Antonia Hover

From: Office of Commissioner Brown
Sent: Wednesday, April 25, 2018 4:00 PM
To: Commissioner Correspondence
Subject: FW: Docket No. 20170166-WS - Correspondence
Attachments: Color-Wash-Summary-Phase-I.pdf; ColorWashSummaryPhase2.pdf

Good Afternoon,

Please place the following e-mail and attachments in docket correspondence in Docket No. 20170166-WS.

Thank you,
Shalonda

From: Jessica Kohl [mailto:jessicalynnkohl@gmail.com]
Sent: Wednesday, April 25, 2018 3:48 PM
To: Office of Commissioner Brown
Cc: Mayor@ocfl.net; District5@ocfl.net; District6@ocfl.net; Jennifer.Thompson@ocfl.net; District3@ocfl.net; district2@ocfl.net; District1@ocfl.net; Shalonda Hopkins
Subject: Re: Docket No. 20170166-WS - Correspondence

Good Afternoon,

Back on August 24, 2017 I had emailed a complaint to the PSC regarding Pluris and the pricing increase for Wedgefield in Orlando, FL.

I had not received a response at the time and just today I missed a voice mail from Mr. Kuhns in response to that complaint followed by the attached email and attachments. Although I believe he meant to refer to a date in 2017 instead of the 2018 as written.

This is now 8 months after the complaint was filed.

I admit, I am a little annoyed and suspect with the response especially with the investigation deferment following the meeting on the 20th.

Thank you for your time,
Jessica Kohl

---------- Forwarded message ----------
From: **Joe Kuhns** <jkuhns@plurisusa.com>
Date: Wed, Apr 25, 2018 at 2:07 PM
Subject: FPSC - 1251275C
To: "jessicalynnkohl@gmail.com" <jessicalynnkohl@gmail.com>
Cc: Beverly Yopp <byopp@plurisusa.com>

Jessica,

I am following up on my phone call on 4-26-2018 at 1:05 pm to discuss your concerns raised in your complaint to the PSC on August 24, 2018. I am providing a brief email outlining your concerns which will provide further clarification for your consideration.

One of your concerns was the bleaching of clothing. During the initial chlorine dioxide pilot study, Pluris received a small number of calls from customers expressing bleaching of clothes during laundry washing. Pluris and our outside professional experts actively evaluated whether chlorine dioxide may have potentially contributed to these type of concerns. In addition, we have researched this topic with other utilities nationwide where chlorine dioxide is used as a primary disinfectant and discovered the attached study reports. I encourage you to read the reports. The utilities went to significant effort and confirmed bleaching of clothes is not a result of the chlorine dioxide residual levels experienced within the distribution system. Also, the use of certain laundry soaps such as but not limited to OxyClean may be a contributing factor in any bleaching of clothing.

You expressed concern of the rate structure and your displeasure with the rates. Pluris did not create the water quality in Central Florida, but Pluris is responsible to treat the water, subject to the Federal EPA and Florida Department of Environmental Protection (“FDEP”) strict requirements to insure the water is safe for consumption by customers. The cost to do this is higher in the Wedgefield area than in areas where the water quality is higher before treatment. The amount of treatment required directly relates to the rates Wedgefield customers pay.

You expressed a concern of being notified during precautionary boil water notices. Pluris utilizes a robo-call to contact all customers about the event. The robo-call willmake three attempts to reach the customer. After the three attempts, a data base is generated to identify customers that were not reached. These customers then receive a door tag advising them of the event. Signs explaining the event are also erected at the entrances of the community. Pluris follows the rules and regulations of the FDEP to notify all customers of an event within 24 hours.

In closing, if you would like to visit the Water Treatment Facility for a detailed tour of the treatment process, including the new chlorine dioxide treatment, I will gladly meet you there. I believe you would gain additional understanding of the process Pluris goes to insuring ongoing safe drinking water for customers. Just let me know.

I have copied Beverly Yopp, Pluris Director of Customer Service on this email. Please feel free to contact us if you have any additional concerns.

Joseph M. Kuhns

Regional Manager

Pluris Holdings LLC

O 863.940.9771 / **M** 813.526.0608

O 1102 S. Florida Ave., Lakeland, FL. 33803

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Click to read full disclaimer.

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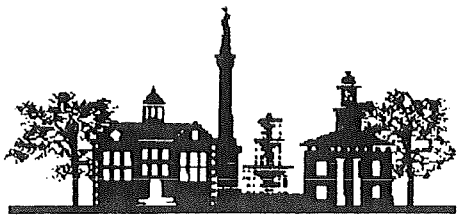

Mount Vernon

Mount Vernon, Ohio

Laundry Color Wash Study: Phase I

12 March 2008

ARCADIS

Dennis J. Kachmarsky, PE
Certified Project Manager

Laundry Color Wash Study: Phase I

Prepared for:
Mount Vernon, Ohio

Prepared by:
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Our Ref.:
CL000532.R001

Date:
12 March 2008

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Table of Contents

Mount Vernon, Ohio

I. Introduction

Customers of the Mount Vernon water system have registered complaints of spotting on clothing after performing laundry for over 15 years. The first recorded complaint of this nature was June 12, 1990. Beginning in 1995, the City began collecting chlorine dioxide levels (initially speculating a connection) whenever a report was made at the residence. This spotting has been generally characterized as "splotching" and typically occurs on dark clothing.

The City has invested significant resources through a number of studies conducted to determine the cause of these incidences. There is yet to be a satisfactory resolution to this problem.

This Phase I Laundry Color Wash Study is designed to provide a technical review of the previous efforts to resolve this problem. A summary of the results of these efforts was reviewed and then compiled to develop a matrix of possible sources of this spotting. The matrix illustrates whether the analysis used to determine the spotting disproved or left unanswered a theory for the color spotting. In addition, some general observations are made from the summary results that assess the need for additional testing or identify gaps in the data. Finally, additional recommendations are made outlining a systematic approach with the goal of bringing this issue to a resolution if possible.

II. Summary of Previous Studies

A brief discussion and summary of the previous studies is outlined in the following subsections in chronological sequence. Copies of the detailed information are included in the Appendices to provide a comprehensive documentation of the efforts to resolve this problem.

In order to gain a perspective of the prevalence of the spotting incidents, the City has recorded incidents of color spotting graphically on a map. This map is included in Appendix 1, and indicates that there have been isolated occurrences at extremities of the system, but the majority of spotting occurrences are clustered around the central and eastern portion of the downtown neighborhoods. This may be generally characterized as the "older" part of the water distribution system. The complete summary of the "Splotching Complaints" (color spotting) compiled by the City is included in Appendix 1.

Observations about the locations of the complaints could indicate that age of the system and associated piping materials may be contributory factors. But this is not conclusive as there are many other "older" system areas with few complaints.

Oxidizable Substances Analyses – Samples at five city locations including the Water Treatment Plant Tap were analyzed by the Belmonte Park Environmental Laboratories in July 2000. The results are shown in Appendix 2 and indicate that no oxidizable substances were detected in any of the samples.

Drinking Water Research Group Study – A Canadian study was performed on the effects of various concentrations of ClO_2 (chlorine dioxide) on clothing, was published in August 2000 and is included in Appendix 3. Dark clothing was used and no discoloration of clothing occurred through ClO_2 concentrations from 0.06-0.66 mg/L. However, at concentrations between 0.8-1.0 mg/L, two out of eight clothing samples showed evidence of splotching. As shown in Appendix 3, concentrations of ClO_2 do not exceed 0.60 mg/L at the Water Treatment Plant Tap and are typically much less in concentration in the distribution system.

Burgess & Niple Study – Part 1 and Part 2–Burgess & Niple (B&N) reported that it took concentrations at levels of nearly twenty times the Plant Tap strength of ClO_2 to produce bleaching on fabrics they tested in September 2000. This confirmed that the plant water was unlikely to be the cause unless "plugs" of bleach escaped the plant – a highly unlikely occurrence. It was suggested that laundry products in combination with the water may be the cause or laundry products alone may be the source of bleaching. Other than verifying that the ClO_2 concentrations had to be much higher than the Plant Tap concentration, there was nothing else conclusive.

An additional theory was proposed in the January 2002 letter report that suggested aeration that occurs from top loading washers could cause free chlorine to come out of solution and then being trapped under the washing machine lid, potentially splotching any protruding fabric. This theory was put forth without any supporting evidence and no subsequent evaluation or analysis was performed to support this theory.

The B&N report is included in Appendix 4.

Vulcan Memo – This chemical manufacturer documented in April 2002 that the bleaching effect on denim does not occur until ClO_2 concentrations are 3 mg/L or greater, which concentrations are multiples greater than the distribution levels. This letter report can be found in Appendix 5.

Nazarene College Study – Two chemistry students from the local Nazarene College worked with City staff to perform bleaching tests on hunter green bath towels at various concentrations of ClO_2 in May 2002. They reported no bleaching until concentrations reached 3.0 mg/L and concluded that the concentration would have to be eight times the maximum plant concentrations of ClO_2 for bleaching to occur. This report is included in Appendix 6.

Potable Water Analytical Report – A test for metals and volatile compounds was performed on water samples taken February 5, 2003 at 1550 Old Delaware Road of the potable water. As shown in Appendix 7, no concentrations exceeded the reporting threshold limit.

Splotching Problem Scans and Comparisons – In May and August 2003, grab samples of City water were taken at different locations to be analyzed for semivolatile and volatile organics. The sampling locations varied and included a personal residence outside the City, a City raw water well, the Plant Tap and a raw water sample from the City of Fredericktown. The purpose of this testing was to compare City of Mount Vernon water to other community waters. All results were well below reporting threshold limits and further analysis in an attempt to identify other unusual characteristics typically unreported revealed nothing. Appendix 8 includes this data.

Proctor & Gamble (P&G) and Water Plant Tap Study – Proctor and Gamble conducted product (fabric) testing on damaged clothing from residents to determine if this could be a possible source as reported in correspondence dated from May 2002 through November 2003. At their request, the City also analyzed samples from the water Plant Tap in November 2003.

Bleach was eliminated as the problem as microscopy revealed no damage to the fabric integrity. Fabric brightener was also eliminated as a cause due to its deposition methodology rather than "stripping" dye from fabric. Sulfur dye testing revealed that damaged clothes from residents did not have clothing made with sulfur dyes which could produce a bleaching effect by a reducing agent. There was nothing in the analysis of the Plant Tap water that raised any concern to the P&G chemists. This report is in Appendix 9.

OEPA Letter – A November 25, 2003 letter from the Ohio EPA recognized the concern of a number of residents about the color spotting problems but went on to affirm that City water quality meets or exceeds regulatory standards. This letter is located in Appendix 10.

Colored Rag Test – In March 2004, test results for a blue rag, a mauve rag and a green rag were conducted to determine if there were any volatile compounds, base neutral compounds or acid compounds in them that were above reportable limits. None were found that would provide any reason for reactivity in the fabrics to cause bleaching. These test results are provided in Appendix 11.

General Information – Various articles and items of interest from newspaper columns to website resources have been collected in relation to this problem. These have suggested various causes of splotching including the use of household laundry detergents and laundry aids. Information from manufacturers would indicate that their products are designed to perform over the typical ranges for alkalinity and pH experienced in typical household waters. There is nothing to suggest from the water samples collected or the products tested that there is a splotching effect due to the chemistry between the water and the laundry aids.

It has also been suggested that fabric characteristics have been changing, possibly causing materials to be less colorfast. EPA regulations have also been named as a possible culprit because of limiting the number of rinses dyed fabric is allowed to receive in the manufacturing process and therefore having clothes "fade" more quickly. Anyone of these could be a partial reason for some splotching effect, but none explain the pervasive nature experienced by City residents. A collection of some of these items is included in Appendix 12.

III. Matrix of Theories

In order to determine the validity of some of the theories proposed, a matrix outlining the theories disproved or still viable are summarized as follows. The classification of "still viable" does not imply an affirmation that the theory is valid, only that there may be a possible connection.

Matrix of Theories			
Theory	**Not Viable**	**Still Viable**	**Comment**
Older piping and plumbing materials may be contributing factors		√	Locations of complaints generally occurred in older neighborhoods (even when considering the relative density of housing), and fewer in outlying "newer" areas
Oxidizable substances in water system	√		July 2000 analyses

Matrix of Theories			
Theory	Not Viable	Still Viable	Comment
Chlorine Dioxide	√		Canadian study, B&N study, Nazarene College study all indicated that bleaching occurs at much higher concentrations of ClO_2 than is found in potable water
Metals, volatile and semivolatile organics may react with laundry products or tap water	√		None of the levels exceed threshold reporting limits
Bleach or fabric brightener may react with potable water	√		P&G Study verified this is not the case
Clothing contained sulfur dyes or fabrics not as colorfast due to overseas production methods		√	Although none of the samples P&G tested had sulfur dyes, some clothing damaged may have sulfur dyes and be a partial explanation for some splotching; also, insufficient colorfastness of some clothing cannot be totally ruled out

IV. Observations from Surveys

In review of the surveys collected by the City, some very general observations may be made, but caution must be exercised before drawing any conclusions. The surveys are in response to spotting incidents and are subject to the interpretation of events by the homeowner. However, the following are a few generalizations.

- Affected homes tend to be older homes – more than 20 years in age and most in the 80 to 100+ age category
- Copper plumbing predominant with some galvanized; very little plastic plumbing
- Dark and cotton (or high cotton content) clothing seem to be the most affected; synthetic material does not appear to be impacted by splotching
- Not every clothing item affected in a wash
- Water temperature does not seem to make a difference
- Many claim a strong chlorine odor at times

- At least two incidences were claimed of spotting on clothes in a sink under a dripping faucet

V. Identified Analyses Gaps

In reviewing the studies and the surveys, there are a few things that have either not been examined or may need further analysis. The following are for consideration.

Examination of the Piping Materials of the Distribution System – The focal point of the complaints appears to center around the historic downtown of Mount Vernon which is generally served by a series of four-inch and six-inch diameter distribution piping. By the age of the homes, many of which are over one hundred years old, it is probable that much of this pipe is sand cast iron or cast iron and very likely unlined. The condition of the pipe walls may be very different than the newer portions of the system which have lined piping. The same may be true of the service connections which may be of other materials no longer used such as galvanized piping. It is recommended that coupons of the distribution system piping and service connections be examined in representative areas to determine the condition of the piping and then have tubercles from the coupons analyzed for content. East Vine Street was one potential area mentioned for this materials testing. A galvanized piping service lateral is suggested for testing. It may be possible to obtain the service lateral material sample from inside a customer's home.

Review of Water Treatment Plant Stability – What may be considered "stable" and not causing corrosive issues in lined or PVC piping may be slightly corrosive and attack unlined piping. In addition to examining the softening and recarbonation targets at the water treatment plant to determine relative stability, it is also recommended that an Alkalinity Profile be developed. One profile should be in the historic areas with sampling from the four and six-inch diameter distribution system piping and one or two other Alkalinity Profiles should be developed simultaneously in an area of town where there has not been the laundry spotting problems. If the alkalinity increases, this would be an indication that the pipe wall is having $CaCO_3$ removed (corrosive) which could release localized mineral deposits. If the alkalinity decreases, then the water is in a scale forming mode (non-corrosive).

VI. Recommendations

There is no apparent solution to the laundry splotching problem since the cause(s) has yet to be identified. However, to narrow the knowledge gap about this issue and possibly get to the answer, there are some additional evaluations recommended as follows.

Examine Piping Materials in Historic Area – It is recommended that coupons of the distribution piping and service connections be examined from representative areas to determine the condition of the piping and have tubercles from the coupons analyzed for content.

Review Stability of Water – Examine the treatment plant targets used to maintain stability and perform an Alkalinity Profile in both the historic area of town and in an area that has not had laundry splotching complaints.

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Mount Vernon

Mount Vernon, Ohio

Laundry Color Wash Study: Phase II – Distribution System

April 14, 2009

ARCADIS

Gary L. Hoffman, PE
Senior Vice President

Laundry Color Wash Study: Phase II – Distribution System

Prepared for:
Mount Vernon, Ohio

Prepared by:
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520 South Main Street
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Our Ref.:
CL000624.R001

Date:
April 14, 2009

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Appendices

I. Introduction

For over 18 years, customers of the Mount Vernon water system have registered complaints of spotting on clothing after performing laundry. The first recorded complaint of this nature was June 12, 1990. The City has invested significant resources through a number of studies conducted to determine the cause of these incidences. Initially, it was speculated that the use of chlorine dioxide as the disinfection agent at the water treatment plant may have been the cause. This spotting has been generally characterized as "splotching" and typically occurs on dark clothing. However, a final conclusion reached in the Phase I Laundry Study ruled out chlorine dioxide as the cause.

Figure 1 – Faded areas on garment typical of the "splotching" effect

This Phase I Laundry Color Wash Study completed in 2008 was a technical review of the previous efforts to resolve this problem. A summary of the results of these efforts was reviewed and then compiled to develop a matrix of possible sources of this splotching. The matrix illustrated whether the analysis used to determine the splotching disproved or left unanswered a theory for the color spotting. In addition, some general

observations were made from the summary results that assessed the need for additional testing or identified gaps in the data.

The objective for the Phase II Study was to determine if the water system was the source of the problem. Identified gaps where an issue had not been previously examined or that may need further analysis included two areas concerning the water distribution system. The first is an examination of water system piping materials and the second is a review of water stability.

This Phase II Laundry Color Wash Study is intended to evaluate and address these two distribution system areas.

Figure 2 – Shirt displays multiple areas of the "splotching"

II. Piping Materials

The focus of water system piping materials concerns corrosion. The control of corrosion is an important task of system operation. Piping systems are deteriorated by corrosion from contact with water. If water has inadequate alkalinity buffer, the water can seek to satisfy the alkalinity demand by absorbing it from the pipe walls. This can result in corrosive action on the pipe. Corrosion results in materials such as lead, copper, iron and zinc being introduced into the water. These chemicals may be harmful to the public, create odors (iron bacteria) or cause staining of fixtures.

Distribution system piping materials used over the last half century have typically included cement lining in the case of ductile iron pipe or the use of plastic piping. Earlier piping systems were typically comprised of cast iron and/or ductile iron pipe which were unlined thereby having the metal piping directly in contact with the water.

Although reports of splotching have been in a widespread geographical area of residents on the system and of persons outside the system on private wells, a number of the complaints appear concentrated in the older, historic areas of the City. A review of this area was done because the population density is greater and it is also the portion of the system served primarily by sand cast iron and galvanized materials for main lines and service connections, respectively. The old piping system would likely be unlined, leading to the theory that these areas may experience corrosion and therefore impact water quality from the release of materials that may contribute to splotching. Both a section of old, unlined cast iron water main and a galvanized service connection were tested for evidence of corrosion and/or coating (scale) formation.

A portion of an unlined, 6-inch diameter water line on Vine Street at the intersection with Park Street was removed by the City and the scale material on the pipe wall tested for calcium, iron, magnesium and manganese. Testing was performed in May 2008 and Appendix A contains the laboratory results.

A portion of a ¾-inch diameter galvanized service connection on East High Street was removed by the City and the scale material on the pipe wall tested for calcium, iron, magnesium and manganese. Testing was performed in November 2008 and Appendix A contains the laboratory results.

A summary of the test results is provided in the table below.

Pipe Materials Coating Contents		
Chemical	**Water Line**	**Service Connection**
Calcium	20,800 mg/Kg-dry	17,700 mg/Kg-dry
Iron	128,000 mg/Kg-dry	149,000 mg/Kg-dry
Magnesium	21,300 mg/Kg-dry	14,500 mg/Kg-dry
Manganese	860 mg/Kg-dry	434 mg/Kg-dry

In review of this data it is observed that there is relative consistency between the proportion of chemical constituents from the two pipe samples tested. Each shows a higher iron content in comparison to the other chemicals. Also, both indicate similar proportions of calcium and magnesium in the coating and very low levels of manganese. The iron content of approximately 13-15% is higher than anticipated but probably reflects the original conditions in the system before lime softening was implemented. The expectation was the highest material content to be calcium if a typical coating (scale-formation) was in place.

Perhaps an explanation of this is that prior to the City beginning to soften their water and removing iron in 1936, a film of iron developed on the pipe walls. This iron deposition remained long after a calcium coating has been formed over top of the iron from the lime softening process. The iron level from the past does not mean corrosion is occurring in the system. In general, the calcium carbonate covers the iron except on the rare occasions when there may be a pipe break or disruption in service that may expose the iron surface in the pipe.

III. Water Stability

Most precipitative softening plants produce water that is slightly over-saturated with calcium bicarbonate (CaCO) and therefore deposit a slight amount of coating onto the piping system. It is preferred to gradually coat or encrust a distribution system as opposed to corroding the piping system. What needs to be avoided is water which is under-saturated or that is over-saturated with calcium carbonate. The former will cause corrosion in the system and the latter will tend to create extreme scaling problems.

There is no indication from available records that the water leaving the plant is corrosive or unstable. Laboratory testing reports the water quality to be very high and well within compliance of standards.

The distribution system was examined to see if there were any reactions taking place in the water once it left the treatment plant that could affect the calcium carbonate levels in the water, particularly in areas with old, unlined pipe materials. Since alkalinity and pH affect the rate of chemical reactions in water, they influence the rate of corrosion. A water is typically less corrosive at higher alkalinity and pH levels. Typical pH values range between 7-10 for public water supplies. This measurement is an indication whether a water may tend to be more corrosive in nature (less than 7) or more likely to deposit harmless scale at higher levels (greater than 7). Standard units for pH are often referred to as "SU" when measured.

An analysis of plant water (Plant Tap) was recommended to be performed along with an Alkalinity Profile. This was done to review alkalinity and pH levels leaving the plant and to see if levels increased in the distribution system thereby perhaps indicating corrosion. As noted earlier, corrosion could potentially lead to the release of local mineral deposits which could then create conditions for splotching.

Before analyzing the data it is important to understand that corrosivity and stability are not the same. Water can be stable while at the same time corrosive depending on system conditions. In turn, stable water leaving a water treatment plant may be corrosive in the system.

The City performed Plant Tap pH and alkalinity testing in August 2008. This data is provided in Appendix B. A discussion of the results follows.

The Plant Tap data was initially evaluated for the two and one-half days provided by the City. A graph was developed for the pH data and is included in Appendix B. The pH data shows a very consistent level of approximately 9.0 SU with little variation

throughout the course of a day as well as between days. The pH value of 9.0 SU is reasonable and the consistency of pH is an indication that the City is very efficient in managing chemical usage to accomplish target softening goals without wasting lime. It would also suggest that some scale is forming in the system but not to a significant degree. This is a desirable condition.

The Plant Tap data for alkalinity was evaluated for the same period. A graph was also developed for the alkalinity data and is included in Appendix B. Alkalinity consistently ran at approximately 70 mg/l CaCO on August 26th and through the morning of August 27th. The afternoon and evening on August 27th showed a noticeable rise in alkalinity from approximately 70 mg/l CaCO to 85 mg/l CaCO. Over the course of the morning on the following day, August 28th, the alkalinity began to lower. It appears that the water leaving the plant is stable and therefore a slight coating of the distribution system should be occurring.

Regarding the increase in alkalinity noted in the previous paragraph, the pH remained unchanged during this increase in alkalinity on the afternoon of August 27th. Checking with plant personnel, it was discovered that a load of lime disrupted operations at the plant that day. During that time the system is shut down, which apparently caused a spike in alkalinity with no recarbonation occurring.

Also provided in Appendix B is the Alkalinity Profile data for two areas of the City. One area (Rogers/Braddock) was tested on August 27th and represents a newer system area, installed after 1970. The other (Chestnut) was tested on August 28th and represents an older system area. Graphs of these profiles were developed and are included in Appendix B.

For the Rogers/Braddock area, the pH maintains at 9.0 SU with a slight drop between the 3rd and 4th data points. This drop corresponds to a drop in alkalinity which ranged from approximately 70-75 mg/l CaCO. However, there is no consistent pattern to suggest a gradual reduction in alkalinity as water moves through the system in this area. Also, the sampled points do not represent water moving through the system as they are from different connection points along the Pleasant Street and Coshocton Avenue water mains.

For the Chestnut area, the pH and alkalinity show a gradual increase over the initial three data points as water moves through the system from west to east, with a subsequent leveling. The alkalinity in this area ranged from 75-78 mg/l CaCO which is higher than that recorded in the Rogers/Braddock area.

For the minor variations in pH and alkalinity values measured in the system, a general observation may be made that the distribution reflects the plant consistency of water quality without any distinct departures in the parameters. This would imply a relatively stable system and there is no evidence to conclude that the distribution system experiences any water quality conditions that would lead to splotching.

IV. Summary

The Phase I Study clearly eliminated chlorine dioxide addition at the water treatment plant as being the cause of splotching. It did not rule out defective fabric materials with unstable dyes in the clothing that was damaged. The objective of the Phase II Study was to see if distribution system issues of piping materials and/or water stability could be contributing to conditions for splotching to occur.

In review and evaluation of the piping materials, there is no evidence to suggest old pipe materials are corroding due to unstable water which could possibly lead to release of mineral deposits from piping. The release of these materials was a theory of what may cause the splotching problems, but this has been ruled out. In addition, mineral releases that stain generally show up as distinct spots and not as bleached or faded areas as shown in the clothing samples illustrated in Figure 1 and Figure 2.

In review and analysis of the plant water stability data and Alkalinity Profiles, it is evident that the City is producing consistently stable water in compliance with Ohio EPA standards. This allows for a coating of the distribution system to some extent.

The water treatment plant nor the distribution system provide any evidence that the water quality is associated with the splotching of garments.

The conclusion to the laundry color wash study points to the clothing itself as the cause of the splotching. Sub-standard dyes and dyeing methods can lead to a faded or bleached appearance of garments when washed. The more common occurrence of clothing with unstable sulfur dyes and fabrics not as colorfast as expected due to overseas production methods are the most likely source of the splotching problems.

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Appendix A

Piping Materials Testing Results

Stantec Consulting Services, Inc.

Date: *27-May-08*

CLIENT:	Mt. Vernon WWTP	**Client Sample ID:**	VINE ST WATER MAIN
Lab Order:	0805119	**Tag Number:**	
Project:		**Collection Date:**	5/8/2008 2:30:00 PM
Lab ID:	0805119-001A	**Matrix:**	SOLID

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS, TOTAL		**6010B**				Analyst: **JP**
Calcium	20800	5.00		mg/Kg-dry	1	5/20/2008
Iron	128000	0.500		mg/Kg-dry	1	5/16/2008
Magnesium	21300	6.00		mg/Kg-dry	1	5/20/2008
Manganese	860	0.500		mg/Kg-dry	1	5/16/2008

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	S	Spike Recovery outside accepted recovery limits
X	Value exceeds Maximum Contaminant Level		

Stantec Consulting Services, Inc.

Date: *06-Nov-08*

CLIENT:	Mt. Vernon WWTP	Client **Sample ID:** 405 EAST HIGH	
Lab Order:	0810180	Tag Number:	
Project:		**Collection Date:** 10/2/2008	
Lab ID:	0810180-005A	Matrix: SOLID	

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS, TOTAL		**6010B**		**SW3050A**		Analyst: **JP**
Calcium	17700	5.00		mg/Kg-dry	1	10/29/2008
Iron	149000	500		mg/Kg-dry	1	10/24/2008
Magnesium	14500	6.00		mg/Kg-dry	1	10/29/2008
Manganese	434	5.00		mg/Kg-dry	1	10/24/2008

Qualifiers:

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- X Value exceeds Maximum Contaminant Level
- E Value above quantitation range
- M Manual Integration used to determine area response
- S Spike Recovery outside accepted recover limits

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Appendix B

Alkalinity and pH Data
and Graphs

CITY OF MOUNT VERNON DISTRBUTION ALKALINITY STUDY

ROGERS/BRADDOCK AREA

ddress 8-27-08 1300-1400 hrs	PH	Alkalinity	Data Point
104 Rogers Street	9.01	73	#1
302 Rogers Street	8.98	73	#2
104 Ringgold Street	9.01	74	#3
401 Braddock Street	8.91	71	#4
605 Braddock Street	8.97	71	#5

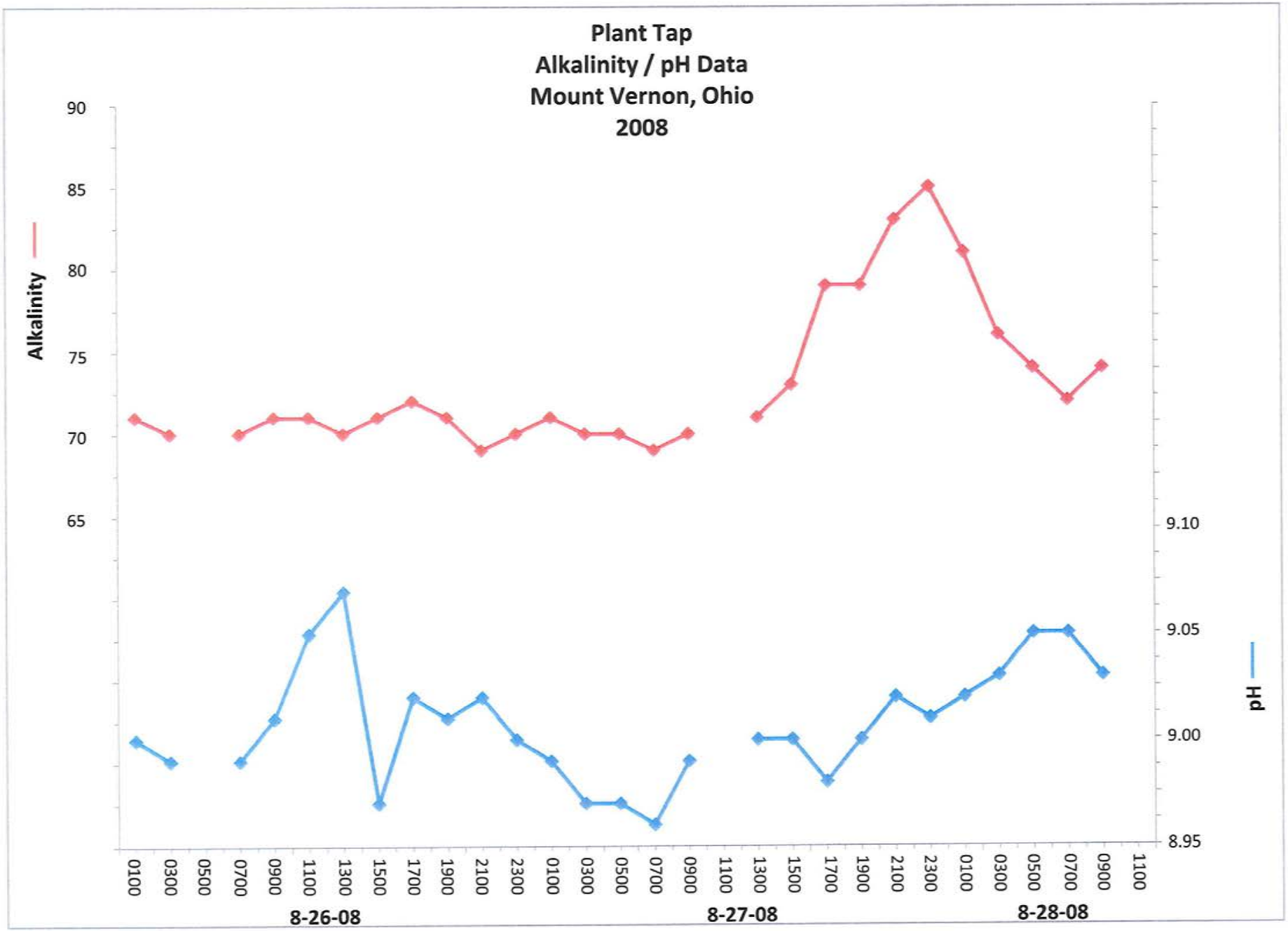
CHESTNUT AREA

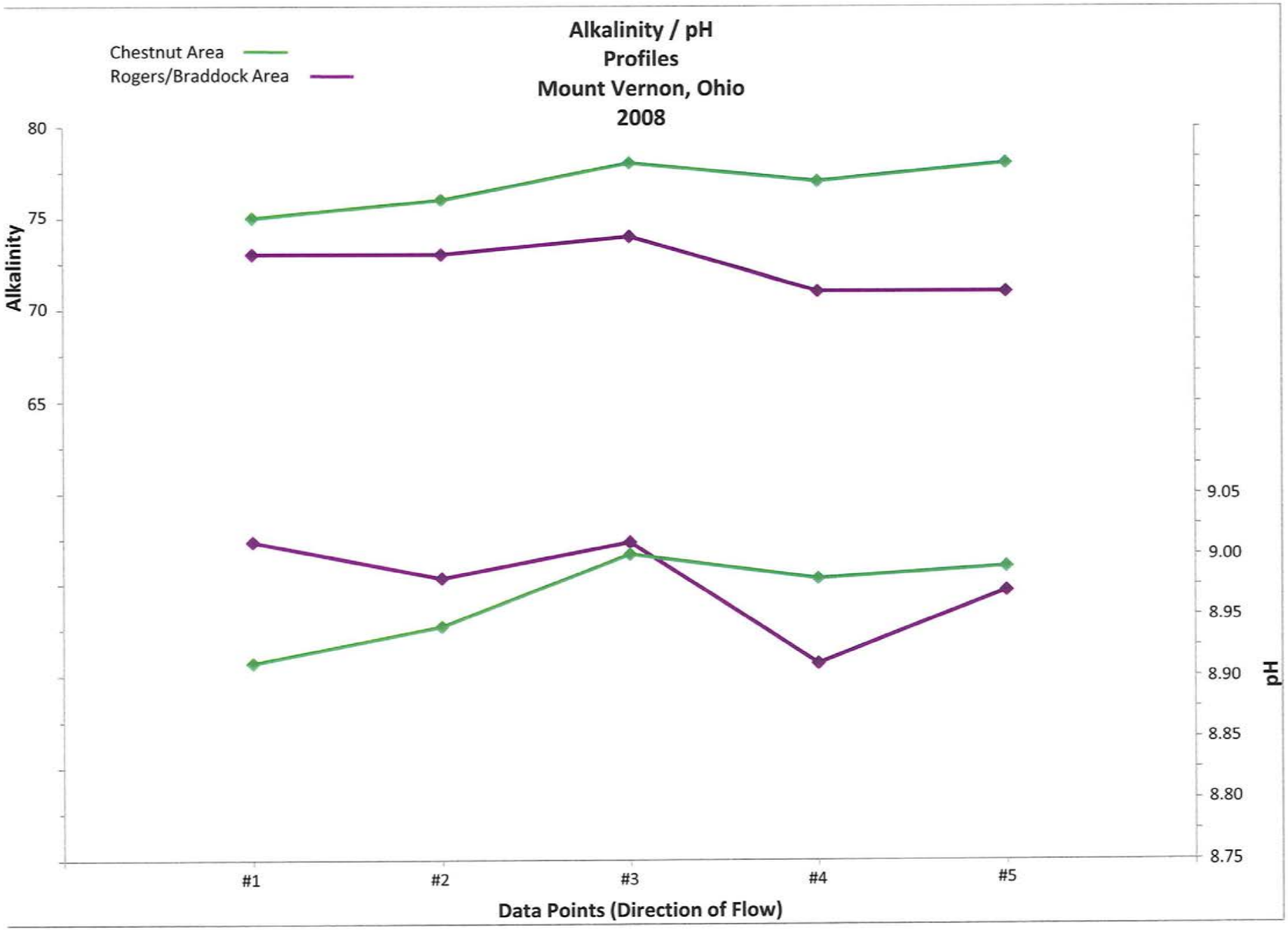
Address 8-28-08 1000-1045 hrs	PH	Alkalinity	Data Point
400 West Chestnut St	8.91	75	#1
5 North Gay Street	8.94	76	#2
304 East Chestnut Street	9.00	78	#3
600 ½ East Chestnut Street	8.98	77	#4
705 East Chestnut	8.99	78	#5

PLANT TAP

8-26-08	PH	Alkalinity	8-27-08	PH	Alkalinity
0100	9.00	71	0100	8.99	71
0300	8.99	70	0300	8.97	70
0500	X	X	0500	8.97	70
700	8.99	70	0700	8.96	69
0900	9.01	71	0900	8.99	70
1100	9.05	71	1100	X	X
1300	9.07	70	1300	9.00	71
1500	8.97	71	1500	9.00	73
1700	9.02	72	1700	8.98	79
1900	9.01	71	1900	9.00	79
2100	9.02	69	2100	9.02	83
2300	9.00	70	2300	9.01	85

8-28-08	PH	Alkalinity
0100	9.02	81
0300	9.03	76
0500	9.05	74
0700	9.05	72
0900	9.03	74
1100		
1300		
1500		
1700		
1900		
2100		
2300		


Plant Tap
Alkalinity / pH Data
Mount Vernon, Ohio
2008
Alkalinity
pH
90
85
80
75
70
65
9.10
9.05
9.00
8.95
0100
0300
0500
0700
0900
1100
1300
1500
1700
1900
2100
2300
0100
0300
0500
0700
0900
1100
1300
1500
1700
1900
2100
2300
0100
0300
0500
0700
0900
1100
8-26-08
8-27-08
8-28-08


Alkalinity / pH
Profiles
Mount Vernon, Ohio
2008
Chestnut Area
Rogers/Braddock Area
Alkalinity
80
75
70
65
9.05
9.00
8.95
8.90
8.85
8.80
8.75
pH
#1
#2
#3
#4
#5
Data Points (Direction of Flow)