# BIOSOLUTIONS

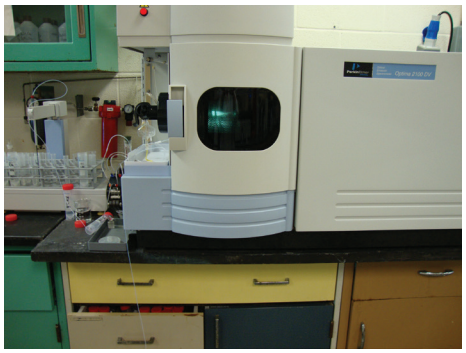
*Cleaner Water through Applied Chemistry & Biology*

## THE LABORATORY

Biosolutions, LLC is a woman-owned small business specializing in water testing since 2002. OEPA certified for drinking water analysis, we work with a variety of public water systems, water and wastewater operators, water treatment companies, corporations that use water to produce their products, and residential customers.

We utilize a variety of equipment to complete drinking, waste, ground, and process water analysis. We are equipped to analyze liquid samples for a variety of metals, chemical compounds, and microbes.

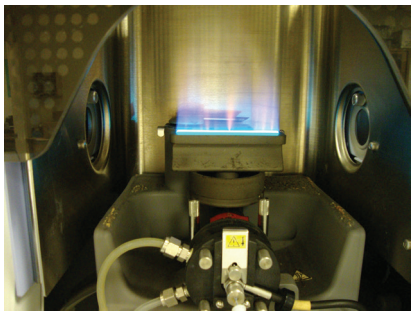
## ICP ANALYSIS

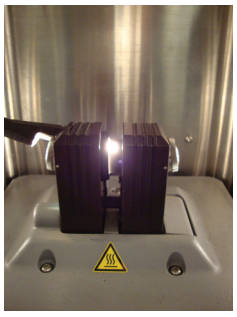


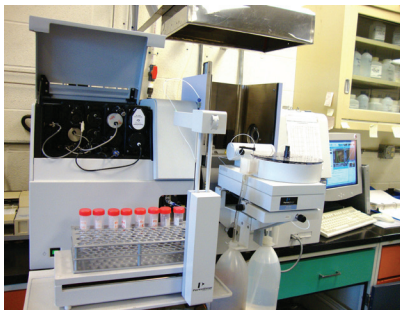
ICP (Inductively Coupled Plasma) Spectroscopy enables us to analyze for metals at a detection rate in compliance with EPA standards. Used for iron, manganese, copper, and other metals, the ICP is a vital part of our laboratory equipment.

## GFAA ANALYSIS

GFAA (Graphite Furnace Atomic Absorption) analysis provides a lower detection limit for some metals in water. Primarily used for lead, arsenic, and other heavy metals, the GFAA enables us to ensure our public water system clients remain in compliance with EPA standards. Flame atomic absorption spectroscopy is available as a backup for ICP analysis.







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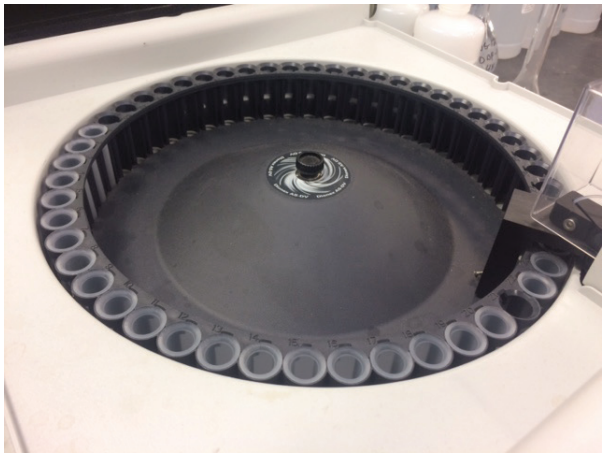
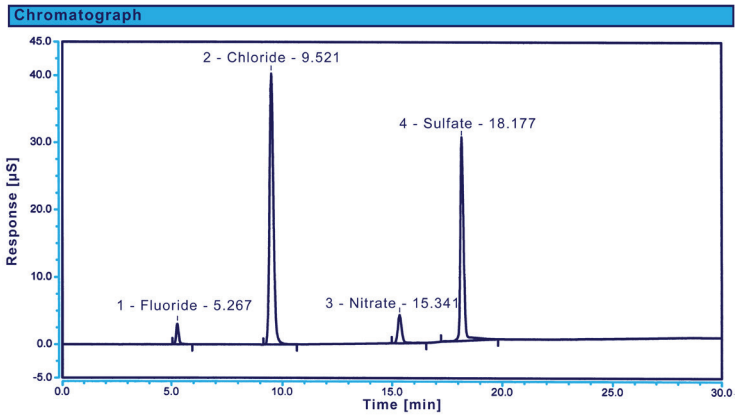
## IC ANALYSIS

The ion chromatograph quantifies fluoride, chloride, nitrite, nitrate, sulfate and ortho-phosphate. Primarily used for drinking water analysis, we have also quantified nitrite and nitrate in closed loop samples. We have soaked deposit samples in deionized water and found sulfate from deposits if the water treatment representative has requested it.

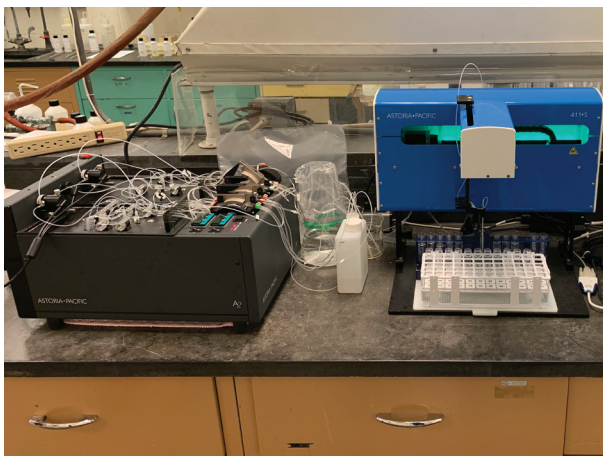


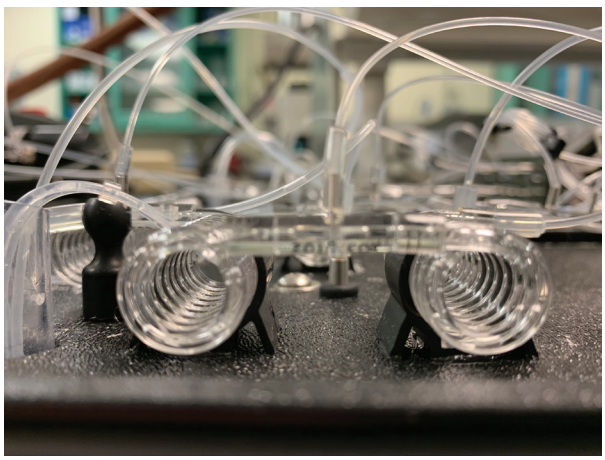



| No. | Peak Name | Retention Time min | Area µS*min | Height µS | Relative Area % | Relative Height % | Amount |
|---|---|---|---|---|---|---|---|
| 1 | Fluoride | 5.267 | 0.408 | 3.071 | 2.69 | 3.95 | 3.3622 |
| 2 | Chloride | 9.521 | 8.326 | 40.272 | 54.83 | 51.80 | 121.6586 |
| 3 | Nitrate | 15.341 | 0.847 | 4.200 | 5.58 | 5.40 | 5.3505 |
| 4 | Sulfate | 18.177 | 5.604 | 30.202 | 36.90 | 38.85 | 89.3636 |

## AMMONIA

Ammonia is analyzed via an automated wet chemistry method that adds reagents to the sample in a continuous flow injection procedure that results in a blue color which is measured at a specified wavelength. The more intense the blue, the more ammonia. Color intensity is calibrated using a standard curve that is run for every sample set. Ammonia is commonly measured in wastewater effluents to document discharge limits are met.





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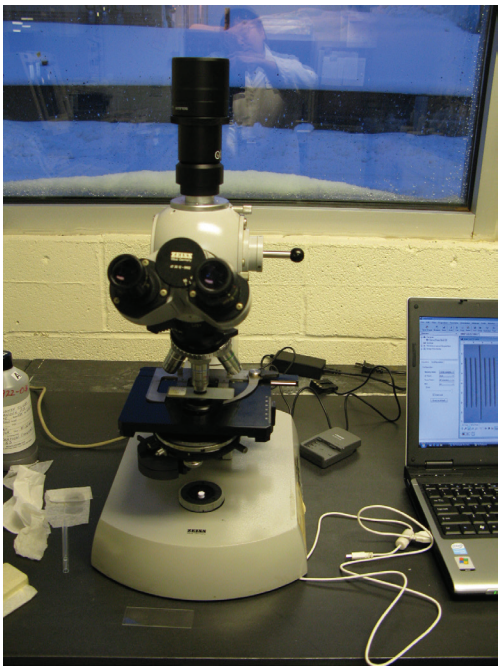
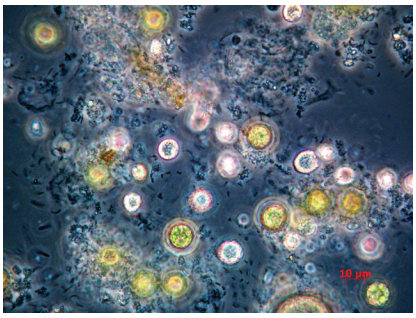
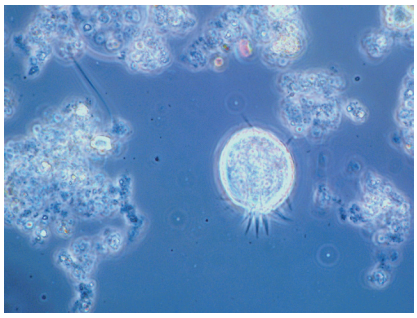
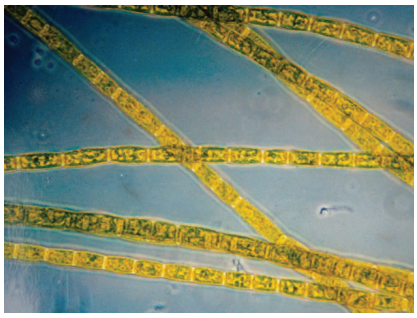
## MICROSCOPY



Biosolutions uses a phase contrast microscope, capable of 1250X magnification, to visually identify microbes and some contaminants. We observe your sample, identify the types of microbes present (bacteria, protozoans, algae, fungi), and provide a narrative analysis of the observations. Photographs of microbes in samples are available. It may be useful to compare them with photos and descriptions in "Wastewater Microbes: A Photographic Catalog" and "What Is This Stuff?" - two publications by Biosolutions' owner and chief microbiologist, Amanda Meitz.

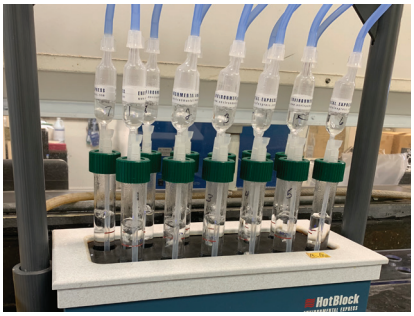






## WET CHEMISTRY

We also perform a variety of tests through traditional wet chemistry methods. Cyanide, Phosphorous, Total Kjeldahl Nitrogen, and other analysis are performed by our experienced chemists according to standard methods.

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## COUPON ANALYSIS

Biosolutions will clean and weigh your metal coupons and calculate corrosion rates. Document corrosion inhibitor performance for mild steel, copper, stainless steel and other alloys.

Before

Copper Mild Steel

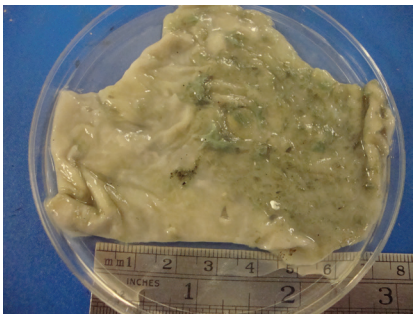
After

Copper Mild Steel

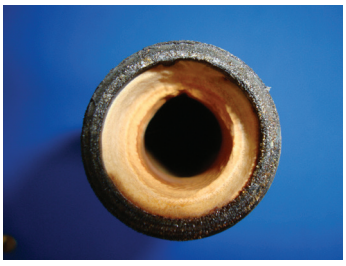
2.21 mpy Corrosion Rate 2.24 mpy

## DEPOSIT ANALYSIS

We provide deposit analysis for an array of substances. We analyze solid and liquid deposits in a variety of forms - whether scraping a filter or fixture or evaporating liquid from solids. Deposit analysis includes a range of qualitative and quantitative data, as indicated below.



Aluminium (Al), Total
Ash
Calcium (Ca), Total as Ca
Carbonate (Quantitative) as CaCO3
Carbonate (Quantitative) as CO3
Copper (Cu), Total as Cu
Iron (Fe), Total as Fe
Loss on Ignition (LOI)
Magnesium (Mg), Total as Mg
Magnetic (Qualitative)
Phosphorus, Total as P
Potassium (K), Total as K
Sample Color (As Received)
Sample Color (Digested Sample)
Sample Color (Dried)
Silica as Si
Sodium (Na), Total as Na
Zinc (Zn), Total as Zn



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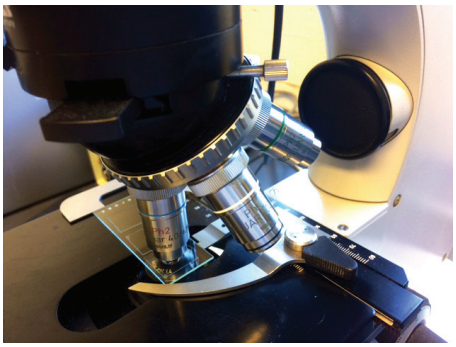
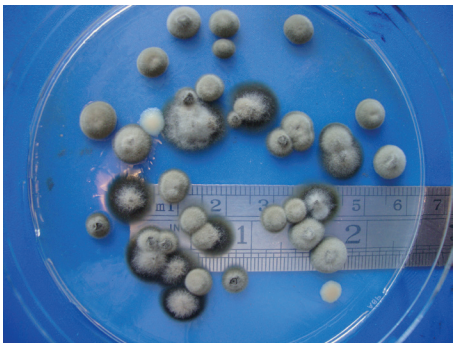
## CONSULTING

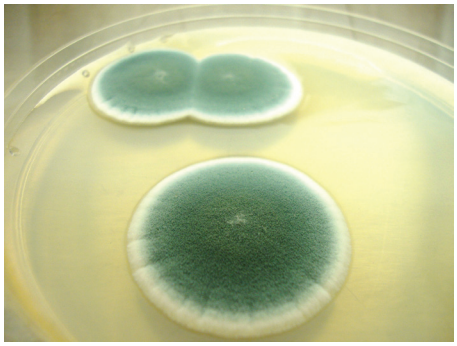
Biosolutions will work with you to develop custom analysis to meet your needs. Whether determining testing parameters for ongoing monitoring, or developing a custom test scenario suited to your unique application, we will work with you to ensure as efficient and effective analysis as possible.

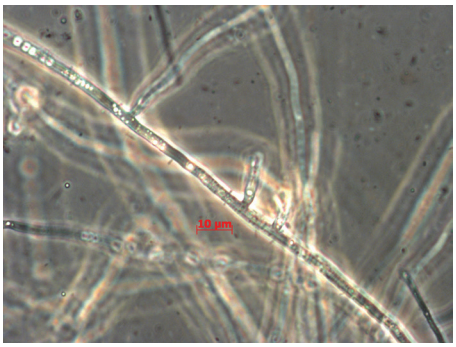


## CUSTOMER COLLABORATIONS

A company working with a microbial inhibitor for construction materials provided a cabinet prescribed by an ASTM method to test wood for fungal growth. Biosolutions staff purchased the required fungi and cultured them, housed the experiment, provided daily monitoring of environmental conditions in the box, and worked with client's staff to complete the experiments. Talk to us about collaborative experimental work that may require equipment or expertise you will need for only short time.







A pond nutrition company with international markets engaged Biosolutions to test their solid and liquid products. Working with the client we developed a testing regime to provide consistent analysis across product categories and customized reporting to meet their branding needs in their different markets.

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## CUSTOMER COLLABORATIONS

A client working with candidate inhibitor formulations for pickle liquor used for steel working processes hired Biosolutions to run dip tests in the chemical fume hood. Coupons were photographed and weights were measured before and after for formulations in a series of baths.

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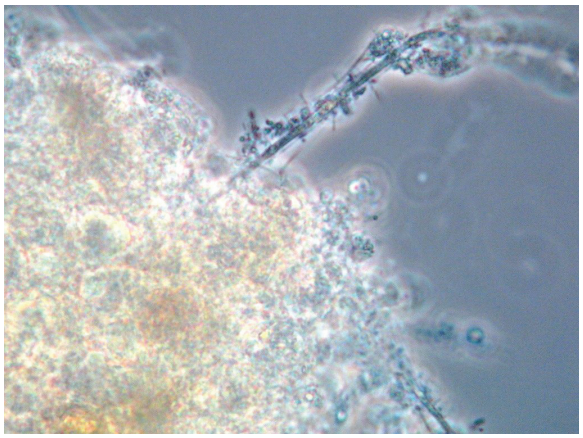
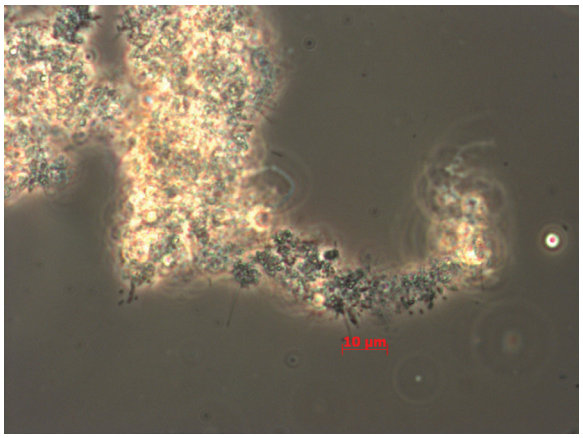
**Water treatment companies** working with pretreatment systems at food or chemical manufacturing plants have come to Biosolutions for answers. Is the foam due to filamentous bacteria or can some surfactant be found? What is the material clogging these filters?


Over the years various companies working on water or wastewater purification projects have come to Biosolutions for third party documentation of the success or shortcomings of their efforts in removal of metals, nutrients or microbes. Talk to us about experimental design and implementation of the work.

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