

Instructions: After reading the instructions, please submit the *Eligibility tool for streamlined chloride variance approach form* (wq-wwprm2-17) electronically via email to the Minnesota Pollution Control Agency (MPCA) at chloridevarianceprocess.pca@state.mn.us.

Questions: If you have any questions regarding the eligibility tool or the instructions, contact Fawkes Char at 651-757-2327 or by email at fawkes.char@state.mn.us.

Purpose of this calculator

To determine eligibility for a variance, the first step is analyze treatment methods. This has been done for you in Alternatives for addressing chloride in wastewater effluent (wq-wwprm2-18) <https://www.pca.state.mn.us/sites/default/files/wq-wwprm2-18.pdf>. After this analysis, the MPCA finds the most feasible pollution control method to remove chloride is upstream of the wastewater treatment plant, rather than costly methods at the wastewater treatment plant (WWTP) itself. Other than negligible amounts of naturally occurring chloride in source waters, most chloride in WWTP discharges originate in household water softeners. In order to prevent the addition of salts into wastewater, municipalities can install centralized water softening in drinking water plants to eliminate the need for in-home water softening. This plan requires homes currently drawing from well water to be connected to the municipal drinking water network.

The MPCA acknowledges this plan entails high capital costs and therefore has developed a chloride strategy to assist dischargers. For some WWTP's, a compliance schedule will be appropriate, and others may need to consider a variance. A variance is a temporary modification to the water quality effluent limit or water quality standard that would otherwise be applicable. In order to qualify for a variance, a discharger must demonstrate that substantial and widespread economic and social impacts would occur due to pollution control costs. The U.S. Environmental Protection Agency (EPA) provides a detailed guideline called the *Interim Economic Guidance for Water Quality Standards Workbook*, (<https://www.epa.gov/sites/production/files/2016-03/documents/econworkbook-complete.pdf>) found on the EPA website at <https://www.epa.gov>. The MPCA used this to craft the chloride variance eligibility tool. The demonstration of substantial impacts in the calculator closely follows the approach discussed in Chapter 2. Widespread impacts are discussed in Chapter 4, and, while not the focus of this calculator, are also addressed on the "Interface – Widespread Impacts" tab of the eligibility tool.

Note: This eligibility calculator is *not* an application for a variance, nor does an "eligible" result guarantee the issuance of a variance. The calculator is simply a tool to help eliminate the more time-consuming and costly aspects of evaluating whether or not the municipality should consider proceeding with the variance application process.

Also, this tool does not mean that MPCA will *require* a facility to soften drinking water. Instead, it finds that centralized softening is the most feasible alternative to meet the effluent limit, and then takes into account the cost and a municipalities' eligibility for a variance. A chloride management plan and discussions with the MPCA will determine the best approach for the Permittee to comply with the chloride standard.

Gather data on your community

In order to determine whether or not your wastewater treatment plant outfall is eligible for a chloride variance, you must gather some data about your municipality.

First, choose your wastewater treatment plant name from the drop-down list. Confirm that the automatically generated information, such as the municipality name and demographic data, are correct. If you cannot find your wastewater treatment plant on the list, type the name of your municipality in column J, to the right of the box labeled "Corresponding municipality you've selected". If this edit leads to error messages in the demographic data, contact Fawkes Char (fawkes.char@state.mn.us) for assistance.

If a data figure is not correct, insert a correction in the box of column J to the right of the incorrect figure. This will overwrite the default value. If you delete what you have entered, the original value will return.

Second, refer to your municipality's financial statements or audit report to find the following information:

- **Percent of user fees from residences:** Enter this information into cell I51 (as opposed to commercial or industrial users)
- **Overall net debt as a percent of full above market value of taxable property:** Enter this information into cell J24 (the MPCA has information on the market value of taxable property, but we do not have reliable information on municipal net debt.)
- **Property tax collection rate:** Enter this information into cell I49 (percent of tax revenues from property taxes divided by the total property taxes levied)

Use some other form of record from the drinking water and wastewater treatment plants to find the following information:

- **Number of households that are hooked up to municipal wastewater but *not* municipal drinking water:** Enter this information into cell I47

You may also enter values for additional capital costs specific to your community's situation, or you may enter the amount in grant funding you anticipate receiving for this infrastructure project.

The eligibility calculator (on the tab named "Interface – Substantial Impact") has outlines around the cells into which you should enter this information.

The eligibility calculator uses information about your community's drinking water plant capacity to estimate the capital and operating costs of both a reverse osmosis system and lime softening, and presents the variance eligibility for both options for comparison. Eligibility for a water quality variance depends on two values described in the *Interim Economic Guidance for Water Quality Standards Workbook*, (<https://www.epa.gov/sites/production/files/2016-03/documents/econworkbook-complete.pdf> found on the EPA website at <https://www.epa.gov>, the municipal preliminary screener and the secondary score.

Note: The municipal preliminary screener, the secondary score, and the eligibility output for both alternatives will be calculated for you and will appear on the "Results" tab.

How the municipal preliminary screener is calculated

The Municipal Preliminary Screener estimates the total per household annual pollution control costs to be paid by residential users (existing costs plus those attributable to the proposed project) as a percentage of median household income. The screener is written as follows:

$$\text{Municipal preliminary screener} = \frac{\text{Annual pollution control cost per household}}{\text{Median household income}} \times 100$$

Median household income information and the number of households for many municipalities are available from the U.S. Census. The calculator has median income and the number of households (which is needed to calculate the annual pollution control cost per household) associated with all of the wastewater treatment plants in the drop down list. The screener value is calculated for the annual pollution costs for both reverse osmosis and lime softening.

Components of annual pollution control cost per household

Current costs

Current costs are annually occurring costs, given in dollars per year, and are split into operating and maintenance costs and into liability costs. Operating and maintenance costs include salaries of technicians in the treatment plant, chemical inputs, and other costs. Current liability costs are the amount of money paid each year towards loans plus interest. It is assumed that these costs will not change over the payback period.

Future costs

Future costs can be categorized in both capital costs and increased operating costs. The upfront, capital costs are the initial installment of the lime softening in the drinking water plant and laying additional pipe. The costs associated with laying pipe are addressed in the section below called "Drinking Water Hook-ups". The MPCA estimates the capital cost of installing centralized lime or reverse osmosis softening according to drinking water facility capacity using engineering cost analysis from a leading engineering consulting firm in Minnesota.

The MPCA assumes that the operating and maintenance costs after the implementation of the project are approximately \$7 and \$4 per 1,000 gallons for centralized lime and reverse osmosis softening, respectively. The MPCA acknowledges that if additional households need to be connected to drinking water infrastructure, the capacity of the drinking water plant may need to be expanded, leading to higher operating and maintenance costs, so the calculator may underestimate these costs in some cases.

Softener disablement

Each household will also incur the cost of taking its water softener offline. Regardless of whether this cost will be incurred by the municipality, wastewater or drinking water treatment plants upfront and paid back by the household over time, or if the household pays upfront, the cost of removing the softener must be annualized. Engineers have estimated that the cost of taking a softener offline costs about \$2,000. In the calculator, this value is annualized and multiplied by the number of households that will be hooked up to municipal drinking water. It is assumed that each household of the community, whether they receive drinking water from a municipal source or a well, has an in-home softening system to remove hardness.

Drinking water hook-ups

For households that draw from a water source other than the municipal drinking water plant, the municipality incurs a high capital cost to lay pipe to connect these households to the drinking water system. The estimate for the capital cost of laying pipe is approximately \$1 million per mile. In order to accurately estimate the total cost for a municipality, we would need to know exactly which households need to be connected and their distance from existing pipes. This would require extensive GIS mapping analyses, which is not possible for the MPCA to do in-house for each municipality. Instead, we have proposed the following proxy.

First, the user needs to enter the number of households that would be hooked up to drinking water under the proposed project. The calculator multiplies the number of miles of piping by the ratio of households that need to be connected to the network to the number of households that are currently connected to the drinking water network. The result of this is the number of miles we expect the municipality to need to connect all households to municipal drinking water. The main assumption is that the density of households that have already been connected is the same density of households that are not connected. We do not expect this assumption to hold for most municipalities, but no other assumption is preferable or better supported. The actual number of miles for each municipality is subject to a number of factors that are cost-prohibitive for the agency to determine individually.

In addition to piping costs, each household not currently connected to centralized drinking water would be responsible for the cost of the hookup from the property boundary to the house, which on average will cost \$15,000. This cost is then annualized, weighted by the percent of households that require a drinking water hookup in the community, and added to the per-household cost of pollution control in the final calculation. Weighting the annualized value and adding to the per-household cost is mathematically equivalent to adding the total costs of drinking water hookup across households to the total cost to the entire community and dividing by the total number of households.

Annualizing costs

In order to finance the capital investment cost, the municipality is likely to arrange for a loan to cover the upfront costs and pay the loan back with interest over time. In order to convert total costs over the lifetime of the project to an annual value, we use an annualization factor to estimate the amount of the principal loans paid back with interest each year. The annualization factor, which is calculated for you in the calculator, is defined below.

$$\text{Annualization factor for upfront costs} = \frac{d}{1 - (1 + d)^{-n}}$$

Where:

d = interest rate

n = payback period in years

We multiply the total upfront costs (also called future capital costs) by the annualization factor to estimate annualized capital costs. Once the future capital costs are annualized, they can then be added to operating and maintenance costs, which are already reported in annual form.

EPA guidance suggests that 20 years is a common and reasonable payback period for most water infrastructure loans, so 20 years is the payback period chosen for this calculator. At the time that the calculator was created, in early 2016, the market interest rate for state and local bonds given by the Federal Reserve Bank was 3.5%. If you have strong evidence that your municipality faces a different payback period or a different interest rate, you may manually change these figures in the section "Economic Assumptions" on the "Interface – Substantial Impact" tab by entering the corrected value in column J, cells 39 and/or 40. For the interest rate, enter the percent as a decimal, such as 0.02 for 2%. In an actual variance application, you will be expected to provide evidence to support a decision to use a different payback period or interest rate.

Final calculation

All future municipal-level costs (lime softening capital cost at the plant and the cost of drinking water piping) are annualized (1) and then added to all municipality-level annual operating costs (2). This cost is multiplied by the percent of total user fees paid by residences, the product of which represents the total cost burden that would fall on households if there were uniform increases in user fees to pay for the project. That value is divided by the number of households in the community to estimate the per-household cost of the lime softening project (3).

- (1) $(\text{Capital cost of softening at plant} + \text{Cost of laying pipe}) * \text{Annualization Factor}$
= Annualized Future Capital Costs
- (2) $\text{Additional Future Operating Costs} + \text{Current Operating Costs} + \text{Current Liabilities}$
= Annual Costs
- (3) $\frac{(\text{Annualized Future Capital Costs} + \text{Annual Costs}) * \text{Percent of Users Fees from Residential Users}}{\text{Total Number of Households}}$
= Household Burden of Capital Costs

The household burden calculated above and the annualized costs of disabling a water softener are added to the drinking water connection cost weighted by the percent of households requiring a connection to find the total per household cost of entire project (4). The last step is to divide the per-household cost of the entire project by the median household income, which is the municipal preliminary screener (5).

$$(4) \quad \text{Household Burden of Capital Costs} + (\text{Softener Disablement Cost} * \text{Annualization Factor}) \\ + (\text{Household Connection Cost} * \text{Annualization Factor} * \text{Percent of Households Requiring Network Connection}) \\ = \text{Household Total Cost}$$

$$(5) \quad \frac{\text{Household Total Cost}}{\text{Median Household Income}} = \text{Municipal Preliminary Screener}$$

How the Secondary Score estimate is calculated

The Secondary Score is calculated using six tests related to the debts and revenues of the municipality in question.

Secondary indicators	Weak	Mid-range	Strong
Bond rating	Below BBB (S&P) Below BAA (Moody's)	BBB (S&P) BAA (Moody's)	Above BBB (S&P) or BAA (Moody's)
Overall net debt as percent of full market value of taxable property	Above 5%	2%-5%	Below 2%
Unemployment	More than 1% above National Average	National Average	More than 1% below National Average
Median household income	More than 10% below State Median	State Median	More than 10% above State Median
Property tax revenues as a percent of full market value of taxable property	Above 4%	2%-4%	Below 2%
Property tax collection rate	< 94%	94% - 98%	> 98%

The secondary score is calculated for the community by weighting each indicator equally and assigning a value of 1 for each indicator judged to be weak, a 2 for each indicator judged to be mid-range, and a 3 for each strong indicator. A cumulative assessment score is found by summing the individual scores and dividing by the number of factors used. The cumulative assessment score is evaluated as follows:

- less than 1.5 is considered weak
- between 1.5 and 2.5 is considered mid-range
- greater than 2.5 is considered strong

Bond rating, unemployment, median household income data, and property tax revenues as a percent of full market value of taxable property have already been collected for almost all municipalities. If the calculator does not automatically populate the bond rating for the municipality, find the rating of the most recent general obligation bond or sewer bond for the municipality, and overwrite the "Not rated" message.

Overall net debt as a percent of full market value of taxable property and the property tax collection rate are not feasible to find for each municipality, so the user of the eligibility tool must find this information and insert it into the appropriate boxes.

How eligibility is calculated

The Municipal Preliminary Screener is a tool to describe how burdensome the proposed lime water softening investment would be for the municipality relative to the households' ability to pay. The Secondary Score depicts the community's overall economic health and ability to pay. The EPA uses a matrix to assess whether or not the impacts of the proposed pollution control project would be substantial for the community. If the impacts are considered substantial, or, in other words, likely to interfere with economic development, the municipal wastewater treatment plant could be considered eligible for the variance.

Assessment of substantial impacts matrix

Secondary Score	Municipal Preliminary Screener		
	Less than 1.0%	Between 1.0 and 2.0%	Greater than 2.0%
Less than 1.5	?	X	X
Between 1.5 and 2.5	o	?	X
Greater than 2.5	o	o	?

In the matrix, "X" indicates that the impact is likely to be substantial. The closer the community is to the upper right hand corner of the matrix, the greater the likelihood. Similarly, "o" indicates that the impact is not likely to interfere with development. The closer to the lower left hand corner of the matrix, the smaller the likelihood. Finally, the "?" indicates that the impact is unclear and the applicant will need to justify why pollution control costs would cause substantial social or economic impacts.

Widespread impacts

The second component of eligibility for a variance involves evidence that not only is the pollution control project substantial and likely to interfere with economic development; the effects are also expected to be widespread. The EPA Economic Guidance recommends a less discrete process than substantial impact evaluation.

Widespread impact is better described narratively, such as the effect to local development, tax revenues, the demand for social services, or using indicators to address expected changes to median income, employment, or the poverty rate in the community.

This section is not required or used for calculation in the eligibility tool. However, if a community is seriously considering applying for a variance, there are tabs labeled "Widespread Impacts" to provide examples of demonstrations of widespread impact.

Ratio analysis

If your wastewater treatment plant serves a significant industrial discharger (one firm discharges more than 10% of all water sent to the WWTP), the EPA guidance recommends that Financial Impact Analysis be conducted to assess pollution control costs to the private discharger. In that case, there is a tab within the chloride variance eligibility tool called "Ratio Analysis" that will assist the user in determining substantial impact to the private firm. See Chapter 3 of the EPA *Interim Economic Guidance for Water Quality Standards Workbook*, (<https://www.epa.gov/sites/production/files/2016-03/documents/econworkbook-complete.pdf> found on the EPA website at <https://www.epa.gov> for more detail.