, some improvement in the THM levels was seen after the prechlorination change.

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	So. Hill TTHM	Wh. Pine TTHM	Fi. Ridge TTHM	Stone Ri. TTHM	Di. Ridge TTHM	End 21 TTHM	
2008 (before Clearitas)	65	134	108	128	117	90	
Q1-Q2 2009 (after Clearitas)	64	91	71	90	79	92	
Q3-Q4 2009 (Cl change)	17	90	79	88	46	77	
<b>% Reduction After Clearitas</b>	<b>1%</b>	<b>32%</b>	<b>34%</b>	<b>30%</b>	<b>32%</b>	<b>-2%</b>	<b>Average All 21%</b>
<b>% Additional Reduction with chlorine change &amp; Clearitas</b>	<b>73%</b>	<b>2%</b>	<b>-11%</b>	<b>2%</b>	<b>42%</b>	<b>16%</b>	<b>22%</b>

	So. Hill HAA5	Wh. Pine HAA5	Fi. Ridge HAA5	Stone Ri. HAA5	Di. Ridge HAA5	End 21 HAA5	
2008 (before Clearitas)	101	205	265	46	109	174	
Q1-Q2 2009 (after Clearitas)	61	81	66	75	60	73	
Q3-Q4 2009 (Cl change)	24	57	56	43	41	55	
<b>% Reduction After Clearitas</b>	<b>40%</b>	<b>60%</b>	<b>75%</b>	<b>-62%</b>	<b>45%</b>	<b>58%</b>	<b>Average All 36%</b>
<b>% Additional Reduction with chlorine change &amp; Clearitas</b>	<b>61%</b>	<b>30%</b>	<b>14%</b>	<b>42%</b>	<b>31%</b>	<b>25%</b>	<b>36%</b>

Table 1 - DBP reduction resulting from Clearitas addition and chlorination change

## DISCUSSION

In this particular system, a very low dosing of Clearitas was very effective at decreasing the DBPs in problem portions of the distribution system. The trend seen in this study has been noted in other field studies of Clearitas. Improvements begin first near the injection site and move throughout the system. Gradually, Clearitas can begin cleaning the pipes further out in the distribution system. In this particular study, End 21 (the farthest point from injection) saw little improvement in the THM values after the addition of Clearitas, but did see immediate improvement in HAA5 values. The same was true for the South Hill Tank. This might suggest that TTHM and HAA5s are formed at different rates and/or locations and that Clearitas either has direct (by interfering with the formation of the precursors) or indirect (through removal of surface deposits) effects in this particular system.

As with any water system, other factors may have had an effect on the numbers seen in this study (water chemistry, weather patterns, time of year, etc.). For this study, SJC provided Blue Earth Products with the DBP values for the South Hill and End 21 numbers for the entire year of 2008. For the other sites, values were only reported for the fourth quarter in 2008. Thus, for those sites, the addition of Clearitas lowered the DBPs from Q4 2008 to Q1/Q2 2009, which would indicate that the reduction was not simply based on the time of year. The change in prechlorination in June of 2009 in Ripley could have affected the numbers after Clearitas in Q3/Q4 2009, as is noted at End 21 and South Hill for the THM values.

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