2019 Project Abstract
For the Period Ending June 30, 2023

PROJECT TITLE:	**Protecting Minnesota Waters by Removing Contaminants from Wastewater**
PROJECT MANAGER:	Matt Simcik
AFFILIATION:	University of Minnesota
MAILING ADDRESS:	MMC 807 420 Delaware Street S.E.
CITY/STATE/ZIP:	Minneapolis, MN 55455
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FUNDING SOURCE:	Environment and Natural Resources Trust Fund
LEGAL CITATION:	M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 04g as extended by M.L. 2022, Chp. 94, Sec. 2, Subd. 19 (c.1) [to June 30, 2023

APPROPRIATION AMOUNT: $250,000
AMOUNT SPENT: $250,000
AMOUNT REMAINING: $0

Sound bite of Project Outcomes and Results

It is possible to drive microplastics and some PFAS into the biosolids of a wastewater treatment plant using stabilized powdered activated carbon. However, the amount required may make the technology cost prohibitive, and may affect the operation of the plant. Further improvements may bring costs down and enable unencumbered operation.

Overall Project Outcome and Results

Everything we flush down the drain ends up in our waste stream. Most of this ends up going through one of our wastewater treatment plants (WWTPs). These plants have protected our environment from raw sewage for over 100 years. Unfortunately, these plants are not equipped to handle contaminants at the part per million or part per billion level. Therefore, many contaminants make it through our WWTPs into our surface waters. They include per and polyfluoroalkyl substances (PFAS) like PFOS and PFOA, and microplastics.

Laboratory experiments were conducted on collected wastewater to test the ability of different chemicals familiar to the investigators to reduce the amount of two emerging contaminants, microplastics and per- and polyfluoroalkyl substances (PFAS). Both a commercially available polymer used in water treatment (polyDADMAC) and a stabilized powdered activated carbon (S-PAC) that was formulated in the laboratory were tested. The water was collected in the well-mixed section of two wastewater treatment plants, and the polymer and/or S-PAC added in the laboratory to simulate adding these chemicals to the plant.

Results indicate that microplastics, particularly larger microplastics in the 25 to 100 micrometer size fraction can be removed from the wastewater, reducing the concentration by greater than half. Results on PFAS were more variable in that the shorter chain acids and sulfonates were not removed from the mixture, but longer acids and sulfonates including perfluorooctane sulfonate (PFOS) were removed from 50 to 99%.

Simulating a section of a wastewater treatment plant of channelized flow and secondary settling, the addition of S-PAC showed an increase in sludge volume. This may affect the operation of a plant should S-PAC be added to it. In some ways, increasing the volume could prove problematic for plants recycling the material but could also represent a decrease in overall particle removal from the wastewater.

Project Results Use and Dissemination

We have made a very important connection with the operators at the Brainerd utility who allowed us to operate our simulated plant at their location. They are very forward thinking and have become an ally for trying to determine ways to remove these emerging contaminants from wastewater. We are reporting back our findings to them so they can better help us reach other operators.

We are also being interviewed by a Public Broadcasting System TV show, “Prairie Sportsman,” who heard about our project and wanted to feature it in an episode.

Other dissemination includes presentations at scientific conferences, meetings and through publication of the student’s thesis.

Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2019 ENRTF Work Plan Final Report (Main Document)

Today's Date: August 15, 2023

Final Report

Date of Work Plan Approval: June 5, 2019

Project Completion Date: June 30, 2023

PROJECT TITLE: Protecting Minnesota Waters by Removing Contaminants from Wastewater

Project Manager: Matt F. Simcik, Ph.D.

Organization: University of Minnesota

College/Department/Division: School of Public Health

Mailing Address: MMC 807, 420 Delaware Street SE

City/State/Zip Code: Minneapolis, MN 55455

Telephone Number: 612-626-6269

Email Address: msimcik@umn.edu

Web Address:

Location: Statewide

Total Project Budget: $250,000

Amount Spent: $250,000

Balance: $0

Legal Citation: M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 04g as extended by M.L. 2022, Chp. 94, Sec. 2, Subd. 19 (c.1) [to June 30, 2023]

Appropriation Language: $250,000 the first year is from the trust fund to the Board of Regents of the University of Minnesota to develop methods for treatment plants to remove harmful polyfluoroalkyl substances and microplastics from wastewater before the wastewater is released to the environment. This appropriation is subject to Minnesota Statutes, section 116P.10.

M.L. 2022 - Sec. 2. ENVIRONMENT AND NATURAL RESOURCES TRUST FUND; EXTENSIONS. [to June 30, 2023]

I. PROJECT STATEMENT: Everything we flush down the drain ends up in our waste stream. Most of this ends up going through one of our wastewater treatment plants (WWTPs). These plants have protected our environment from raw sewage for over 100 years. Without them we would have fish dying from lack of oxygen, as it takes oxygen to break down all that waste. Unfortunately, these plants are not equipped to handle contaminants at the part per million or part per billion level. Therefore, many contaminants make it through our WWTPs into our surface waters. They include per and polyfluoroalkyl substances (PFAS) like PFOS and PFOA, and microplastics. A study in 2002 found as many as 82 industrial, residential and agricultural chemicals downstream of WWTPs.

Recent research by the two Principal Investigators has developed a method for the sequestration of PFAS in groundwater. They have used a polymer commonly used as a drinking water coagulant to dramatically increase the sorption of PFAS to soil particles in a groundwater system. This same coagulant is expected to increase the sorption of PFAS and microplastics to activated sludge in a wastewater treatment plant.

This method is effective because of the negative charge on the PFAS molecules and the positive charge on the coagulant. Therefore, it is expected that the coagulant addition will also improve the removal of other negatively charged materials like microplastics.

PFAS enter our waste stream, mostly from consumer products, but some industrial sources may be present. PFAS were used as stain and water repellents in upholstery and clothing for many years. They were also used in food packaging like microwave popcorn bags. As surfaces containing these compounds are washed they enter our waste stream.

Recent interest has grown over microplastics. The small pieces of plastic are formed from abrasion and may be present in various products. They are also formed by the degradation of other larger plastics, such as water bottles and food packaging. Once in the waste stream they are not readily removed by WWTPs.

II. OVERALL PROJECT STATUS UPDATES:

First Update March 1, 2020 (LCCMR note: submitted 6/10/20; revisions requested 6/19/20 and reminders sent 7/9/20, 7/28/20; additional revisions requested 9/30/20; approved 11/4/20)
Due to COVID-19 we have no updates to results at this time. Our lab was shut down from March through the first update date. Once our return to work is approved, we plan to use samples that were collected from the Metropolitan Wastewater Treatment Plant to test our microplastic methods and analyze them for PFAS. We will request samples from the WWTP to continue work on Activity 1. However, they are not allowed to perform any research on site, which may jeopardize Activity 2.

Second Update September 1, 2020 (LCCMR note: no updated submitted)

Third Update March 1, 2021 (LCCMR note: submitted by a colleague on behalf of project manager 8/24/21 when project manager could not be reached)

COVID-19 restrictions were still in place at the Metropolitan WWTP as of spring 2021, which unfortunately puts plans for bench-scale duplication on hold indefinitely. In addition, tightening of regulations around PFAS in the state of Minnesota resulted in local, partnered WWTPs explicitly asking that samples not be used to conduct PFAS research. Significant advancements were made, however, in developing techniques to improve capturing and isolating microplastic particles from the wastewater medium. There were developments in the methodology for the detection, enumeration, and characterization of synthetic polymers.

Fourth Update September 1, 2021 (LCCMR note: submitted by a colleague on behalf of project manager 8/24/21 when project manager could not be reached)

In an effort to circumnavigate the sensitivity of studying PFAS in samples from Minnesota's WWTPs, wastewater recently collected from WWTPs in western Wisconsin will likely recommence this avenue of inquiry. While a few preliminary experiments using a single coagulant at varying concentrations bore fruit, a particular experiment involving a combination a polymer coagulant and powered activated carbon showed promise in removing a significant proportion of microplastics, most notably in the 25 – 100 µm size range. This is an important finding, as smaller microplastics are known to have a more profound ecological impact.

LCCMR note: per email with the project manager on 2/8/23, water collection in Wisconsin was not part of another project, but rather, "Since the MCES would not allow us to use any samples from the Metro plant for PFAS, and getting similar responses from other Minnesota plants, we needed to go out of state to obtain samples." The project manager confirmed no ENRTF funds were spent on this out-of-state travel.

Fifth Update March 1, 2022 (LCCMR note: submitted December 2022)
Testing of the wastewater from western Wisconsin was completed to characterize PFAS present. No PFAS were detected in the dissolved phase of the wastewater from these particular samples.

Update as of June 30, 2022:

Project extended to June 30, 2023 by LCCMR 6/30/22 as a result of M.L. 2022, Chp.94, Sec. 2, Subd. 19, legislative extension criteria being met.

Sixth Update as of September 1, 2022 (LCCMR note: submitted December 2022):
The wastewater samples from Wisconsin were very low in PFAS, so the samples had to be spiked with sufficiently high levels of PFAS to allow measurable amounts to be measured in the dissolved phase. Once that was accomplished, polyDADMAC was added and the resulting reduction in dissolved phase PFAS concentration was determined. The addition of the coagulant reduced the PFAS concentrations in the dissolved phase below our detection limits. Therefore, the addition of polyDADMAC has been show to be an effective method for reducing PFAS in wastewater streams and driving the compounds into the biosolids.

LCCMR questions 2/23/2023:

1. **How was the sampling you report on in your September 1, 2022 status update for Activity 2 different from the sampling and tests you did for Activity 1?**
2. **What benefit does increasing the number of samples serve to determining the efficacy of the coagulants to remove contaminants without impacting the primary function of the WWTP?**
3. **How does increasing the number of samples "bolster the batch samples?"**
4. **How is the information gathered through these additional samples going to translate to WWTP operations?**
5. **What additional work will you be doing between now and June 30, 2023 to determine the efficacy of the method to remove contaminants without impacting the primary function of the WWTP?**

Project manager response 3/3/23:

The primary goal of the WWTP is to remove biochemical oxygen demand (BOD) in its effluent. This is essentially the amount of organic matter in the water leaving the plant. Because our method is adding an organic compound, we have to make sure that we are not increasing the BOD of the plant's effluent. Another key component of plant operations is the dewatering of sludge. Because transporting sludge is expensive, the more water that can be removed, the less mass needs to be transported. Plants often add coagulant (similar to the one we are using) to dewater the sludge. However, this is usually done after a small portion of the sludge is pumped back to the beginning of the plant to seed the microorganisms that chew up the organic matter. While dewatering is a good thing, we have to make sure that doing it earlier in the process does not affect the pumping of sludge to the front of the plant. The measurement for this would be viscosity. Originally, we had hoped to accomplish this at the plant with a side stream, but we switched to using grab samples. We may still be able to resurrect the side-stream project this spring prior to the final report, but it is not certain.

So, to answer your questions:
1. The difference between the samples is what we intend to use them for. Sampling prior to and after adding our material impacts the sample itself, so we needed separate samples for contaminant removal and for BOD/dewatering/viscosity
2. Increasing the number of samples allows greater statistical power to determine both the removal and impacts (since we need separate samples as for Q1)
3. "bolster" might be a poor choice of words. What we are doing is allowing for the separate analyses.
4. By analyzing these samples for BOD/dewatering/viscosity, we will be able to inform operations.
5. We think we can still get a side-stream project going to the Eau Claire plant (just a lot easier to work at). This could be completed prior to the final report and at no additional costs to the LCCMR.

Seventh Update as of March 1, 2023: (LCCMR note: include with Final Report)

Final Report as of June 30, 2023:

<u>Overall Project Outcome and Results</u>

Everything we flush down the drain ends up in our waste stream. Most of this ends up going through one of our wastewater treatment plants (WWTPs). These plants have protected our environment from raw sewage for over 100 years. Unfortunately, these plants are not equipped to handle contaminants at the part per million or part per billion level. Therefore, many contaminants make it through our WWTPs into our surface waters. They include per and polyfluoroalkyl substances (PFAS) like PFOS and PFOA, and microplastics.

Laboratory experiments were conducted on collected wastewater to test the ability of different chemicals familiar to the Investigators to reduce the amount of two emerging contaminants, microplastics and per- and polyfluoroalkyl substances (PFAS). Both a commercially available polymer used in water treatment (polyDADMAC) and a stabilized powdered activated carbon (S-PAC) that was formulated in the laboratory were tested. The water was collected in the well-mixed section of two wastewater treatment plants, and the polymer and/or S-PAC added in the laboratory to simulate adding these chemicals to the plant.

Results indicate that microplastics, particularly larger microplastics in the 25 to 100 micrometer size fraction can be removed from the wastewater, reducing the concentration by greater than half. Results on PFAS were more variable in that the shorter chain acids and sulfonates were not removed from the mixture, but longer acids and sulfonates including perfluorooctane sulfonate (PFOS) was removed from 50 to 99%.

Simulating a section of a wastewater treatment plant of channelized flow and secondary settling, the addition of S-PAC showed an increase in sludge volume. This may affect the operation of a plant should S-PAC be added to it. In some ways, increasing the volume could prove problematic for plants recycling the material, but could also represent a decrease in overall particle removal from the wastewater.

III. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1 Title: *Determine the optimum coagulant(s) and dosage to remove PFAS and microplastics in approximately 30 WWTP samples taken over an 18 month period*

Description:
We propose a series of experiments to determine the optimal coagulant dose to remove the most contaminants from the waste stream. The concentration necessary to adequately remove the contaminants will also be determined. This will be an experiment where WWTP samples will be treated in the laboratory, and the concentrations determined in both Dr Simcik's and Dr. Arnold's laboratories. Samples will be collected using a pump and 4L glass bottles from the Metropolitan WWTP, and sterilized with sodium azide to insure safety from pathogens for personnel. Contaminant concentrations will be determined from bottles where the sludge has been allowed to settle. Varying concentrations and type of coagulant will be added to each of the same bottles. They will then be shaken and allowed to settle again. The contaminant concentration will be determined on the treated bottles, and compared to the untreated values.

ACTIVITY 1 ENRTF BUDGET: $124,630

Outcome	Completion Date
1. Determine optimum coagulant(s) and dosage to remove contaminants of interest	January 1, 2021

First Update June 1, 2020
For Activity 1 we have been working on developing our methods to quantify and enumerate microplastics from wastewater. We have also characterized a wastewater sample that was collected prior to initiation of this project for PFAS. It shows as shift in dominant PFAS from PFOS and PFOA to shorter chain compounds, reflecting the shift in manufacture. We have now received samples and are characterizing them for both microplastics and PFAS. We also plan to include samples taken each month to look at the temporal variability in both microplastics and PFAS.

LCCMR note: per project manager email 2/8/2023: Microplastics samples are from the metro plant, PFAS samples are from Wisconsin

Second Update September 1, 2020 (LCCMR: no update submitted)

Third Update March 1, 2021

As previously stated, advancements in this six-month period were centered around improving methods used to isolate, detect, enumerate, and characterize microplastic particles in local wastewater samples. A wet peroxide oxidation treatment was most effective in digesting labile organic material. Given the heterogeneity of the contaminant, it was necessary to sieve wastewater and separate particles according to size. A new particle detection software involving deep learning, tested against a conventional program, proved more accurate in both enumeration and characterization (size and morphology) of microplastic particles. Finally, various issues around quality control were examined, such as the material of the filtering apparatus, the type of filtered water used in rinsing, and the type of fume hood used. A methods paper outlining these best practices is forthcoming.

Fourth Update September 1, 2021

As outlined in the description for Activity 1, wastewater arrived in discrete 4L-grab samples and conditions such as the full suspension of contaminants were best recreated through the shaking and settling of these bottles. The commercial coagulant PolyDADMAC injected into sample bottles at varying concentrations resulted in some reduction in the density of microplastics higher in the water column. However, a combination of PolyDADMAC and powered activated carbon yielded the most promising results, reducing microplastics >25 µm by nearly two-thirds. This experiment must be replicated before we can be fully confident about our findings, and future experiments will also include assessment of PFAS removal.

Fifth Update March 1, 2022 (LCCMR note: no update submitted)

Update as of June 30, 2022:

Project extended to June 30, 2023 by LCCMR 6/30/22 as a result of M.L. 2022, Chp.94, Sec. 2, Subd. 19, legislative extension criteria being met.

Sixth Update as of September 1, 2022 (LCCMR note: submitted December 2022):

Samples for testing the stabilized particulate activated carbon (S-PAC) dosage to optimize the removal of microplastics and PFAS was determined on samples from a WWTP in western Wisconsin. The optimal dosage (that which balances removal and cost of materials) was determined to be 60 mg/L polyDADMAC with 12 mg/L PAC. Given a typical flow through a plant of 10MGD (million gallons per day), this would translate into one 55 gallon drum of polyDADMAC mixed in with the powdered activated carbon.

LCCMR note: per the project manager via 2/8/23 email regarding the paper mentioned in the March 2021 update: "The abstract has been accepted for a special issue of Environmental Engineering Science Journal which will be submitted by the end of February, 2023

Seventh Update as of March 1, 2023 (LCCMR note: include with Final Report):

Final Report as of June 30, 2023:

Given a dosage of 200 mg/L polyDADMAC and 40 mg/L PAC, microplastic particles were reduced by as much as half (Figure 1.). The greatest reduction was in the 25 µm size particles, followed by 100 µm size particles, and very little removal of the smallest particles (5 µm). This water was collected from the well-mixed section of the activated sludge bioreactor. This represents the highest particle concentration and biomass, so there is most likely competition for the polyDADMAC and PAC from other contaminants/materials in the waste stream.

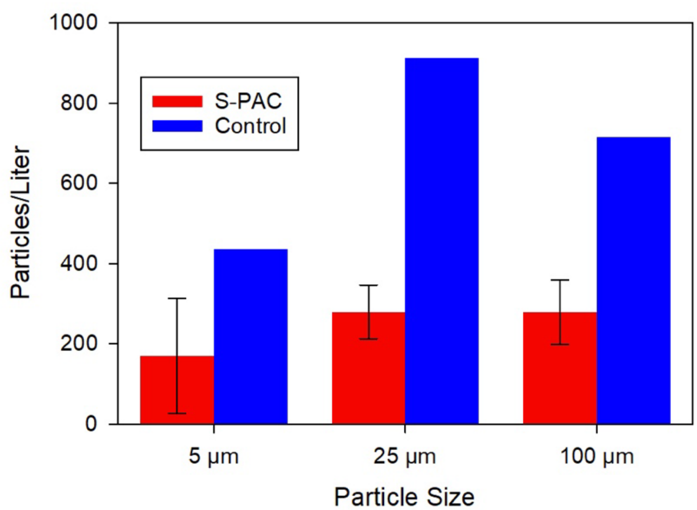

Figure 1. Removal of microplastics from wastewater.

Given a dosage of polyDADMAC only, there was minimal removal of PFAS except for perfluorooctane sulfonate (PFOS), which was reduced in the dissolved phase by 50% (Table 1). Increasing the polyDADMAC to 1 mg/L increased the removal of PFAS for all but the short-chain sulfonates, short-chain acids and PFOA. Dosing with 5 mg/L polyDADMAC and 1 mg/L PAC (much lower than the determined dosage mentioned above in the September, 2022 update) increased the removal of all PFAS except the short-chained compounds. For branched isomers of PFOS, the removal was 99%.

Treatment	0.2 mg/L polyDADMAC	1 mg/L polyDADMAC	S-PAC: 5mg/L polyDADMAC; 1 mg/L PAC
C_4-C_7 Acids	No Change	No Change	No Change
PFOA	No Change	No Change	42%
PFNA	22%	60%	54%
PFDA	51%	86%	80%
PFUnA	9%	71%	38%
PFTeA	25%	32%	90%
C_4-C_5 Sulfonates FTS, FOSA	No Change	No Change	No Change
linear-PFHxS	20%	48%	16%
branched-PFHxS	1%	43%	79%
PFHpS	40%	92%	79%
linear-PFOS	50%	90%	83%
branched-PFOS	66%	91%	99%

ACTIVITY 2 Title: ***Dose coagulant(s) in a simulated WWTP and monitor effluent over a period of 18 months.***
Description:
We propose to use the loading/concentration determined in Activity 1 to add coagulant(s) to a simulated WWTP. The simulated WWTP is actually a bench-scale duplication of the Metropolitan WWTP. It is housed at the Metro plant in their laboratory, and will be made available to this project for the expressed purpose of determining the correct dosage of coagulant to reduce contaminants without affecting the intended capabilities of the plant. Approximately 36 samples will be taken over an 18 month period (one from each side each month). Contaminants will be determined in the same manner as Activity 1.

ACTIVITY 2 ENRTF BUDGET: $125,370

Outcome	Completion Date
1. *Determine the efficacy of the method to remove contaminants without impacting the primary function of the WWTP*	June 31, 2022

First Update June 10, 2020
Currently, the Metropolitan Wastewater Treatment Plant is limited to essential services due to COVID-19. Therefore, they are prevented from conducting any research at this time. Depending on how long this goes on, we may have to amend Activity 2, or ask for a no-cost extension.

Second Update September 1, 2020 (LCCMR note: no update submitted)

Third Update March 1, 2021

To date, the Metropolitan Wastewater Treatment Plant is not permitting members from our lab on site, due to COVID-19 restrictions.

Fourth Update September 1, 2021

To date, the Metropolitan Wastewater Treatment Plant is not permitting members from our lab on site, due to COVID-19 restrictions and the mentioned restrictions on PFAS related sampling. We are assessing the possibility of a smaller scale test conducted in our own laboratory.

Fifth Update March 1, 2022
Due to the changing attitudes at the Metropolitan Wastewater Treatment Plant, we are unable to do any work with PFAS at their plant. They are not allowing any work to be done regarding the addition of chemicals to their treatment train.

Update as of June 30, 2022:

Project extended to June 30, 2023 by LCCMR 6/30/22 as a result of M.L. 2022, Chp.94, Sec. 2, Subd. 19, legislative extension criteria being met.

Sixth Update as of September 1, 2022:
The philosophy at the Metropolitan Wastewater Treatment Plant, has not changed. They are still not allowing any work to be done regarding the addition of chemicals to their treatment train. As a result of this policy and given the absence of PFAS in WWTPs we identified that would cooperate, we were forced to just increase the number of samples we treated over the time period and bolster the batch samples. The method employed batch experiments in 4-liter amber bottles at temperatures matching environmental conditions at the plant. Simply, the sample is spiked with a suite of PFAS biosolids are allowed to settle, water is sampled and analyzed for PFAS. Then, polyDADMAC and/or suspended particulate activated carbon (S-PAC) is added to the bottle, shaken and allowed to settle for 20 minutes. The supernatant is then re-sampled and PFAS determined.

Seventh Update as of March 1, 2023 (LCCMR note: include with Final Report):

Final Report as of June 30, 2023:
We constructed a simulated WWTP channel that had a mixing zone, a quiescent zone, and a settling basin and employed it at the Brainerd WWTP (Figure 2). The influent to the simulator was collected from one of the batch tanks at the plant during activated sludge aeration from a valve at the bottom of the tank and was introduced to the simulator via a large peristaltic pump at a flow rate of 1 liter per minute. Wastewater flowed through two parallel channels and back into a sink below the tank.

Figure 2. Simulated WWTP Channel set up at Brainerd

Stabilized powdered activated carbon (S-PAC) was added to one side of the simulator via a small peristaltic pump at a flow rate of 4 milliliters per minute. The addition of the S-PAC created flocculation within the channel (Figure 3), and what visually appeared to be larger floc that remained suspended.

Figure 3. Ordinary settling in simulator on the left and enhanced flocculation on the right

This flocculation carried through to the settling basins in the simulator, where the treated basin had clearer water with larger floc (Figure 4). Given sufficient settling, it is believed that this would result in lower suspended particulate matter in the treated wastewater.

Figure 4. Treated settling basin (top) and untreated settling basin (bottom)

However, with a standardized sludge volume test, the treated wastewater had approximately a 30% greater sludge volume than the untreated (Figure 5). The sludge volume test collected one liter of wastewater (in this case in the valve bypassing the settling basins) and allowed it to settle for 30 minutes. After 30 minutes the level of the settled solids was recorded. The volume of the treated solids was 310 mL compared to 240 mL for the untreated solids. While the volume was larger, it did appear denser in the floc, and the floc more spread out. It is not immediately clear how this might affect the pumpability, dewatering, or volume of biosolids. If, in fact, the volume is larger it could reflect more solids driven into the biosolids, which was the goal of treatment.

Figure 5. Sludge volume test

IV. DISSEMINATION:

Description: Results from this project will be disseminated to the wastewater treatment community and the greater scientific community through a variety of mechanisms. The wastewater treatment community will be informed of the results through presentation at conferences targeting managers of WWTPs like the Air and Waste Management Association Conference. The greater scientific community will be informed through conference presentations, but also in the peer reviewed literature.

The Minnesota Environment and Natural Resources Trust Fund (ENRTF) will be acknowledged through use of the trust fund logo or attribution language on project print and electronic media, publications, signage, and other communications per the ENRTF Acknowledgement Guidelines.

First Update June 10, 2020
As we have not completed any analysis from our samples, we have nothing to disseminate. As soon as results are available, we will report these back to the WWTP, and present them at scientific conferences, eventually writing a manuscript for the peer reviewed literature. During the laboratory shut-down, the student has begun conducting an extensive literature review that we hope to publish in the peer reviewed literature.

Second Update September 1, 2020 (LCCMR note: no update submitted)

Third Update March 1, 2021

Nothing to report

Fourth Update September 1, 2021

Results from our work in method improvements for microplastic detection, enumeration, and characterization will be presented at the 42nd Annual North American SETAC Conference in November 2021.

Fifth Update March 1, 2022 (LCCMR note: submitted December 2022)
A report is being written to summarize the results of our work with the goal of informing the wastewater treatment community.

Update as of June 30, 2022:

Project extended to June 30, 2023 by LCCMR 6/30/22 as a result of M.L. 2022, Chp.94, Sec. 2, Subd. 19, legislative extension criteria being met.

Sixth Update as of September 1, 2022 (LCCMR note: submitted December 2022):
We are continuing to work on the written report.

Seventh Update as of March 1, 2023 (LCCMR note: include with Final Report):

Final Report as of June 30, 2023:

We have made a very important connection with the operators at the Brainerd utility who allowed us to operate our simulated plant at their location. They are very forward thinking and have become an ally for trying to determine ways to remove these emerging contaminants from wastewater. We are reporting back our findings to them so they can better help us reach other operators.

We are also being interviewed by a Public Broadcasting System TV show titled, "Prairie Sportsman" who heard about our project and wanted to feature it in an episode.

Other dissemination includes presentations at scientific conferences, meetings and through publication of the student's thesis.

V. ADDITIONAL BUDGET INFORMATION:

A. Personnel and Capital Expenditures

Explanation of Capital Expenditures Greater Than $5,000: N/A

Explanation of Use of Classified Staff: N/A

Total Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation:

Enter Total Estimated Personnel Hours for entire duration of project: 4472	Divide total personnel hours by 2,080 hours in 1 yr = TOTAL FTE: 2.15

Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation:

Enter Total Estimated Contract Personnel Hours for entire duration of project: 0	Divide total contract hours by 2,080 hours in 1 yr = TOTAL FTE: 0

VI. PROJECT PARTNERS:

A. Partners outside of project manager's organization receiving ENRTF funding
N/A

B. Partners outside of project manager's organization NOT receiving ENRTF funding
Metropolitan Council Environmental Services
Brainerd WWTP

VII. LONG-TERM- IMPLEMENTATION AND FUNDING:

The results of this project will be used to inform other WWTPs in Minnesota as to how best to improve the removal of these contaminants from their waste streams.

VIII. REPORTING REQUIREMENTS:

- Project status update reports will be submitted March 1 and September 1 each year of the project
- A final report and associated products will be submitted between June 30 and August 15, 2023

IX. SEE ADDITIONAL WORK PLAN COMPONENTS:

A. Budget Spreadsheet Submitted
B. Visual Component or Map N/A
C. Parcel List Spreadsheet N/A
D. Acquisition, Easements, and Restoration Requirements N/A
E. Research Addendum TBD

Attachment A:
Environment and Natural Resources Trust Fund
M.L. 2019 Budget Spreadsheet - Final
Legal Citation: M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 04g
Project Manager: Matt Simcik
Project Title: Protecting Minnesota Waters by Removing Contaminants from Wastewater
Organization: University of Minnesota
Project Budget: $250,000
Project Length and Completion Date: 4 years; complete 06/30/2023
Today's Date: 08/15/2023

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Budget	Amount Spent	Balance
BUDGET ITEM			
Personnel (Wages and Benefits)	$ 220,000	$ 220,000	$ -
PI: Matt F. Simcik (13% effort years 1 and 2, 12% year 3) Fringe is 34.2% of salary			
Co-PI: William A. Arnold (1% effort all three years) Fringe is 34.2% of salary			
Lab Manager: Michael McCarty (8% effort all three years) Fringe is 28.4% of salary			
Grad RA: Mary Kosuth (50% effort all three years, fringe is 17.7% of salary plus tuition at $15,522/year)			
Professional/Technical/Service Contracts			
	$ -	$ -	$ -
Equipment/Tools/Supplies			
Consumables for extraction and analysis of microplastics and PFAS, coagulant	$ 30,000	$ 30,000	$ -
Capital Expenditures Over $5,000			
	$ -	$ -	$ -
Fee Title Acquisition			
	$ -	$ -	$ -
Easement Acquisition			
	$ -	$ -	$ -
Professional Services for Acquisition			
	$ -	$ -	$ -
Printing			
	$ -	$ -	$ -
Travel expenses in Minnesota			
	$ -	$ -	$ -
Other			
	$ -	$ -	$ -
COLUMN TOTAL	$ 250,000	$ 250,000	$ -

OTHER FUNDS CONTRIBUTED TO THE PROJECT	Status (secured or pending)	Budget	Spent	Balance
Non-State:		$ -	$ -	$ -
State:		$ -	$ -	$ -
In kind: Indirect costs contributed in-kind by the University of Minnesota		$ 109,855	$ 109,855	$ -

PAST AND CURRENT ENRTF APPROPRIATIONS	Amount legally obligated but not yet spent	Budget	Spent	Balance
Current appropriation:		$ -	$ -	$ -
Past appropriations:		$ -	$ -	$ -