TEST REPORT

Alex Orr Water Treatment Plant

Initial Investigation of Particulate Fallout

Professional Services Agreement E09-DERM-01

Under Subcontract to Cherokee Enterprises, Inc.

Prepared for

Miami-Dade County Water and Sewer Department

3071 SW 38 Avenue, Room 554-3

Miami, FL 33146

Prepared by

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GROVE
SCIENTIFIC & ENGINEERING

TABLE OF CONTENTS

TABLE OF CONTENTS 1
LIST OF ATTACHMENTS 2
REPORT CERTIFICATION 3
SECTION 1 4
INTRODUCTION 4
1.0 Background 4
1.1 Scope of Work 4
SECTION 2 6
DISCUSSION 6
2.0 Initial Observation 6
Figure 1: Alex Orr Water Treatment Plant 6
2.1 Investigation 7
2.2.1 Observations 7
2.3 Resident's Property Observations and Interview 8
Figure 2: Resident Aerial View 9
SECTION 3 12
RESULTS 12
3.0 Emissions from Recalcining Stack 12
3.1 Laboratory Analysis 12

3.1.1 Particle Size Distribution 13
3.1.2 Composition Analysis from Recalcining Stack 13
3.1.3 Composition Analysis of Wipe Sample 13
SECTION 4 14
CONCLUSIONS AND RECOMMENDATIONS 14
4.1 Conclusions 14
4.2 Recommendations 14

LIST OF ATTACHMENTS

ATTACHMENT 1 - LIME RECALCINING PLANT #2 DAILY OPERATING REPORT

ATTACHMENT 2 - SUMMARY REPORT FROM STACK EMISSION SAMPLING

ATTACHMENT 3 - LABORATORY REPORT

REPORT CERTIFICATION

This initial investigation was conducted under the observation of the undersigned and after reasonable enquiry and review, the observations, test results and process data are true and correct to the best of my knowledge.

09/29/14

_____ _____

Bruno A. Ferraro, CEP, QEP Date

SECTION 1

INTRODUCTION

1.0 Background

Grove Scientific & Engineering Company (GSE) was subcontracted under Professional Services Agreement E09-DERM-01 by Cherokee Enterprises, Inc. (CEI) to provide environmental consulting services for an initial particulate investigation. A meeting and site visit was held on July 29, 2014 at the Alex Orr Water Treatment Plant. The meeting was attended by representatives of Dade County, GSE and CEI.

This project was initiated after a report was made to the local State Representative by an adjacent residential property owner that their home was being impacted by white dust and white residue that they believed was coming from the adjacent water treatment plant. During this meeting, we discussed the general scope of work of this initial investigation. A follow up phone conference call lead by Douglas Yoder, Ph.D. Deputy Director of Miami-Dade Water and Sewer Department (WASD), finalized the scope of work. Dr. Yoder emphasized responding quickly and professionally to the concerned resident's report of particulate matter on their property.

1.1 Scope of Work

The following scope of work was agreed upon by Dade County;

1. Collect a particulate sample from the recalcining stack using EPA Method 5 using a polycarbonate filter.

2. Analyze the polycarbonate filter for particle size and distribution. The particulates will be speciated using X-ray diffraction and other microscopic or spectrophotometric methods.
3. During the same day the stack sample is being collected, GSE will collect deposition samples from the resident's location. The deposition samples will be analyzed using the same general techniques as the stack test filter sample.
4. Analyze the laboratory data and prepare a draft report of findings for review by Cherokee and WASD.

SECTION 2

DISCUSSION

2.0 Initial Observation

Only July 29, 2014 the representatives from GSE, CEI, WASD and DERM conducted a tour of the lime recalcining area and settling pond. During this tour we observed piles of lime dust under and around much of the transfer equipment both indoors and out. We observed piles of lime dust at the edge of the pond. Most of the lime dust was susceptible to suspension by wind, vehicular traffic and any movement of the material. These areas are identified in Figure 1.

Figure 1: Alex Orr Water Treatment Plant

We observed the recalcining stack. During this initial visit an attached steam plume was visible. When the steam plume dissipated, visible particulate emissions of approximately 5% opacity were observed in a fanning-type plume. Winds were from the west when we made these observations.

2.1 Investigation

On September 10, 2014 we conducted the investigation as outlined in the scope of work. A particulate sample was collected onto a polycarbonate filter from the recalcining stack using EPA Method 5. Sampling was limited to 30 minutes to achieve proper filter loading. The recalcining plant was operating at 130-135 tons per hour during the sample collection. A copy of the daily operating log is included in Attachment 1.

The sample was collected by representatives of South Florida Environmental Services under the direction of Mr. Francis Morlu, QSTI. During this sample collection, an attached steam plume was visible at the discharge point of the exhaust stack. When the steam plume dissipated, visible particulate emissions of approximately 5% opacity were observed in a fanning-type plume. Winds were from the east-southeast during this testing. Light to moderate intermittent rain showers occurred before, during and after sampling.

2.2.1 Observations

While the particulate sampling was being collected, we conducted a tour of the same areas of the recalcining plant toured on July 29. A visible improvement in management practices was immediately noticeable in and

around the recalcining plant. The piles of loose lime dust had been vacuumed and the areas were much cleaner. Conversations with WASD personnel indicated that they had performed much needed maintenance on the lime handling equipment. It was verbally reported to us that leaking seals had been replaced, clogged vent pipes cleared, and other parts were on order to complete the maintenance. It was also reported that these areas were being added to the quarterly maintenance inspection program to prevent future issues.

We conducted a perimeter tour of the the pond. The water level in the pond was high and there were no exposed bottom sediments. Though it had rained, some residual evidence of white dust on the leaves of vegetation surrounding this perimeter road was still noticeable. The perimeter road is made of limestone rock but vegetation has grown over much of this limestone. Vegetation on this roadbed should be encouraged as a method of dust suppression. This perimeter road is has a reduced potential for fugitive dust emissions due to this vegetation covering much of the limestone base.

There were large piles of dry lime dust at the eastern-most edge of the pond. These piles are a potential source of fugitive dust because the loose particles are easily disturbed and suspended. The road leading up to and around these piles was also dusty even though it had rained on the same day.

2.3 Resident's Property Observations and Interview

The resident of concern is located at the western property boundary of the Alex Orr Water Treatment Plant and is presented in figure 2.

Figure 2: Resident Aerial View

After the emission test was completed, Richard O'Rourke, P.E., Engineer at WASD and Bruno Ferraro, CEP, QEP, from GSE met with the property owner at 10 AM at his home. We started our investigation by interviewing the property owner to gain some historic perspective. They have lived on this property for 20 years. Many of their neighbors are long-time residents. Their State Representative lives on their same street. Over the years they and their neighbors have experienced varying degrees of white dust and a creamy white residue on their outdoor furniture, automobiles, motor homes and structures. Several years ago they had an event that deposited a heavy layer of white dust on the neighborhood. The residents responded by calling 911 and a HazMat team responded. This was the resident's

example of an extreme impact they believed was caused by the Alex Orr treatment plant.

The resident commented that he and his neighbors were concerned about the “incinerator” stack and the “toxic white smoke” being emitted in such large amounts. We responded by educating the resident on the nature of the emissions and assuring him there was no incineration occurring at this facility. We explained the nature of the white plume as being an “attached steam plume” and how to differentiate the steam from the particulate plume. We also explained that the facility uses natural gas as the fuel to fire the recalciner. The resident responded by thanking us for the simple explanation and expressed his desire that this would have been communicated to the residents earlier. Knowing there was not a potential “toxic” exposure from an incinerator would have been a relief.

We conducted a walk-around the resident’s property. Due to earlier rains much of the particulate matter had washed off but a creamy white residue was observed on the outdoor furniture and on a black automobile. The automobile is parked outdoors (in the driveway) and reportedly had not been driven for a month. A wipe sample was collected from this automobile and sent to the laboratory for analysis. A second sample was collected on a glass table top under the rear porch but is being held in case WASD wishes to have this analyzed in the future.

At the end of the interview the resident commented that he and his neighbors that have swimming pools all experience a white powdery residue in their pool. He explained that water chemistry analysis indicates their pools are high in calcium. Recently his pool service technician had to

adjust this with 2 gallons of hydrochloric acid to bring the calcium level back to normal range.

SECTION 3

RESULTS

3.0 Emissions from Recalcining Stack

A sample was collected using reference US EPA Method 5 onto a polycarbonate filter. This sample method allows a sample to be collected isokinetically meaning that the particulate matter is neither over-sampled nor under-sampled. This is achieved by drawing the sample onto the filter at the same velocity as the exhaust gas using a nozzle orifice size specified by the method.

We collected a 30 minute sample to obtain the desired filter loading. After 30 minutes, we looked at the filter and visually determined that we had collected enough sample for microscopic analysis. The filter was recovered and placed in a petri dish for transport to the laboratory. A summary of the sampling data is included in Attachment 2.

3.1 Laboratory Analysis

The polycarbonate filter sample was analyzed by scanning electron microscope (SEM) for particle size distribution and composition. Particle size distribution describes the number of particles in each size range and the percentage of particles distributed in each of these size ranges. The composition analysis identifies the composition and chemical makeup of these particles. A copy of the lab report is included in Attachment 3.

3.1.1 Particle Size Distribution

Seventy-five percent (75%) of the particles are between 0.5 and 1 micron. Ninety-eight percent (98%) of the particles are between 0.5 and 2.5 microns in size. These are small light particles that are transported by wind downstream of the emission point. The distance and area of particulate and gaseous distribution (i.e., dispersion) varies with the speed, turbulence and direction of the wind and a particular time and climatic condition.

3.1.2 Composition Analysis from Recalcining Stack

Polarized light microscopic (PLM) examination of the particulate on the Method 5 filter collected from the recalcining stack indicated that it is composed of >99% carbonate (with a minor amount of gypsum) particles (see Figure 1 in Attachment 3). Analysis by energy dispersive x-ray spectrometry (EDS) confirmed that the predominant particle type is calcium (Ca) carbonate (CO3) (see Figure 2 in Attachment 3), with a small amount of a calcium sulfate (CaSO4) salt (e.g. gypsum) (see Figure 3 in Attachment 3) and a trace of sodium chloride (Na Cl) salt present (see Figure 4 in Attachment 3).

3.1.3 Composition Analysis of Wipe Sample

The cloth wipe sample from the residents automobile identified that it is composed of 70-90% algae and fungal material (see Figure 5 in Attachment 3), 1-5% plant fragments, and traces of soil minerals (including quartz and carbonates) and probable insect fecal pellets (see Figure 6 in Attachment 4) that have been colonized by the algae and fungi present.

SECTION 4

CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

The material collected from the recalcining stack on the Method 5 filter is composed of >99% carbonate minerals plus small amounts of sulfates and chlorides. The material collected from the resident's automobile surface on the wipe is composed principally of an algal/fungal biofilm and is not related to the material seen in the Method 5 sample. Therefore, during this particular sampling event, the analysis indicates the recalcining stack particulate emissions was not the source of particulate matter on the resident's car surface.

4.2 Recommendations

The facility can do several things to reduce future impacts of fugitive particulate matter to the neighboring properties. These include implementing the best management practices for controlling unconfined particulate matter as referenced in Specific Condition 10, Section II of the Title V air permit issued to the facility. It reads;

Emissions of Unconfined Particulate Matter. *Pursuant to Rule 62-296.320(4)(c), F.A.C., and the renewal application received June 2, 2010, this facility will comply with the following precautions to control unconfined particulate matter (see Condition 57. of APPENDIX TV-6, TITLE V CONDITIONS, and Attachment C of application).*

• Paving and maintenance of roads, parking areas and yards.
• Application of water or chemicals to control emissions from such activities as demolition of buildings, grading roads, construction, and land clearing.
• Application of asphalt, water, oil, chemicals or other dust suppressants to unpaved roads, yards, open stock piles and similar activities.
• Removal of particulate matter from roads and other paved areas under the control of the owner or operator of the facility to prevent re-entrainment, and from buildings or work areas to prevent particulate from becoming airborne.
• Landscaping or planting of vegetation.
• Use of hoods, fans, filters, and similar equipment to contain, capture and/or vent particulate matter.
• Confining abrasive blasting where possible.
• Enclosure or covering of conveyor systems.
[Rule 62-296.320(4)(c), F.A.C.; and/renewal Title V permit application received June 2,2010,

As required by your Title V permit, one or more of these procedures in combination must be followed throughout the facility and especially when disturbing the piles of spent lime stored at the edge of the pond, the silos and anywhere material is handled.

Based on our conversation with the resident, improved communication between the Alex Orr Water Treatment Plant and the local neighbors would help educate residents and thereby alleviate some of their concerns and

misconceptions regarding the impacts from the processes and emissions authorized by your air permit.

ATTACHMENT 1

LIME RECALCINING PLANT #2 DAILY OPERATING REPORT

24-HR. GAS FLOW

STACK - TEST

DAILY OPERATING REPORT—LIME REC

B.
A. - 869826
T =

TONS PER DAY
A. 1220
B. +
T =

HOLDING TANK #1
Ø

HOLDING TANK #2
100%

T = 1260
TONS IN STORAGE

SILO #1: 700
SILO #2: 560

TIME	HOLDING TANK % Load	HOLDING TANK Torque	HOLDING TANK % Load	HOLDING TANK Torque	KILN TRAVEL	KILN Feed End	KILN Hood Temp	KILN % Hood Draft	KILN Amps	KILN R.P.M.	KILN Material Rating	KILN % I.D. Damper	KILN I.D. AMPS	KILN % Primary Air	KILN INLET	KILN OUTLET	KILN GAS-FLOW	KILN ANNUALS	KILN CORE	MIXING AIR COMPRESSOR #1	MIXING AIR COMPRESSOR #2	MIXING AIR COMPRESSOR #3
12M																						
1																						
2																						
3																						
4																						
5																						
6																						
7						485	—	-1.50	110	1.1	A	80	161	6	28	10	40	6	6			
8						484	—	-1.50	111	1.1	A	80	159	6	28	10	40	6	6			
9						485			111	1		80		6	28	10	40	6	6			
10						4						80		6								
11																						
12N																						
1PM																						
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11																						
12M																						

ALCINING PLANT #2—ORR PLANT

Date 9-10-14

% Oxygen	Camera Temp	CO^2 P.S.I. #1	#2	#3	#4	CENTRIFUGE AMPS #1	#2	#3	CENTRIFUGE G.P.M. #1	#2	#3	% Solids	$H2^0$ B. A. - T =
													#2 Oper.
													#1 Oper.
4.6						90	96		58	58		34	
4.4						91	95		58	58		34.5	
5						90	95		58	56			#2 Oper. Motta
													#1 Oper. QUESADA
													GPM x K-FACTOR = TPD Solids 34%
													#1 CENT = 58 GPM REJECT - 2 %
													#2 CENT = 58 GPM K-FACTOR → 32% = 1.168
													TOTAL = 116
													116 x 1.168 = 135
													#2 Oper.
													#1 Oper.

Run Emer. Generator _____

Aver. Tons per Day _____ Run Emer. Engine _____

ATTACHMENT 2 - SUMMARY REPORT FROM STACK EMISSION SAMPLING

SOUTH FLORIDA ENVIRONMENTAL SERVICES
Air Quality Specialists

PM Testing at MDWASD Alex Orr Plant

At the request of Bruno A. Ferraro, President of Grove Scientific & Engineering, South Florida Environmental Services conducted a 30-minute Particulate Matter (PM) sampling on the stack for the Lime Kiln at Alexander Orr on September 10, 2014. This facility is owned and operated by Miami Dade Water & Sewer Department (MDWASD).The sampling was conducted in accordance with EPA Method 5. A single sample was collected isokinetically over a 30-minute period onto a polycarbonate filter. The filter was recovered, placed in a sample container, and turned over to Grove Scientific & Engineering for laboratory analysis and reporting.

The table below shows a summary of the relevant Method 5 input data calculation sheets.

Stack Temp °F	Moisture (%)	% ISO	Qs (DSCFH)	Qs' (ACFM)
131	17.5	95.7	1,047,721	22,579

If you have any question, please do not hesitate to contact me, Francis K Morlu by phone at (561)-687-5300 or my cell phone (561)-644-7979. You can also reach me by email at fmorlu@montrose-env.com.

Thanks for giving South Florida Environmental Services the opportunity to be of service to Grove Scientific & Engineering.

Sincerely yours,

South Florida Environmental services

ATTACHMENT 3

LABORATORY REPORT

MVA SCIENTIFIC CONSULTANTS
Full Service Analytical Microscopy Laboratory

3300 Breckinridge Blvd
Suite 400
Duluth, GA 30096

770.662.8509
FAX 770.662.8532
www.mvainc.com

Environmental Forensics Services

Particle Characterization

Dust Characterization

Carbon Black Analysis

Fly Ash Characterization

Darkening Agents Identification

Soot Analysis

Asbestos Analysis & Exposure Evaluation

Unknown Material Analysis

Contamination Analysis

Source Determination

Expert Witness Services

Techniques

Light Microscopy

Scanning Electron Microscopy

Transmission Electron Microscopy

Fourier Transform Infrared Spectroscopy

Confocal Raman Microscopy

White Light Interference Microscopy

Energy Dispersive X-ray Spectrometry

Fluorescence Microscopy

Ion Milling & Ultramicrotomy

Accreditations

cGMP Compliant

ISO/IEC 17025
A2LA Certificate #2096.01

FDA Registered

Particle Sizing and Composition: Alex Orr Water Treatment Plant

Performed for Grove Scientific

MVA Project 10618

25 September 2014

Executive Summary

On 12 September 2014, we received a Method 5 filter and a cloth wipe sample. We were asked to determine the size distribution and composition of the material on the Method 5 filter and to determine the components of the debris on the wipe sample. Upon receipt, the samples were assigned unique MVA Scientific Consultants laboratory identification numbers Z1897 (Method 5 filter) and Z1898 (wipe sample). Analyses were performed at MVA Scientific Consultants during the period of 15 September through 25 September 2014.

The material collected on the Method 5 filter is composed of >99% carbonate minerals plus small amounts of sulfates and chlorides. The material collected on the wipes is composed principally of an algal/fungal biofilm and is not related to the material seen in the Method 5 sample.

The size distributions of the particles down to 0.5 micrometer are shown in Tables 1 and 2.

Table 1. Percentages of Particles in Various Diameter Ranges by Number of Particles

MVA#	Z1897
Client ID	1
Diameter Range (µm)	Number %
0.5-≤1.0	75.3
>1.0-≤2.5	23.0
>2.5-≤5.0	1.6
>5.0-≤7.5	0.1
>7.5-≤10.0	0.01
>10.0	0.0
Total Particles	8324

Table 2. Percentages of Particles in Various Diameter Ranges by Mass of Particles

MVA#	Z1897
Client ID	1
Diameter Range (µm)	Mass %
0.5-≤1.0	21.8
>1.0-≤2.5	47.5
>2.5-≤5.0	21.0
>5.0-≤7.5	6.5
>7.5-≤10.0	3.2
>10.0	0.0

Respectfully Submitted by:

EXECUTED BY ELECTRONIC SIGNATURE

Tim B. Vander Wood, Ph.D.
Executive Director

Report of Results: MVA10618

Particle Sizing and Composition
Alex Orr Water Treatment Plant

Prepared for:

Grove Scientific
6140 Edgewater Dr., Suite F
Orlando, FL 32810-4810

Respectfully Submitted by:

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Tim B. Vander Wood, Ph.D.
Executive Director

MVA Scientific Consultants
3300 Breckinridge Boulevard
Suite 400
Duluth, GA 30096

25 September 2014

MVA SCIENTIFIC CONSULTANTS
Full Service Analytical Microscopy Laboratory

Report of Results: MVA10618

Particle Sizing and Composition

Introduction

On 12 September 2014, we received a Method 5 filter and a cloth wipe sample. We were asked to determine the size distribution and composition of the material on the Method 5 filter and to determine the components of the debris on the wipe sample. Upon receipt, the samples were assigned unique MVA Scientific Consultants laboratory identification numbers Z1897 (Method 5 filter) and Z1898 (wipe sample). Analyses were performed at MVA Scientific Consultants during the period of 15 September through 25 September 2014.

Methods

The Method 5 filter was prepared for particle size analysis in accordance with MVA SOP 310: "Sample Preparation Methods for Total Particle Sizing Using Microscopical Techniques."

The particle size analysis was performed using a JEOL JSM-6500F field emission scanning electron microscope operating in automated mode under the control of a Thermo Scientific Noran System SIX x-ray analysis system, utilizing MVA SOP 316, "Automated Particle Size Analysis Using the JEOL JSM-6500F FESEM and Thermo Scientific Noran System SIX." The particle size data are presented in terms of particle number and in terms of estimated mass. The assumption has been made that the particles are all of similar density and therefore the particle volume distribution is equivalent to the particle mass distribution.

Portions of the material on the filter and from the wipe were isolated and examined by polarized light microscopy (PLM). Portions of the material on the filter were also analyzed by energy dispersive x-ray spectrometry (EDS) using the Thermo Scientific Noran System SIX system attached to the JEOL JSM-6500F electron microscope.

Results

The size distributions of the particles down to 0.5 micrometer are shown in Tables 1 and 2.

PLM examination of the particulate on the Method 5 filter indicated that it is composed of >99% carbonate (with a minor amount of gypsum) particles (Figure 1). Analysis by EDS confirmed that the predominant particle type is calcium (Ca) carbonate (CO_3) (Figure 2), with a small amount of a calcium sulfate (SO_4) salt (e.g. gypsum) (Figure 3) and a trace of sodium (Na) chloride (Cl) salt present (Figure 4).

MVA SCIENTIFIC CONSULTANTS

PLM examination of the material from the wipe sample indicated that it is composed of 70-90% algae and fungal material (Figure 5), 1-5% plant fragments, and traces of soil minerals (including quartz and carbonates) and probable insect fecal pellets (Figure 6) that have been colonized by the algae and fungi present.

Conclusions

The material collected on the Method 5 filter is composed of >99% carbonate minerals plus small amounts of sulfates and chlorides. The material collected on the wipe is composed principally of an algal/fungal biofilm and is not related to the material seen in the Method 5 sample.

Table 1. MVA 10618. Percentages of Particles in Various Diameter Ranges by Number of Particles

MVA#	Z1897
Client ID	1
Diameter Range (µm)	Number %
0.5-≤1.0	75.3
>1.0-≤2.5	23.0
>2.5-≤5.0	1.6
>5.0-≤7.5	0.1
>7.5-≤10.0	0.01
>10.0	0.0
Total Particles	8324

Table 2. MVA 10618. Percentages of Particles in Various Diameter Ranges by Mass of Particles

MVA#	Z1897
Client ID	1
Diameter Range (µm)	Mass %
0.5-≤1.0	21.8
>1.0-≤2.5	47.5
>2.5-≤5.0	21.0
>5.0-≤7.5	6.5
>7.5-≤10.0	3.2
>10.0	0.0

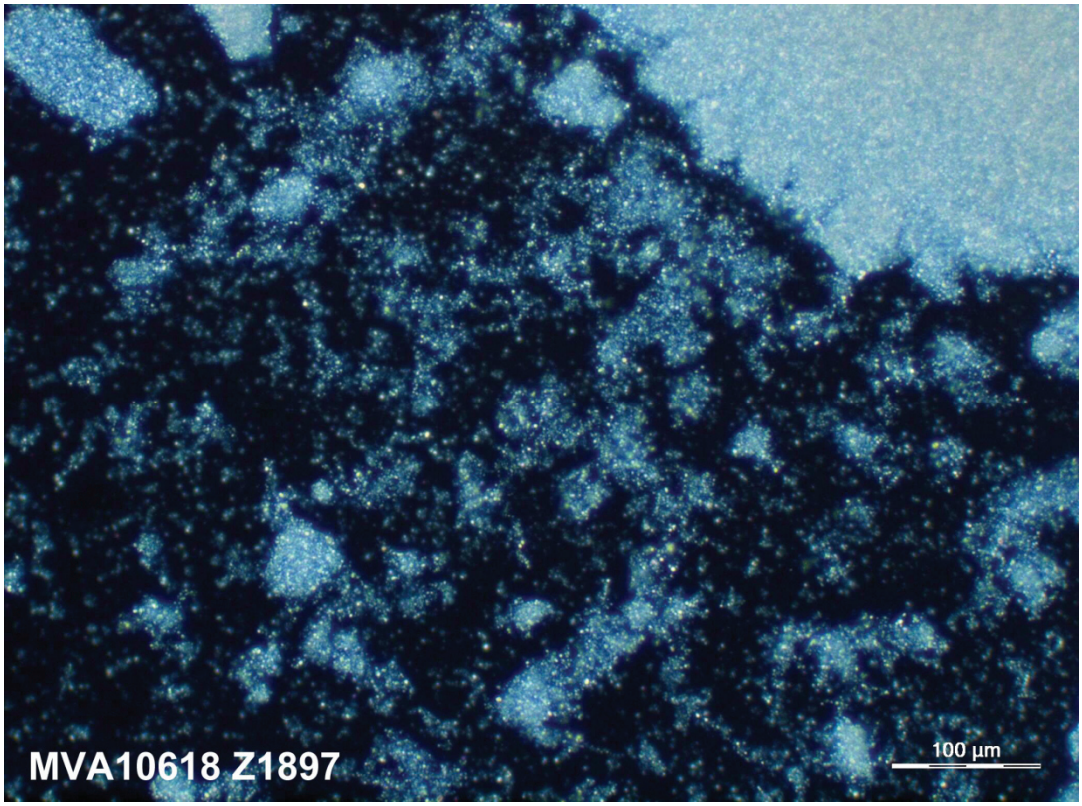

Figure 1. Polarized light micrograph of a portion of the material isolated from the Method 5 filter.

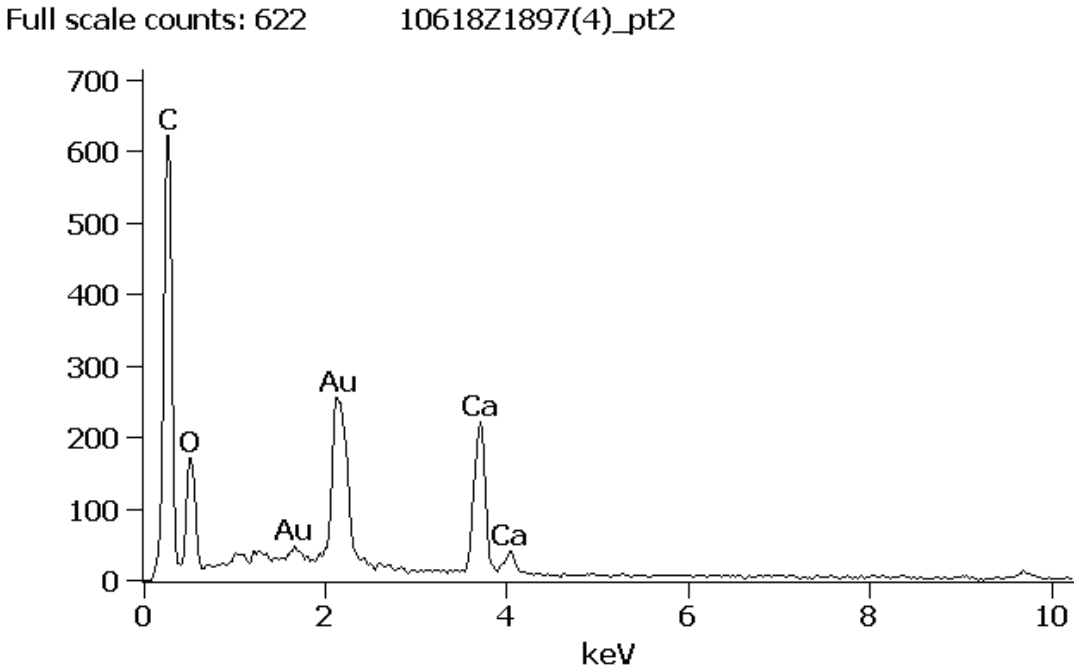

Figure 2. Typical EDS spectrum obtained from the material on the Method 5 filter, consistent with calcium carbonate. Gold (Au) is from a thin layer of gold applied during sample preparation for SEM/EDS analysis.

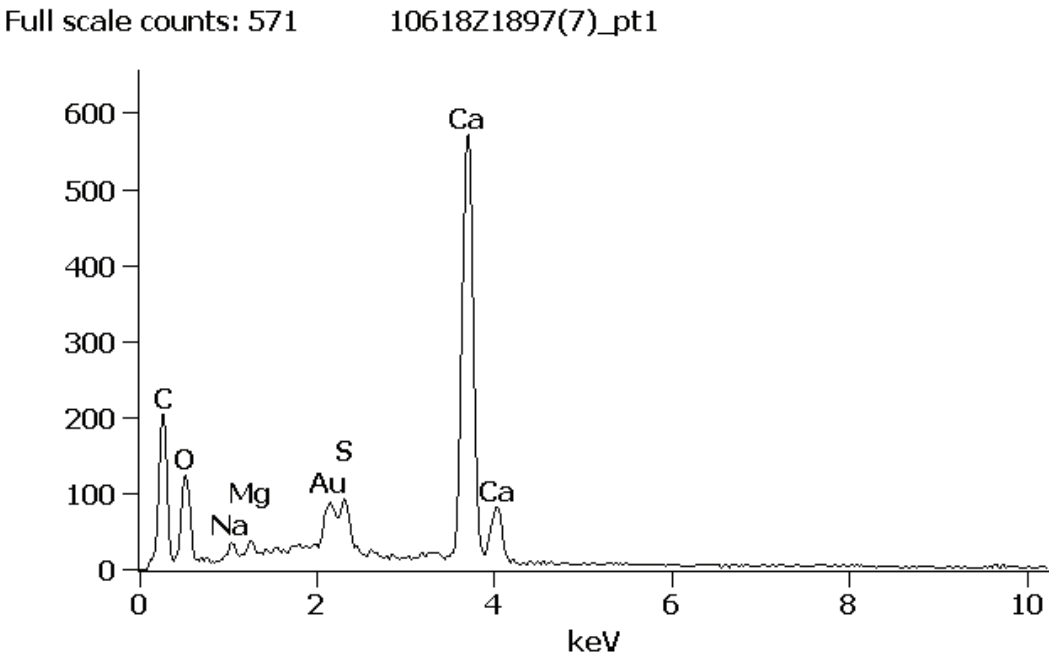

Figure 3. EDS spectrum obtained from the material on the Method 5 filter, consistent with a mixture of calcium carbonate and calcium sulfate. Gold (Au) is from a thin layer of gold applied during sample preparation for SEM/EDS analysis.

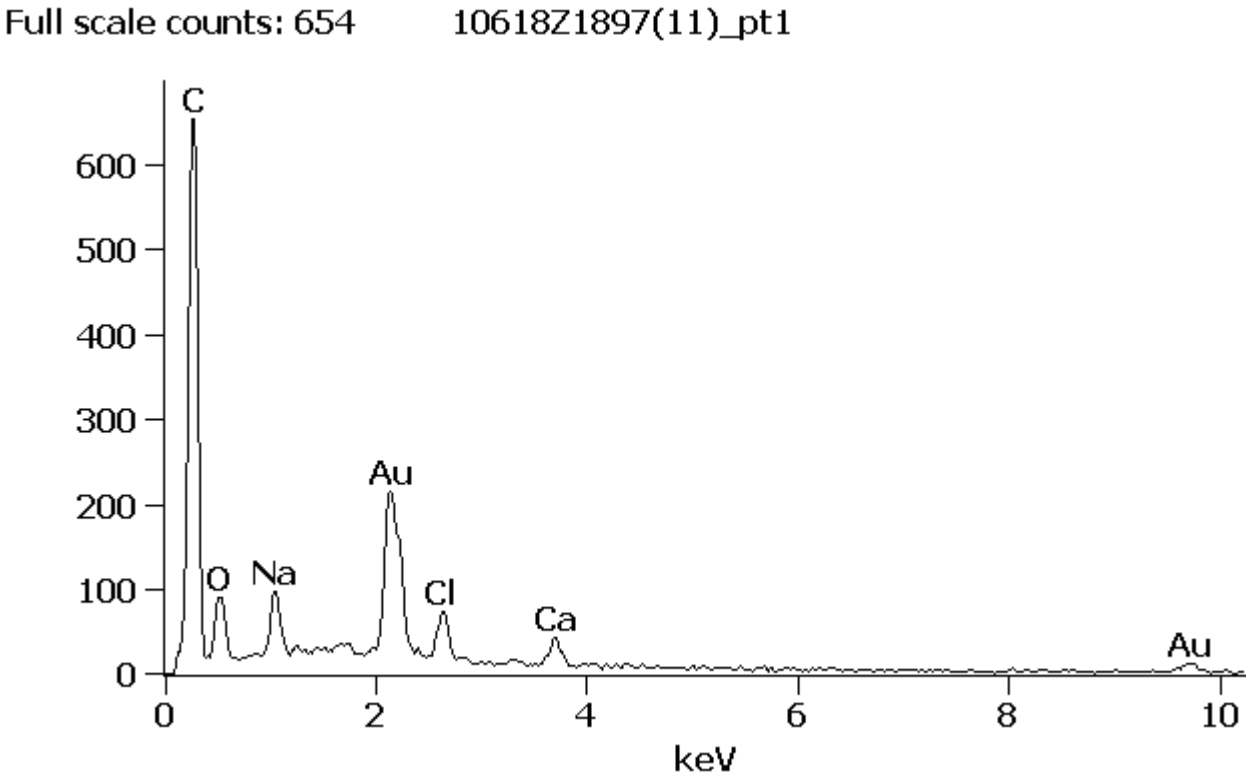

Figure 4. EDS spectrum obtained from the material on the Method 5 filter, consistent with a mixture of calcium carbonate and sodium chloride. Gold (Au) is from a thin layer of gold applied during sample preparation for SEM/EDS analysis.

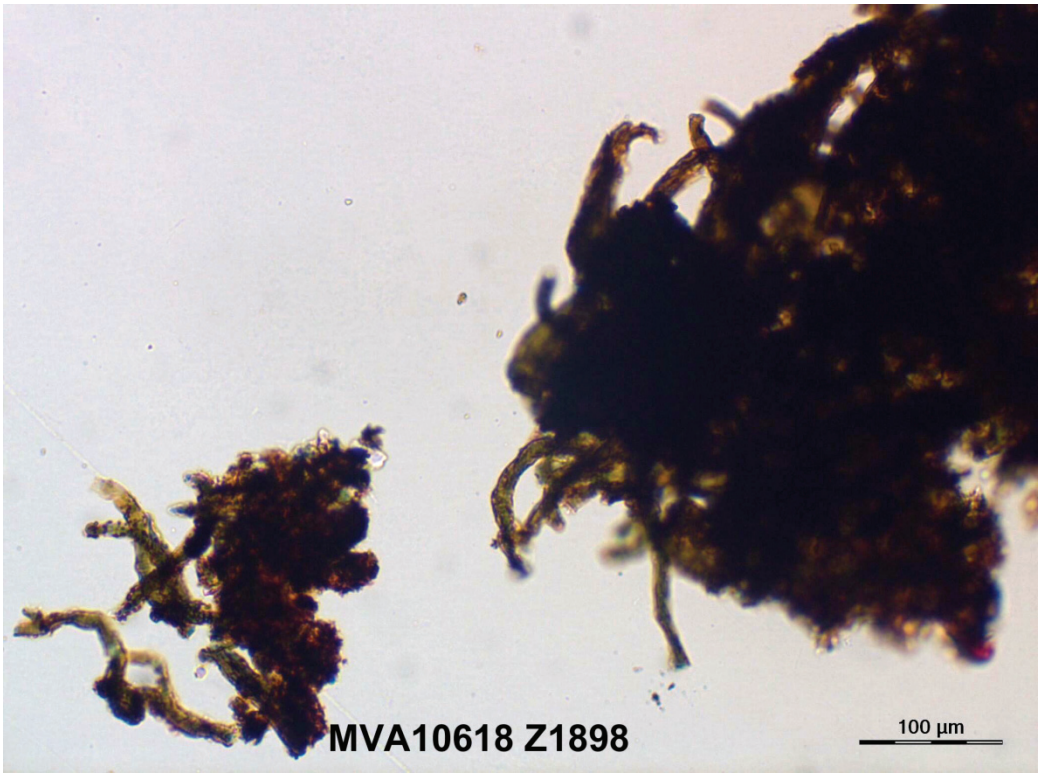

Figure 5. Light micrograph of a portion of the biofilm composing the majority of the material on the cloth wipe.

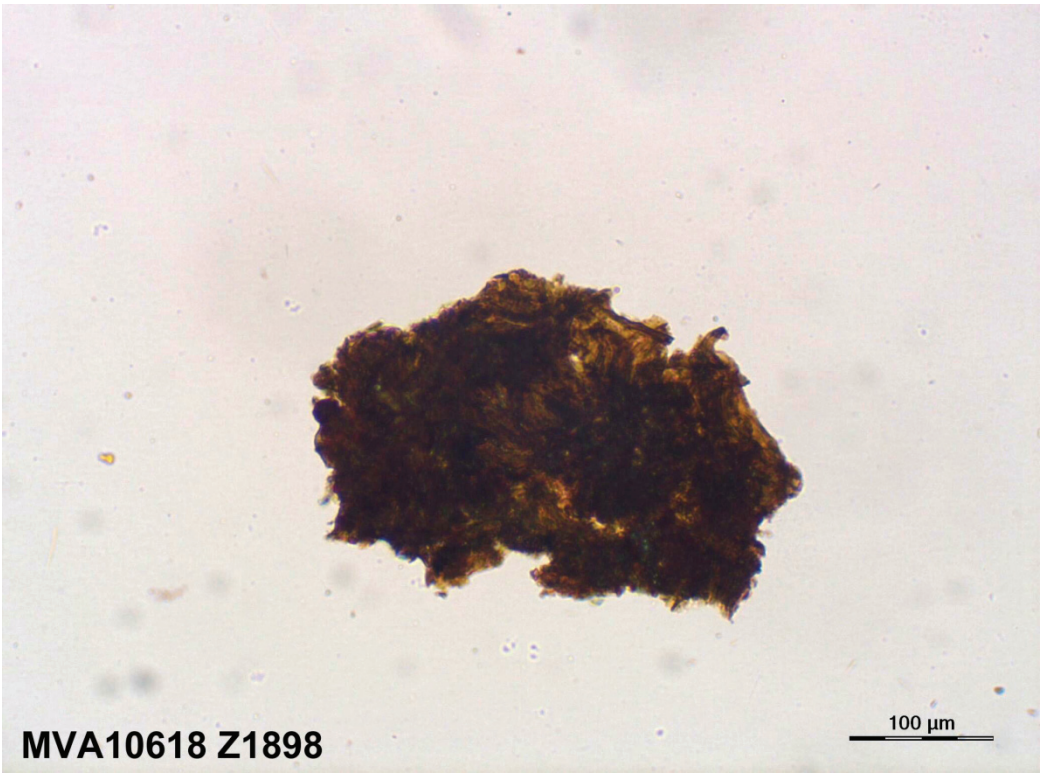

Figure 6. Light micrograph of an insect fecal pellet found in the material on the cloth wipe.

10618

ENVIRONMENTAL SAMPLE CHAIN-OF-CUSTODY FORM

GROVE SCIENTIFIC

PROJECT NAME: Alex Orr Water Treatment Plant PROJECT#: 340700

CLIENT CONTACT: Bruno Ferraro TELEPHONE#: (407) 298-2282

PO#/AUTHORIZATION: 340700 SAMPLE KIT#: _____

Sample Matrix: Water _____ Soil _____ Bulk X
Air _____ Ind. Waste _____ Haz. Waste _____

SAMPLERS NAME AND TITLE	SAMPLE ID/DATE/TIME	GROVE ID #
Bruno A. Ferraro	#1 9/10/14 0930	#1 Filter - Stack
	#2 9/10/14 1030	#2 Brown Residence wipe sample - car
Sample storage:		

SAMPLE TYPE:

_____	General	_____	Cyanide
_____	Metals	_____	Oil/Grease
_____	Nutrients/Phenols	_____	Hydrocarbons
_____	Organics	_____	VOC
_____	TOC	_____	Radiological
_____	Bioassay	_____	Other

Total No. of bottles collected: _____

ANALYSES REQUESTED #1 - Filter from Method 5 - recalcining Exhaust Stack Particle size distribution and Indentification

#2 - Brown residence - Automobil surface wipe - Particle Indentification

	1st Transfer Recipient	2nd Transfer Recipient	3rd Transfer Recipient
Signature:			
Title:			
Date & time of receipt:			
Sample storage:			

LABORATORY PERSON RECEIVING SAMPLES:

Signature: _____

Title: _____

Date & time of receipt: 9/12/14 0900 hrs

Sample storage: _____

Coolant: wet ice gel ice none

Arrival temp: _____ °C

Sample color: _____

Odor: _____

Solids: _____

COMMENTS: _____

CHAIN2/FORMS/061193