

# Industrial Water Conservation Grant Summary Report



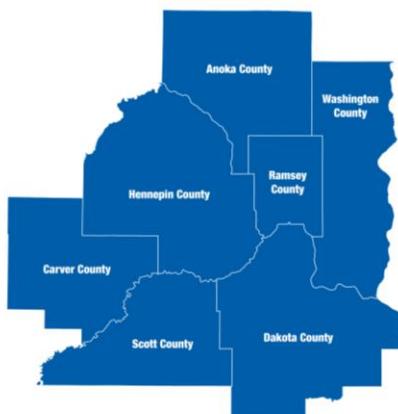
February 2023



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A summary report outlining industry reasons for success of, or barriers to, water conservation recommendations and findings developed by the Minnesota Technical Assistance Program for assistance clients and intern host companies in the eleven-county metropolitan area from 2012-2017.

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## Executive summary

The Minnesota Technical Assistance Program (MnTAP) at the University of Minnesota continues a successful, collaborative relationship with Metropolitan Council Environmental Services (MCES), working together to address the metro-area need for industrial sector water use efficiency awareness and water use reductions. Since the launch of the industry-focused technical assistance partnership in 2012, MnTAP has worked with numerous operations in the metro providing a range of practical suggestions to improve industrial water efficiency. Since 2013 MnTAP, with MCES support, has made 288 water efficiency recommendations representing potential annual water savings of over 487,600,000 gallons per year. Approximately 88% or 253 of the water efficiency recommendations resulted from 44 MnTAP intern projects. The remaining 12% or 35 water efficiency recommendations resulted from 10 MnTAP staff site assessments conducted during the 2012-2013 project period. Implemented recommendations as of this report total about 162,803,000 gallons per year or approximately 37% of the recommended opportunity which includes recent years that have not had time to reach full implementation.

	Number of recommendations	Water saving potential (gal/year)	Recommendations implemented (gal/year)	Realized cost savings (\$/year)
<b>2013-2022 MnTAP intern projects</b>	253	417,600,000	153,803,000	1,660,000
<b>MCES sponsored projects/grants and site assessments</b>	35	70,000,000	9,000,000	Not Available
<b>TOTAL</b>	<b>288</b>	<b>487,600,000</b>	<b>162,803,000</b>	<b>1,660,000</b>

MCES seeks to maximize the water efficiency achieved to maintain sustainable water supplies across the metro area for continued regional public health, quality of life and economic development. To inform future outreach efforts and identify leverage points that encourage implementation of industrial water efficiency activities, MnTAP proposed and MCES agreed to utilize a portion of the 2020 and 2021 intern effort to analyze past industrial water recommendations. This analysis classified the types of industrial water efficiency opportunities identified and the rates of implemented recommendations and developed a search tool to direct facility operations staff to water conservation recommendations and intern project summaries that may be applicable to their operations.

## **Introduction**

The Minnesota Technical Assistance Program (MnTAP) is an outreach and assistance program at the University of Minnesota Twin Cities campus that helps Minnesota businesses develop and implement industry-tailored solutions that prevent pollution at the source, maximize efficient use of resources, and reduce energy use and costs to improve public health and the environment. MnTAP has been providing technical assistance services at industrial facilities across the state for nearly 40 years. MnTAP's technical assistance staff members hold degrees in engineering and science and provide staff site visits, support student intern projects, and generate resources as direct technical assistance for Minnesota businesses.

The Metropolitan Council is the regional policy-making body, planning agency, and provider of essential regional services for the Twin Cities metropolitan region. The Council's mission is to foster efficient and economic growth for a prosperous region. Metropolitan Council Environmental Services (MCES) is nationally renowned for its superior work treating wastewater, monitoring air and water quality, and planning for a long-range water supply to meet future demand. Effective and resilient water supplies for the region's municipalities are the focus of the Water Supply Planning Group of MCES.

In an effort to carry out the mission of providing resilient water supplies for the Metro region, MCES has funded MnTAP technical assistance and [\*\*MnTAP Intern Program\*\*](#) efforts to assist businesses with identification and implementation of water efficiency projects. MCES seeks to maximize the water efficiency achieved in order to maintain sustainable water supplies across the metro area. To inform future outreach efforts and identify leverage points that encourage implementation of industrial water efficiency activities, a portion of the intern effort in 2020 and 2021 was directed to analyze past industrial water recommendations. This analysis classified the types of industrial water efficiency opportunities identified and the rates of implemented recommendations and created a search tool to direct facility operations staff to water conservation recommendations and intern project summaries that may be applicable to their operations. This work has been funded by MCES through a grant from the Clean Water, Land, and Legacy Amendment.

MnTAP is well-qualified to lead these kinds of projects due to a strong history of applying pollution prevention and conservation solutions for businesses across Minnesota, including industrial water conservation. MnTAP staff members have many years of experience applying source reduction practices in industrial settings and hold a deep understand of business operations needed to offer customized solutions. Additionally, MnTAP is well known as a leading pollution prevention provider in the State of Minnesota. This reputation, as well as MnTAP's broad network of vendors, county and city government personnel, professional associations, and other contacts, is routinely leveraged to provide effective technical assistance.

## **Approach**

This report compiles assistance information from MCES-sponsored client interactions aimed at improving water efficiency at industrial facilities located primarily within the seven-county metropolitan area (Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington). Work prior to 2015 also included four additional counties (Chisago, Isanti, Sherburne and Wright). Recommendation and implementation data were analyzed to document what conditions tend to promote or constrain industrial investment in water efficiency. Improvement recommendations are categorized in the MnTAP data as implemented, planned, proposed, or not planned when the information is gathered during routine follow-up activities.

# Background

An active partnership between the MCES Water Supply Planning and MnTAP was launched in 2012 to study aspects of industrial groundwater use in the eleven-county Twin Cities metropolitan region. The history of MCES and MnTAP collaborations includes the following:

**Figure 1. Partnership timeline**

The timeline is represented by a large blue arrow pointing from left to right, spanning the width of the five columns. Each column represents a two-year period: 2012 - 2013, 2014 - 2015, 2016 - 2017, 2018-2019, and 2020 - 2022.

2012 - 2013	2014 – 2015	2016 - 2017	2018-2019	2020 - 2022
Private well water efficiency Industrial water use survey 7 visits 3 interns	Define industrial water use in the North and East Metro Ground Water Management Area 5 interns	Identify motivations for water efficiency at facilities that participated in MnTAP water programs 10 interns	Support industrial water efficiency in Metro area 10 interns	Support industrial water efficiency and analyze past data trends 15 interns

This long-standing relationship has shown substantial documented success in identifying opportunities for industrial water efficiency. Specifically, 253 water efficiency recommendations were made through the MnTAP Intern Program through 2022 representing potential annual water savings of over 417,600,000 gallons. Implemented water efficiency recommendations from these projects total approximately 153,803,000 gallons in first year savings or approximately 37% of the recommended opportunities as of this report. This work continues to provide opportunities to revisit organizations that have received technical assistance for water efficiency. Follow up activities provide opportunities to inquire about facility success in implementing recommendations and identify any challenges encountered through the implementation process. This information is used to offer additional assistance and craft future approaches to water efficiency technical assistance to avoid barriers to implementation.

## MCES-Sponsored Projects

MCES-sponsored projects have successfully combined MnTAP staff site assessment activities with intern projects aimed at fulfilling specific water efficiency goals. Table 1 identifies project work accomplished through surveying, water conservation site assessments, and in-depth water opportunity identification and implementation utilizing the MnTAP summer intern program. Published reports and case studies from these MCES-sponsored activities are available on-line.

**Table 1. Projects and outcomes**

Year	Project	Outcomes
2012	"Assessing the Opportunity and Barriers for Water Conservation by Private Industrial Water Users" <sup>1</sup>	<ul style="list-style-type: none"> <li>- Industrial well user survey</li> <li>- Seven technical site assessments</li> <li>- Three intern projects</li> </ul>
2013	MnTAP <u>SOLUTIONS</u> <sup>2</sup>	<ul style="list-style-type: none"> <li>- Three intern project summaries</li> </ul>
2014	MnTAP <u>SOLUTIONS</u> <sup>3</sup>	<ul style="list-style-type: none"> <li>- One intern project summary</li> </ul>
2014 - 2015	"Industrial Water Conservation in the North and East Metro Groundwater Management Area" <sup>4</sup>	<ul style="list-style-type: none"> <li>- Water use analysis</li> <li>- Ten technical topic outreach e-newsletters</li> <li>- Three technical site assessments</li> <li>- Three intern projects</li> </ul>
2015	MnTAP <u>SOLUTIONS</u> <sup>5</sup>	<ul style="list-style-type: none"> <li>- Four intern project summaries</li> </ul>
2016 - 2017	"Metro Water Conservation Utilizing MnTAP Interns"	<ul style="list-style-type: none"> <li>- Ten intern projects</li> <li>- Report on 2016-2017 grant objectives</li> </ul>
2016	MnTAP <u>SOLUTIONS</u> <sup>6</sup>	<ul style="list-style-type: none"> <li>- Seven intern project summaries</li> </ul>
2017	MnTAP <u>SOLUTIONS</u> <sup>7</sup>	<ul style="list-style-type: none"> <li>- Five intern project summaries</li> </ul>
2018	"Industrial Water Conservation Motivations Report" <sup>8</sup>	<ul style="list-style-type: none"> <li>- Report on motivations and barriers to industrial water efficiency</li> </ul>
2018	MnTAP <u>SOLUTIONS</u> <sup>9</sup>	<ul style="list-style-type: none"> <li>- Five intern project summaries</li> </ul>
2019	MnTAP <u>SOLUTIONS</u> <sup>10</sup>	<ul style="list-style-type: none"> <li>- Six intern project summaries</li> </ul>
2020	"MnTAP Water Efficiency BMP" <sup>11</sup>	<ul style="list-style-type: none"> <li>- Analysis of industrial water efficiency recommendations to identify best practices</li> </ul>
2020	MnTAP <u>SOLUTIONS</u> <sup>12</sup>	<ul style="list-style-type: none"> <li>- Four intern project summaries</li> </ul>
2021	"Industrial Water Efficiency Optimization Search Tool" <sup>13</sup>	<ul style="list-style-type: none"> <li>- Develop searchable database of MnTAP industrial water efficiency recommendations</li> </ul>
2021	MnTAP <u>SOLUTIONS</u> <sup>14</sup>	<ul style="list-style-type: none"> <li>- Three intern project summaries</li> </ul>
2022	MnTAP <u>SOLUTIONS</u> <sup>15</sup>	<ul style="list-style-type: none"> <li>- Seven intern project summaries</li> </ul>

<sup>1</sup><https://metrocouncil.org/Wastewater-Water/Publications-And-Resources/WATER-SUPPLY-PLANNING/Water-Conservation-by-Private-Well-Industries.aspx>

<sup>2</sup><http://www.mntap.umn.edu/wp-content/uploads/simple-file-list/Publications/Solutions/2013-Solutions.pdf>

<sup>3</sup><http://www.mntap.umn.edu/wp-content/uploads/simple-file-list/Publications/Solutions/2014-Solutions.pdf>

<sup>4</sup><https://metrocouncil.org/Wastewater-Water/Publications-And-Resources/WATER-SUPPLY-PLANNING/Industrial-Water-Conservation-North-East-Metro-G.aspx>

<sup>5</sup><http://www.mntap.umn.edu/wp-content/uploads/simple-file-list/Publications/Solutions/2015-Solutions.pdf>

<sup>6</sup><http://www.mntap.umn.edu/wp-content/uploads/simple-file-list/Publications/Solutions/2016-Solutions.pdf>

<sup>7</sup><http://www.mntap.umn.edu/wp-content/uploads/simple-file-list/Publications/Solutions/2017-Solutions.pdf>

<sup>8</sup><https://metrocouncil.org/Wastewater-Water/Publications-And-Resources/WATER-SUPPLY-PLANNING/INDUSTRIAL-EFFICIENCY-CONSERVATION/Industrial-Water-Conservation-Motivations-Report.aspx>

<sup>9</sup><http://www.mntap.umn.edu/wp-content/uploads/simple-file-list/Publications/Solutions/2018-Solutions.pdf>

<sup>10</sup><http://www.mntap.umn.edu/wp-content/uploads/simple-file-list/Publications/Solutions/2019-Solutions.pdf>

<sup>11</sup><http://www.mntap.umn.edu/wp-content/uploads/simple-file-list/Intern/2020-2029/2020/bethany-mestelle-mntap-water-bmps-executive-summary-2020.pdf>

<sup>12</sup><http://www.mntap.umn.edu/wp-content/uploads/simple-file-list/Publications/Solutions/2020-Solutions.pdf>

<sup>13</sup><http://www.mntap.umn.edu/wp-content/uploads/simple-file-list/Intern/2020-2029/2021/Executive-Summary/MnTAP-Water-BMPs-Executive-Summary.pdf>

<sup>14</sup><http://www.mntap.umn.edu/wp-content/uploads/simple-file-list/Publications/Solutions/2021-Solutions.pdf>

<sup>15</sup><http://www.mntap.umn.edu/wp-content/uploads/simple-file-list/Publications/Solutions/2022-Solutions.pdf>

Technical site assessments are a primary way MnTAP staff members work with businesses throughout the year. This type of interaction has a short duration, utilizes experienced engineering staff, and results in focused recommendations that are left for the facility to implement. While staff site assessments offer limited time and resources for implementation activities, periodic follow-up is conducted to answer site staff questions and encourage implementation. Site assessments were a primary outcome of the industrial water efficiency project only in 2012, 35 water efficiency recommendations resulted from 10 MnTAP staff site assessments that year. Site assessments offer industrial facilities a minimal time commitment option to screen for water efficiency opportunities.

These preliminary site assessments often uncover substantial improvement opportunities that the company may not have time to implement. A follow-on intern project can be used to provide additional engineering resources at the site to launch implementation. Intern projects commit both MnTAP and the facility to invest time and money on the goals of an agreed upon project executed through the effort of an engineering student applied to the project full time over 12 weeks. This degree of project investment often supports implementation of some recommendations due to the presence of extra engineering help and the longer timeframe of the assistance activity. The MnTAP formal intern project team of student, advisor, and facility, along with the facility commitment of time, resources, and financial support makes a strong, productive relationship with a documented impact on water conservation.

## **Recommendation Analysis**

### **MCES-Sponsored Intern Projects**

Since 2013, MCES has provided full or partial support for 44 MnTAP facilitated intern projects in the greater metro area with an emphasis on water efficiency and conservation. Availability of consistent funding has strengthened MnTAP's ability to recruit sites and increase engagement to address water efficiency. The 44 intern projects resulted in 253 water efficiency recommendations as summarized in Table 2 below.

**Table 2. MCES-Sponsored intern projects (2013-2022)**

Year	Sector	Number of recommendations	Water saving potential (gal/year)*	Number of implemented recommendations	Recommendations implemented (gal/year)	Realized cost savings (\$/year)
2013	Metal products	9	10,941,000	6	9,935,000	90,000
	Food processing	4	5,903,000	0	0	0
	Food processing	8	30,593,000	7	22,343,000	96,000
2014	Filtration products	7	7,070,000	3	2,620,000	6,000
2015	Food processing	2	2,203,000	2	2,203,000	15,000
	Power generation	5	6,910,000	5	6,726,000	10,000
	Organics processing	6	7,742,000	5	9,330,000	33,000
2016	Education	3	3,536,000	0	0	0
	Building materials	36	16,729,000	9	5,275,000	6,000

Year	Sector	Number of recommendations	Water saving potential (gal/year)*	Number of implemented recommendations	Recommendations implemented (gal/year)	Realized cost savings (\$/year)
2017	Residential properties	1	3,000,000	1	12,450,000	3,000
	Healthcare	16	13,024,000	8	8,955,000	129,000
	Power generation	10	6,569,000	10	6,569,000	59,000
	Electronics	2	11,900,000	1	7,600,000	90,000
	Bio tech	7	6,072,000	5	4,468,000	42,000
2018	Metal forming	9	5,586,000	1	940,000	7,000
	Horticulture	2	48,000,000	0	0	0
	Building materials	5	19,109,000	2	11,600,000	30,000
	Power equipment	3	1,780,000	3	1,715,000	20,000
	Beverages	5	503,000	1	150,000	2,000
2019	Museums	4	5,819,000	1	58,000	1,000
	Book printing	5	10,550,000	2	2,300,000	17,000
	Cosmetics	9	6,047,000	7	3,148,000	57,000
	Healthcare	7	5,540,000	7	5,540,000	83,000
	Paper products	5	8,570,000	1	250,000	2,000
2020	Municipal	6	7,396,000	0	0	0
	Metal can products	3	5,733,000	3	5,733,000	54,000
	Laundry services	4	3,678,000	2	2,480,000	24,000
	Zoos	5	4,186,000	0	0	0
	Medical products	2	3,977,000	2	3,977,000	16,000
2021	Food processing	5	1,177,000	3	677,000	8,000
	Medical products	6	14,485,000	3	3,360,000	645,000
	Food processing	12	19,650,000	1	3,000,000	12,000
	Medical Products	2	1,135,000	0	0	0
	Municipal	3	10,190,000	1	1,890,000	21,000
2022	Food processing	5	987,000	1	38,000	1,000
	Beverage products	4	3,360,000	1	1,250,000	5,000
	Sports facilities	4	7,134,000	1	223,000	2,000
	<b>TOTAL</b>	<b>231</b>	<b>326,784,000</b>	<b>105</b>	<b>146,803,000</b>	<b>1,586,000</b>
	Dairy products	5	51,041,000	1	7,000,000	74,000
	Audio and video products	2	2,700,000	-	-	-
	Leather products	2	12,218,000	-	-	-
	Healthcare	5	4,025,000	-	-	-
	Metal can products	3	2,830,000	-	-	-

Year	Sector	Number of recommendations	Water saving potential (gal/year)*	Number of implemented recommendations	Recommendations implemented (gal/year)	Realized cost savings (\$/year)
	Electroplating	4	12,632,000	-	-	-
	Public utilities	1	5,370,000	-	-	-
	<b>TOTAL</b>	<b>253</b>	<b>417,600,000</b>	<b>106</b>	<b>153,803,000</b>	<b>1,660,000</b>

\* Rounded up to the nearest 1,000.

**SOURCE:** MnTAP data, MCES project reports, and applicable [SOLUTIONS](#) publications.

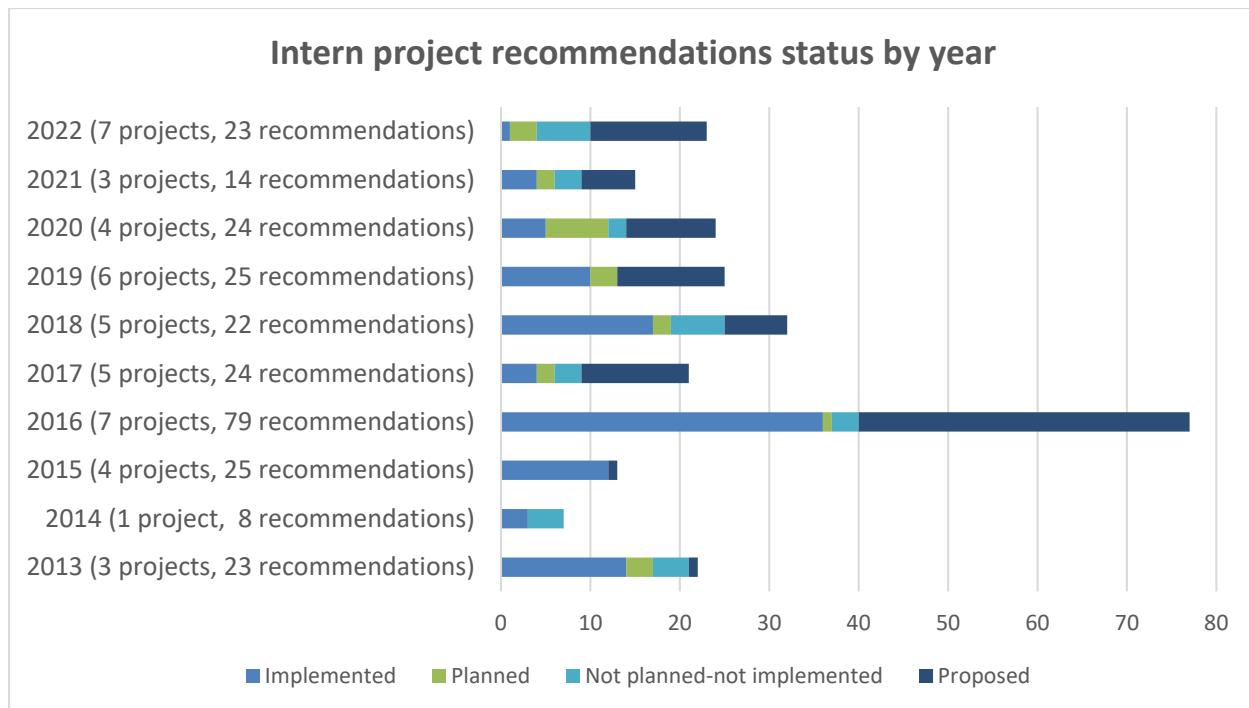
Recommendations from the intern projects conducted in 2022 are excluded from a number of calculations because these sites have not had sufficient time to implement recommendations.

- The recommendations for water saving from 2013 through 2022 from 44 facility projects total 417 million gallons/year.
- Seven facilities from 2022 projects have 22 water recommendations with a total of 91 million gallon/year potential.
- Implementation from project years 2013-2021, 45% of the recommendations were implemented representing 45% of water savings potential across 37 of the 44 (84%) intern project sites.
- Implemented dollar values through 2021 ranged from \$0 to \$645,000 per site with a median implementation value of \$11,000 in first year savings.

The progress status of the intern project recommendations is documented internally by MnTAP. This information is updated annually based on information received during follow up activities. A total of 253 intern recommendations were made between 2013 and the end of 2022 (there were no MCES-sponsored intern projects in 2012). One hundred six (42%) of these recommendations have been implemented, 23 (9%) recommendations are planned to be implemented while 24 (10%) are not planned for implementation at this time. One hundred (39%) of the recommendations are still under consideration and listed as proposed. The status of all 253 recommendations is shown graphically in

Figure 2.

**Figure 2. Intern project recommendations status by year**



# Industrial Water Efficiency Recommendations Analysis

Due to the high impact of water efficiency measures that have been demonstrated at industrial facilities, MCES and MnTAP were interested in determining if more guidance on industrial water efficiency opportunities could be provided by analyzing past project impacts. This 2020 intern project analyzed a set of 341 water conservation recommendations made by MnTAP between 2015 and 2020 using data compiled on June 22, 2020. The overarching goal of the analysis was to identify recommendations that consistently yield water conservation opportunities both across and within various industries.

## Water Mapping

For all industries, the first step in any water conservation project should be creating a water map. This is standard procedure for projects completed by MnTAP and is identified as an integral step toward water conservation by many other organizations. To complete this, all water inputs and outputs within the system should be identified and quantified. An unbalanced water budget could be indicative of leaks within the system that should be addressed, or other hidden water uses to be identified. The mapping process also indicates where water is being used within an industrial facility by volume and thus where the potential for water conservation may reside.

## Maintenance

Maintenance recommendations are those that involve repairing equipment or processes to function in the way they were originally intended. This often includes inspecting and repairing equipment, as well as developing a plan to identify and manage future or recurring leaks. Maintenance recommendations made up 10% of the total water conservation recommendations from the target data set and accounted for a total proposed reduction of 40,000,000 gallons of water. The implementation rate for maintenance recommendations is 48%, which is the highest of all types of recommendations. This may indicate that facilities are well positioned to implement maintenance recommendations through normal routine maintenance processes.

## Management

A recommendation classified as a management makes a change to the process to perform the same operational function in a more efficient way. Though there may be changes made to the process, ultimately, the bulk of the process remains the same. Automating processes or switching to high efficiency fixtures and appliances, as well as adjusting schedules, run times, and capacity of existing equipment, are considered management recommendations. Management recommendations were the most common type of recommendation made by MnTAP in the target data set and made up 56% of total recommendations analyzed. The total proposed reduction for this type of recommendation was 170,000,000 gallons. Management recommendations had a 37% implementation rate.

## Modifications

Modifying a system is a large-scale change to the process and the way water is used throughout the new system. This may include a change to the product itself, installing a water reuse system, or using waterless processes. These recommendations tend to take more time to implement and be more costly to the company but often yield high-value potential water savings. Modifications made up 34% of all MnTAP water recommendations in the target data set. The total proposed reduction for modification reductions was 420,000,000 gallons. At 31%, the implementation rate for these recommendations was

the lowest among the three major recommendation types, reflecting the more complex nature of the projects.

## Water Use

To evaluate how water was used in a facility, all water conservation recommendations were labeled as either process, meaning it was related to the operations going on in the building; irrigation, referring to exterior lawn or grounds seasonal water use; or domestic, related to water associated with human occupancy of the building. The latter two water uses make up the larger category of “non-process water” as they are typically part of the facility building operations rather than the manufacturing operations. Of the 341 water conservation recommendations, 233 are related to water use within a process (68%) while 54 (16%) represented domestic uses and an additional 54 (16%) represented irrigation uses. Within this data set, recommendations related to industry processes were implemented more frequently and yielded higher savings than recommendations focused on domestic water use or irrigation. This may be due to MnTAP’s focus on process related improvements and generally work with staff focused on operations activities.

The 233 recommendations related to process uses equates to a total proposed reduction of 580,000,000 gallons. Most process water use (75%) was found in the following applications.

- Ingredient – water becomes part of the product
- Conveyance – water used to transport material within a facility
- Sanitation – water used for cleaning operations
- Steam – water used for generation of steam
- Heat Management – water used for heating or cooling processes.

The distribution of recommendations made and implemented and the associated water volume is shown in Table 3.

**Table 3 – Total and Implemented Recommendations for Major Process Water Uses**

Use Type	Number of Recommendations	Implemented Recommendations	Total Proposed Reduction (gal)	Total Actual Reduction (gal)
Ingredient	28	14	17,000,000	12,000,000
Conveyance	8	3	32,000,000	2,300,000
Sanitation	86	27	88,000,000	51,000,000
Steam	8	6	4,800,000	3,400,000
Heating	9	5	20,000,000	15,000,000
Cooling	43	17	260,000,000*	30,000,000
<b>Total</b>	<b>182</b>	<b>72</b>	<b>421,800,000</b>	<b>113,700,000</b>

\*One unimplemented recommendation for 200,000,000 gal

Despite non-process water making up a smaller portion of total recommendations than process use, these recommendations are significant. Domestic water use and irrigation account for 32% of total water use recommendations across all industries and represent a total proposed reduction of 85 million gallons. While this represents considerable water efficiency opportunity, only 23% of these recommendations have been implemented. Implementation of non-process recommendations should be encouraged as a means for improving water conservation. Opportunities for irrigation and domestic water use conservation may be more generally applicable across more business sectors and often have relatively low implementation costs and short payback periods.

## **Example**

The intern classified the data by industry sector using NAICS codes with more specific classification for recommendations focused on manufacturing. The type of water efficiency recommendation, Maintain, Manage, or Modify, was applied to each sector to chart the distribution of recommendations by industry. For example, food processing was the largest component of the manufacturing sector, with 51 recommendations. Of these recommendations 21 were implemented, giving an implementation rate of 41%. A majority of recommendations (90%) were directly related to the industrial process, while 8% focused on domestic water use and 2% were related to irrigation. The food processing recommendation distribution includes 20% maintenance recommendations, 51% process management recommendations, and 25% more substantial process modifications to reduce water use.

## **Industrial Water Efficiency Optimization Search Tool**

This 2021 intern project expanded on the intern water efficiency recommendation classification effort previously described by developing a search tool for the database created in 2020. The goal of this work was to allow users to search the database collection of industry specific water efficiency recommendations to identify high volume, high value efficiency options for replication in their own facilities. A key feature of this work was to allow access to types of water efficiency recommendations that have been made and access to published intern summaries, while maintaining confidentiality of the businesses originally receiving the recommendations.

With a history of intern projects focused on industrial water conservation, MnTAP has a solid base of practical water efficiency suggestions and recommendations made to companies. These recommendations are based on in-the-field technical assistance which makes these practical examples other facilities can adopt. These suggestions are published as individual MnTAP Intern Program executive summaries on the MnTAP website but are not easy to find and utilize.<sup>16</sup> The development of this tool to compile published industrial water efficiency recommendations and make the data searchable has the potential to expand the impact of past and future projects beyond the participating facilities. Because these recommendations are sourced from published case studies, no sensitive company information was revealed.

The industrial water efficiency optimization search tool was built on the data visualization platform Tableau. This platform allowed for a direct connection to the MnTAP database containing suggestion data. The tool consists of a filterable table with statistics and details of each suggestion which meets the criteria for this project including the following.

- Savings and implementation cost
- Type of suggestion – maintain, manage, modify
- Industry sector
- Link to a MnTAP Intern project executive summary

Filters to allow users to search through suggestions include adjusting the range of dollars or gallons saved by each suggestion, choosing industries from which they would like to see suggestions,

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<sup>16</sup> <http://www.mntap.umn.edu/interns/pastprojects/>

choosing to see only suggestions that are of certain methods, and a blank keyword search. The link to the executive summary allows users to find details for each suggestion.

Instructions for how to use the tool can be found on the MnTAP website.<sup>17</sup>

## Conclusions

Between 2013 and 2022, MnTAP Interns made 253 water efficiency recommendations identifying potential annual water savings of over 417,600,000 gallons per year. To date, implemented water efficiency recommendations total over 153,803,000 gallons per year, 37% of the recommended opportunity. Implementation from project years 2013-2021, projects that have had time to implement recommendations made, 45% of the recommendations were implemented representing 45% of water savings potential across 37 of the 44 or 84% of the intern sites. This high participation rate in implementing MnTAP Intern Project water efficiency recommendations indicates there is generally accessible water efficiency opportunity that companies can access with a modest amount of support.

Analysis of these water efficiency recommendations indicates they fall into three categories, maintain – return operations to original efficiency, manage – conduct similar operations with improved efficiency, and modify – reinvent how water is used within a process. Maintenance related recommendations have the highest implementation rate, however recommendations to manage process water use have the most recommendations in MnTAP's work. Recommendations to modify how water is used in industrial processes offer significant water reduction opportunity, however these recommendations take much longer to implement due to process engineering and financial investments required.

Follow-up is conducted after any technical assistance activity to determine how the facility is progressing toward implementation of recommendations and to identify if additional resources may be needed. These interactions positively reinforce company actions and help maintain the MnTAP-client relationship. Due to the protracted implementation timeline for industrial projects, follow-up is critical for measuring and verifying the impact of applied technical assistance services.

MnTAP will continue to successfully combine experienced MnTAP program staff, in-depth internships for appropriate projects, and long-term follow-up to successfully support industrial water efficiency initiatives and achieve meaningful results.

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<sup>17</sup> <http://www.mntap.umn.edu/wp-content/uploads/simple-file-list/Resources/Extended-User-Guide.pdf>



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