#11: WASTEWATER

CORE METRIC FOR CATEGORY **A** & **B** & **C** COMMUITIES

Bold, green font indicates metrics that must improve to be recognized at Step 5

METRICS

11.1 Residential gallons of wastewater produced per person per day (gallons/person/day)
11.2 Non-residential gallons produced per job per day (gallons/job/day)
11.3 Annual energy used per million gallons treated/pumped (report only if you own a treatment facility) (MMBtu/ million gallons)
11.4 Annual energy operating cost in dollars per million gallons treated/pumped (report only if you own a treatment facility) ($/ million gallons)
11.5 **a Ratio of inflow & infiltration volume to total volume entering the wastewater collection system** (I&I:total volume) OR
b Peaking factor (peaking factor) OR
c Percent of total sanitary sewer pipe and manholes that were been lined or replaced (%)

See CO2e Guidance Document for Metrics **I** and **J**

METRIC DEFINITION

- **If your local or tribal government owns or** is part-owner or jointly controls a wastewater treatment plant (WWTP), then report all the data points in this metric. (Metric 11.1-11.5)
- **Communities that do not own and operate** a WWTP (most cities in the 7-county metro area; some greater MN cities; some tribal nations) should report residential and business gallons, I & I (inflow and infiltration) data, and only energy and cost data related to the part of a sewer system they do operate, such as lift stations. (Metrics 11.1, 11.2, 11.5, and partial 11.3 and 11.4)
- **If your community is entirely served by septic systems** then this is not a Core metric for you. If you track a metric about septic systems in your community, GreenStep would appreciate your reporting that in the notes field on the Step 4 reporting survey.
- **Residential and non-residential gallons** exclude accounts outside the jurisdiction. Non-residential gallons include wastewater treated from commercial, industrial & institutional accounts. (Metrics 11.1 and 11.2)
- **Energy and cost per million gallons treated** should cover total inflow to the plant, from accounts inside and outside the jurisdiction and total energy costs. (Metrics 11.3 and 11.4)
- **Report energy in MMBtu** = million British Thermal Units of energy. Electricity (tracked in kilowatt-hours: kWh) and liquid fuels (generally tracked in BTUs) should be converted to the common metric MMBtus. (Metric 11.3)
- **Energy from renewables:** If an anaerobic digester, or solar thermal or photovoltaic or wind system provides energy for plant operations ("behind the meter"), measure and include that in MMBtus/million gallons. (Metric 11.3)
- **Inflow and Infiltration (I & I) measures clear water "leakage" into** the wastewater system (conveyance pipes, the WWTP itself) – typically rain water – and represents a volume of liquid that does not need to be treated at the WWTP. Minimizing I & I effectively adds treatment capacity for what needs to be treated. (Metric 11.5)
- **Peaking factor** is used to predict the maximum flow that a sewer line can handle. In more simple terms, if each house that flowed to a lift station turned on every shower, ran every faucet, and flushed every toilet, that number would be multiplied by a factor, typically by three, to account for substantially more than the maximum possible sewage flow. This number is used as a best practice in the engineering of sewer and wastewater lift stations, and

understanding the specific peaking factor needs for your site is a crucial design consideration for your lift station. This number is highly variable based on I&I and weather conditions. (Metric 11.5)

- **Lined or replaced sanitary sewer pipes and manholes** help reduce I&I and build resilience to the sanitary sewer system.
- **Alternative metrics**: If you have been gathering or want to gather different metrics, report those and explain why they are a better fit for your city. For example:
    - The ENERGY STAR® score compares the predicted energy use of a wastewater plant to its actual energy use to yield a 1 to 100 percentile ranking of performance, relative to plants across the nation.
    - Energy used to treat each unit of biological oxygen demand in the sewage.
    - System operators tend to use one of four other metrics, typically measured in less-than-yearly evaluations of the sewer system, which can also be reported, if tracked in your city, in the notes section of the metrics survey:
        - Gallons/day/foot of sewer pipes
        - Gallons/day/inch-mile of pipe
        - Million gallons/day/1,000 feet of pipe
        - Million gallons/day/acre of land served by sewer pipe

DATA SOURCES

- Utility records (Metrics 11.1-11.5)
- For cities located in the 7-county Twin Cities area, the Metropolitan Council Environmental Services (MCES) Customer Portal online platform provides maps, data, and program details for each community (Metrics 11.1, 11.2, and 11.5)
- WWTP permit DMR data submitted to the MN Pollution Control Agency (Metrics 11.1 and 11.2)
- The B3 system: https://mn.b3benchmarking.com (Metrics 11.1 - 11.4)
- Energy Star Portfolio Manager (if using this tracking system) https://www.energystar.gov/sites/default/files/tools/Wastewater_Trtmnt_Aug_2018_EN_508.pdf (Metrics 11.1 - 11.4)
- Jobs data from North American Industry Classification System (NAICS) and the Quarterly Census of Employment Wages (QCEW); use Quarter 2 data, as it tends to be least affected by seasonal fluctuation: https://apps.deed.state.mn.us/lmi/qcew/ResultsDisp.aspx (Metric 11.2)
- Infrastructure Stress Transparency Tool (MN State Auditor): https://www.osa.state.mn.us/reports-data-analysis/data/infrastructure-stress-transparency-tool/infrastructure-stress-transparency-tool/ (Metric 11.4)
- The Metropolitan Council requires all communities served by the MCES regional wastewater system to have and include I/I mitigation programs in their comprehensive sewer plans, including annual and monthly peak I/I ratio. The Met Council can provide further instructions on how to calculate this. See also the Guide for Estimating Infiltration and Inflow (EPA, 2014). (Metric 11.5)

METRIC CALCULATION AND PUBLIC REPORTING

- **Annual measurement and reporting** for these metrics is for the calendar year before the reporting year. If I & I has not been calculated in the last year, simply report the last I & I percent and note the calendar year during which the percent was calculated. (Metrics 11.1-11.5)
- **If a local or tribal government purchases some of its wastewater services** from another city/entity for some residential/commercial addresses, do not add in data from that other system: report numbers based on the city utility data only. (Metrics 11.1-11.-5)

- **Residential and non-residential gallons** use the past year of data (usually estimated) so that an average daily waste water flow is reported for residential accounts and for business accounts. These numbers are normalized, respectively, by your latest city population number and your latest total city jobs number so as to identify whether in aggregate residences and businesses are higher or lower waste water services users. (Metrics 11.1 and 11.2)
- **MMBtu /million gallons** = energy used to run the complete city waste water system (treatment plan and off-site pumps). Systems using electricity (tracked in MMWh) and liquid fuels (generally tracked in Btus or therms) should convert all energy use to the common metric MMtus. Use data from the calendar year before the reporting year. For energy conversions use http://www.eia.gov/Energyexplained/index.cfm?page=about_energy_conversion_calculator (Metric 11.3)
- **Annual operating cost in dollars per million gallons treated**: total energy (dollars), divide by total gallons treated over the past 12 months, and divide by 1,000,000. (Metric 11.4)
- **While % I & I highlights** the magnitude of any I & I problems, system operators tend to use one of four other metrics, which should also be reported in the notes section of the GreenStep reporting survey form if one or more of them is tracked in your community:
    - Gallons / day / foot of sewer pipes
    - Gallons / day / inch-mile of pipe
    - Million gallons / day / 1,000 feet of pipe
    - Million gallons / day / acre of land served by sewer pipes

    (Metric 11.5)
- **Lined or replaced sanitary sewer pipes and manholes** include the total linear feet of any newly constructed or (re)lined sanitary sewer pipes in the previous calendar year as a percent of total linear feet of all sanitary sewer lines. Also report the total number of replaced manholes in the previous year as a percent of total manholes used for sanitary sewer lines in the city. (Metric 11.5)

METRIC RATIONALE

Wastewater treatment plants are highly regulated and must report various detailed reports and measures to the State of Minnesota. Flow volumes, however, are not regulated but affect overall pollutant loading on bodies of water receiving treated effluent from WWTPs. This GreenStep metric also includes an energy measure, often overlooked in city improvement processes, and defines metrics to help improve demand-side management of a community's treatment plant and wastewater system.

Conserving water in and reducing wastewater flows from homes and businesses effectively adds capacity to a community's wastewater infrastructure at generally a cost cheaper than expanding a WWTP. Local and Tribal governments can promote such actions, which are found in several GreenStep best practices, including Existing Buildings and Green Business Development. Benefits include reducing carbon emissions from wastewater systems, which can easily make up one quarter of the city operations' carbon footprint.

I & I expenditures in the 7-county metro area cities during 2009 were an estimated $12 million. Without annual expenditures incentivized by the metro sewer authority, the cost to add metro wastewater interceptor and treatment capacity to handle the excess flow from I & I was estimated to exceed $900 million.

STEP 5 METRIC TARGETS

Individual communities are best equipped to set realistic goals for metric improvement, as every community's mix of businesses and residences and geography is different. Any improvement in the metrics is beneficial. That said, the Minnesota Technical Assistance Program (MnTAP) has benchmarked energy use for dozens of treatment plants of differing types and can be consulted. I & I rates under 6% are considered achievable at a reasonable cost.

LEED FOR CITIES & COMMUNITIES

https://www.usgbc.org/leed/rating-systems/leed-for-cities-communities

EN Credit: Energy Efficiency

- Option 3: Water and Wastewater
    - Demonstrate reduction in the energy intensity of water and wastewater systems, including water supply pumping, treatment, distribution as well as wastewater pumping, and treatment, from a baseline year no more than five years prior to the most recent reporting year.

RELATED BEST PRACTICE ACTIONS

- 20.1 Compare the **energy use and financial performance** of your facilities with other peer facilities using standardized, free tools.
- 20.3 Establish an on-going budget and program for decreasing **inflow and infiltration** into sewer lines and **losses in drinking water systems**.

NEED HELP? CONTACT

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