



1202 Musser Street  
Muscatine, IA 52761-1645  
(563) 263-2752  
Fax (563) 263-3720

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**WATER POLLUTION CONTROL**

MEMORANDUM

To: Gregg Mandsager, City Administrator

CC: Nancy Lueck, Finance Director  
Fran Donelson, Secretary

From: Jon Koch, WPCP Director

Date: November 2, 2015

Re: Struvite Removal Study for High Strength Waste Receiving Station Project

**INTRODUCTION:** A struvite removal study is needed to proceed with the budgeted High Strength Waste Receiving Station Project. This study is necessary before proceeding with adding more material to the digesters. Stanley Consultants, Inc. has submitted a Professional Services Agreement in the amount of \$9,660.00 for this study.

**BACKGROUND:** The Water Pollution Control Plant (WPCP) is not designed to accept high strength waste in Muscatine. All grease interceptor waste generated by the 100+ food service establishments in Muscatine must be hauled as far away as Cedar Rapids and Des Moines for proper disposal. These cities then receive fees and taxes to receive this waste instead of Muscatine. This material is valuable for the production of biogas, a gas that is nearly identical to natural gas and is currently used to fire boilers at the plant. In larger quantities, this gas can be used to generate electricity, heat buildings and fuel vehicles.

The WPCP has had difficulty over the past three years with a substance called struvite, or magnesium ammonium phosphate. Struvite is produced in the anaerobic digesters and forms on the inside of pipes, valves and pumps as a hard mineral deposit. Over time, this mineral deposit can completely obstruct pipes and requires quarterly acid recirculation to remove it. This is a costly procedure (\$2500/dose) plus prep and down time. A struvite removal system will eliminate the need for acid cleaning and will produce a product that can be sold as a fertilizer.

Struvite is a relatively new phenomenon in the wastewater industry and is showing up extensively in larger systems such as Iowa City, Des Moines, Davenport and Omaha to name a few. Many of these systems have spent millions of dollars replacing piping and valves to maintain operation. Researchers estimate a cost savings of \$500-\$2500/260,000 gallons of wastewater treated when utilizing struvite removal systems. In the next 2-7 years, phosphorus removal plant wide will be required by the DNR and will make struvite formation even worse. It

**"I remember Muscatine for its sunsets. I have never seen any  
on either side of the ocean that equaled them" — Mark Twain**

is the desire of the WPCP staff in Muscatine to be ahead of the curve before more money is spent replacing equipment.

Properly functioning anaerobic digesters are critical to the utilization of biogas for revenue generation and clean energy production. This study is vital if the City still desires to head in that direction.

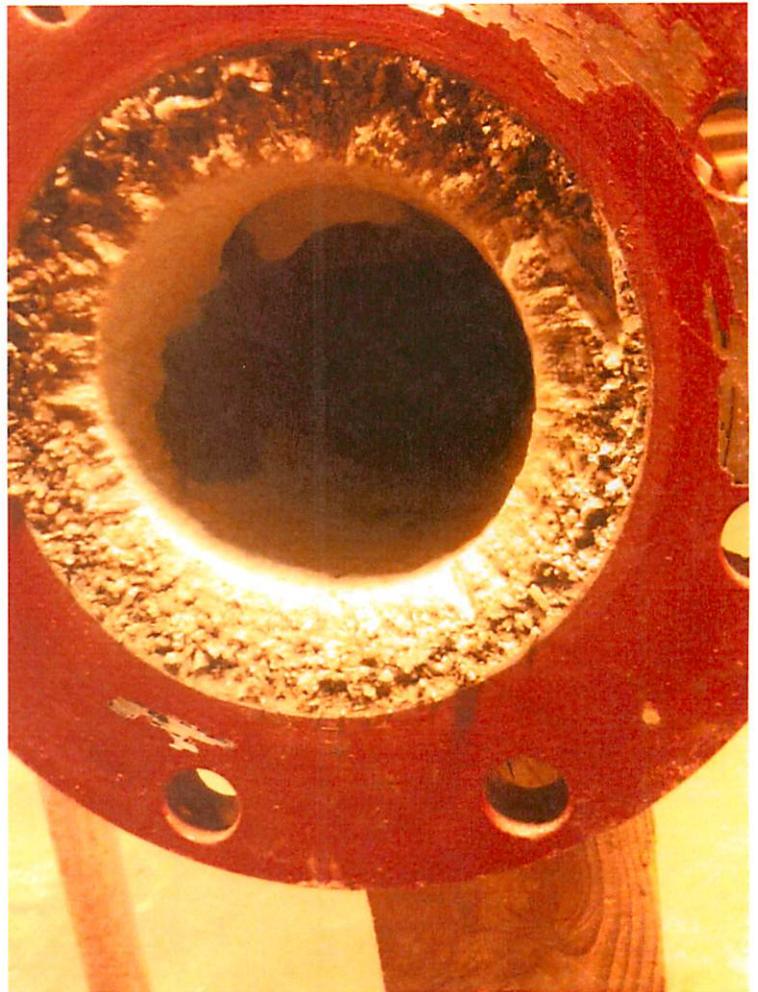
RECOMMENDATION/RATIONALE: Staff recommends proceeding with a Professional Services Agreement with Stanley Consultants for \$9,660.00 to conduct the Struvite Removal Study as part of the budgeted High Strength Waste Receiving Station Project.

BACKUP INFORMATION:

1. Exhibit 1 Scope of Services
2. Images of struvite formation in pipes



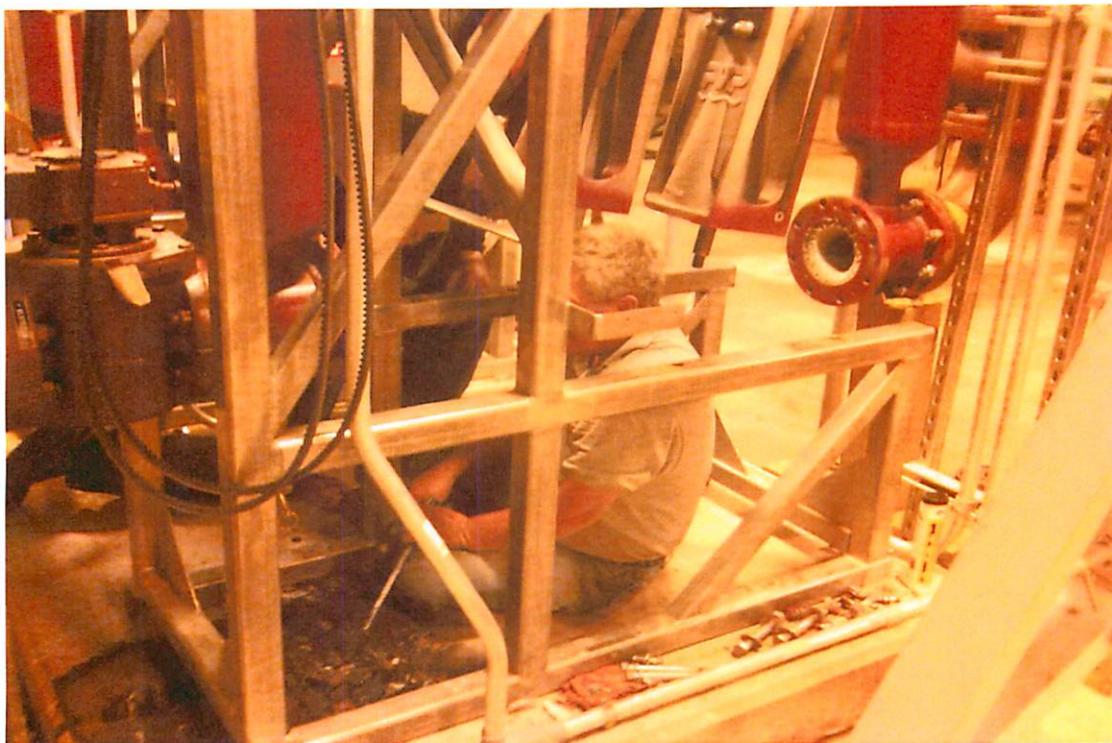
Stock Photo of sever struvite formation



Muscatine-light struvite formation. More sever in other locations, no photo available.



WPCP staff disassembling piping to remove struvite (black material) from digester outfall #2.



WPCP staff disassembling pumps to chip struvite from internal parts, 2013.



## PROFESSIONAL SERVICES AGREEMENT

### Exhibit 1 Scope of Services

#### Background

Muscatine Wastewater Treatment Plant (WWTP) has experienced struvite formation in sludge piping downstream of the anaerobic digestion system. The struvite is a chemical precipitate formed from phosphate, magnesium, and ammonia. The precipitate forms a hard deposit on piping and equipment that is difficult to remove. The deposit grows over time and can greatly constrict the pipe section increasing headloss and ultimately resulting in pipe obstruction. Chemical dissolution and physical means are two methods commonly employed to keep pipes and equipment from being obstructed. In response to this issue, the wastewater industry has developed technologies to precipitate the struvite in a controlled manner prior to deposition on piping and equipment downstream of the digesters. The City of Muscatine desires to study this technology to determine whether it is appropriate and cost-effective for the City.

#### Basic Services

1. Initial project meeting with client and one follow up site visit.
2. Coordinate plant testing of influent and effluent, and sludge streams for various parameters required for sizing and analyzing the struvite precipitation process. Client will sample, perform analytical testing, and report results to Consultant in excel spreadsheet format.
3. Summarize existing struvite precipitation technologies including advantages/disadvantages.
4. Coordinate with preferred technology vendor for system sizing, utility and space needs, and equipment budget costs.
5. Develop overall system concept with building to house the system and connections to the existing digester system.
6. Perform cost analysis including:
  - a. Estimated construction cost for the system.
  - b. Estimated annual operation and maintenance costs.
7. Summarize findings in short report. Provide 3 copies of report to Client.

#### Additional Services

1. Pilot Testing Coordination and Review
2. Design of identified improvements.



## PROFESSIONAL SERVICES AGREEMENT

### Exhibit 2 Compensation

1. Compensation for BASIC SERVICES:

Consultant shall be compensated for Basic Services included in *Exhibit 1 – Scope of Services* the Lump Sum amount of Nine Thousand Six Hundred and Sixty Dollars (\$9,660).

2. Compensation for ADDITIONAL SERVICES:

Compensation for ADDITIONAL SERVICES is NOT included in Basic Services or the Lump Sum. Additional Services shall be compensated on an HOURLY basis for LABOR PLUS REIMBURSABLE EXPENSES, in accordance with the attached *Hourly Fees and Charges Fiscal Year 2015-2016 (Form BC\_C15-16)* and future fee and charges forms that are revised on or after April 1 of each year unless other compensation is agreed upon prior to performance of the services.