

Hydraulic Design Capacities and Chapter 94 Wasteload Management Reports

If your municipal wastewater treatment facility is identified by Municipal Wasteload Management (Chapter 94) Reports to be hydraulically overloaded, or projected to be overloaded, there may be something you can do before you consider an expansion project.

In 1990, the Department of Environmental Resources (DER) adopted a change to the term Design Flow in the Domestic Wastewater Facilities Manual which had a significant impact on Chapter 94 Reports. "Design Flow" was replaced with two terms: Annual Average Flow and Maximum Monthly Average Flow. The latter became the treatment plant's hydraulic capacity and is annually compared with a facility's actual three-month maximum flow to determine if hydraulic overload conditions exist.

To attempt to simplify the subject, let's divide this discussion into three separate topics:

1. *How are hydraulic overload conditions determined,*
2. *What is your "plant's hydraulic design capacity", and*
3. *How do you establish a maximum monthly flow?*

The text box on the next page includes some official Department

of Environmental Protection (DEP) definitions of key phrases from Chapter 94 for your reference.

Hydraulic Overload Conditions

Through the early 1990's, Municipal Wasteload Management, Chapter 94, compared the monthly average flows to the annual average flow (defined as the Total Design Flow) to determine hydraulic overload conditions.

In July of 1991, the Department issued a guidance document entitled, "Guidance on Assessment of Hydraulic Capacity in Wasteload Management." This document clearly states a change.

"Traditionally, a treatment plant's three highest consecutive monthly average flows have been compared to the annual average flow rating of the treatment plant, found in the Water Quality Management permit, to determine overload. Monthly average flows will still be utilized, but will now be compared to the maximum

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monthly average flow rating of the plant, which is the maximum amount of flow, averaged over each month, that the plant can process while still meeting effluent limits."

The document goes on to state,

"In order to implement these changes, some treatment plants will have to be rerated."

A copy of this document is available in its entirety on our website: www.cet-inc.com.

The most recent changes to Chapter 94 occurred in 1998 and includes modifications to the definitions to support the use of maximum monthly flow. These definitions are listed in the text box on the next page. The definition of hydraulic design capacity was specifically revised to clarify that it applies to the maximum monthly design flow rather than the annual average flow.

Even though this guidance was issued nearly nine years ago, most treatment facilities still do not have

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Chapter 94 Municipal Wasteload Management

DEFINITIONS

Hydraulic design capacity—

The maximum monthly design flow, expressed in millions of gallons per day, at which a plant is expected to consistently provide the required treatment or at which a conveyance structure, device or pipe is expected to properly function without creating a backup, surcharge or overflow. This capacity is specified in the water quality management permit (Part II permit issued under Chapter 91) (relating to general provisions).

Hydraulic overload—

The condition that occurs when the monthly average flow entering a plant exceeds the hydraulic design capacity for 3-consecutive months out of the preceding 12 months or when the flow in a portion of the sewer system exceeds its hydraulic carrying capacity.

maximum monthly design flows. For example, at this time in the Southeastern Region of DEP, there are approximately 102 facilities regulated under Chapter 94. About eighteen (18) have maximum monthly design flows. In the Southcentral Region, there are 219 regulated wastewater facilities with 57 having an existing or projected overload condition. Of those 57 facilities, only three (3) have maximum monthly design flows.*

The chart on this page shows a hydraulic loading chart from a Chapter 94 report. You can see that if there was no maximum monthly design flow, the design capacity is considered to be 6.4 MGD and the plant would be classified as hydraulically overloaded. With the maximum monthly design flow

* Data from regional DEP personnel.

established, there is adequate capacity remaining even beyond the five year projection period.

Hydraulic Design Capacity

So what is the hydraulic design capacity for your treatment facility? The answer is in the Part II Water Quality Management (WQM) permit application.

In the past, Part II WQM permit applications, included a Total Design Average Flow in Module 1. The Total Design Average Flow was considered the annual average flow and became the hydraulic design capacity of the plant. DER/DEP used the Total Design Average Flow to determine if a facility was, or was projected to be, overloaded within the Chapter 94 regulations.

As a result of the changes that occurred in the 1990's, the Part II WQM permit application changed too. The current WQM permit application now calls for four (4) Total Design Flows: Average Annual, Maximum Monthly, Peak Hour, and Peak Instantaneous.

By reviewing Module 1 of your Part II permit application and the Basis of Design included with the application, you can determine if a maximum monthly flow was developed for your facility.

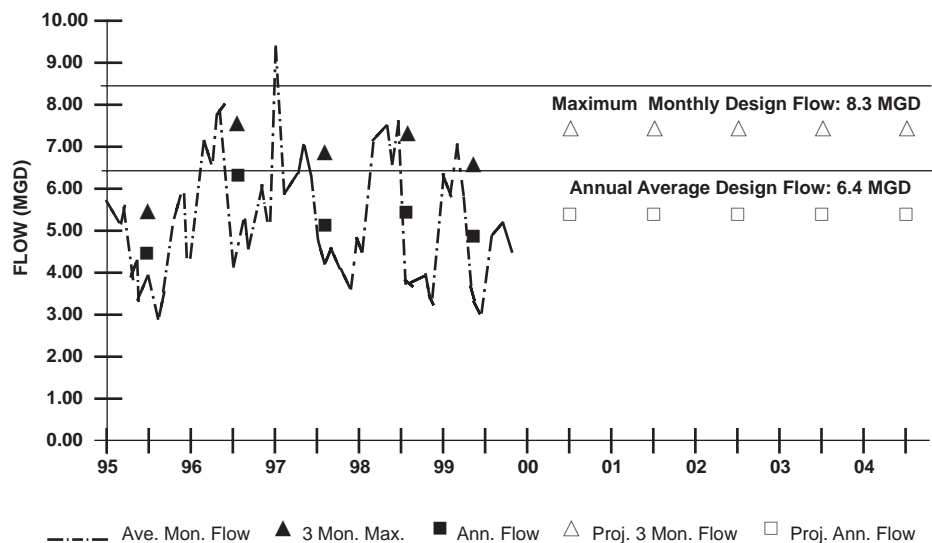
How to Establish a Maximum Monthly Flow

If you have determined that your facility **does** have a maximum monthly flow listed in the Part II permit application, make sure that flow is being used within the Chapter 94 reports.

Now let's assume that the Part II application does not list a maximum monthly design flow. DEP typically requires submittals of both Part I (NPDES) and Part II permit applications to establish this design flow for a facility. Typically, the annual average design flow and the organic design capacity remain the same.

How do you establish a maximum monthly flow for your facility? There are several approaches you can take. You can start with the maximum monthly flow that the facility needs based on Chapter 94 projected flows and determine if the facility can accommodate that flow rate. Or you can determine the maximum monthly flow rate for the existing facility assuming no modifications to the plant and compare that to projected flows.

Regardless of the approach you consider, it is recommended that you should consider first meeting with representatives from the



regional DEP office to discuss your objectives.

As an example, one approach is to conduct a hydraulic evaluation of the municipal wastewater facility and determine a peak flow for all pumps, pipes, weirs, etc. In other words, how much water can you physically push through the existing plant. This evaluation and the resulting hydraulic profile can ensure that the hydraulic gradient is adequate and the facility will not be flooded or backed up during the peak flow conditions.

Next, review existing flow data for the facility and develop ratios between annual average, maximum month, peak day, and peak hour flow rates. Apply these ratios to the peak flow developed during the hydraulic evaluation described above to determine a new peak day and maximum monthly design flows.

The loadings on the treatment units are then evaluated relative to the criteria and guidelines listed in the *Domestic Wastewater Facilities Manual* from DEP using these new flows - in essence, developing a new basis of design. For example, the maximum monthly design flow is used to determine clarifier surface overflow rates and minimum retention times for aeration basins. Peak day and peak hour design flows are used for determining adequate chlorine contact tank capacity, etc.

The resulting maximum monthly design flow may or may not be adequate for future flow rates projected in Chapter 94 reports. If not, the hydraulic evaluation will identify the bottleneck(s) and process unit limitations that will need to be modified.

One facility developed a maximum monthly flow that was needed to meet future flow projections. The hydraulic analysis identified two limitations: the chlorine contact and

aeration tank retention times were not long enough. The facility is choosing to switch to ultraviolet disinfection utilizing the existing chlorine contact tanks and will raise the water level in the aeration tanks by one foot to achieve proper detention time. With these two modifications, the new maximum monthly design flow was approved by DEP.

Another facility developed a maximum monthly flow as described above for the existing facility without considering any modifications. The maximum monthly flow was adequate for future projected flows. In fact, the evaluation did not determine the ultimate maximum flow rate which this facility can adequately treat on a monthly basis. Because of the physical complications in that facility, determining the highest maximum monthly flow rate would have required surveying, data collection during storm events, etc. Facility personnel believed that the maximum monthly design flow developed without the additional work using some conservative estimations was sufficient at this time and the additional effort was not required. DEP will allow the facility to decide at some future time, that a more intensive evaluation is needed.

This can be a confusing issue. There can even be different interpretations among DEP, engineers, and municipal officials. There are also impacts with dischargers that have reserve capacities with the municipality. Contact your consulting engineer or your local DEP representative if you have questions or are considering establishing a maximum monthly design flow for your facility and want additional information. You may also contact the author of this article, Jodi Reese at CET Engineering Services, by calling 1-800-238-3644 or send email to jreese@cet-inc.com.

This article was written based on our experience of establishing maximum monthly design flow rates for several municipal clients located in different DEP regional offices. If you would like to share your experiences, similar or different, possibly for a future newsletter, we would appreciate hearing from you.

Statewide Building Code Update

On November 10, 1999 Governor Ridge signed Act 45 of 1999, establishing a Uniform Construction Code, which is more commonly known as the Statewide Building Code. The Act is applicable to new construction, alteration, repair and occupancy of all buildings in the Commonwealth of Pennsylvania.

The Act provides for the adoption of the 1999 BOCA National Building Code, fourteenth edition for buildings and the International Fuel Gas Code (IFGC) for the installation of fuel gas piping systems and gas utilization equipment. One and two family dwellings that are not more than three stories in height shall have the option of being designed and constructed either in accordance with the International One and Two Family Dwelling Code, 1998 edition or in accordance with the requirements of the Uniform Construction Code. The residential building permit applicant must select their code option at the time of plan submission.

The Department of Labor & Industry has 180 days from the effective date of the Act to promulgate regulations adopting BOCA and IFGC. The Department must develop the regulations, which will include the development of a certi-

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fication program for building inspectors and third party agencies. They must also publish the proposed regulations in the Pennsylvania Bulletin, hold public hearings, respond to public comment, have the Independent Regulatory Review Commission and other required State agencies review the regulations. Upon the publishing of the final regulations in the Pennsylvania Bulletin, municipalities will have 90 days to adopt the Uniform Construction Code.

A more detail report on the Statewide Building Code can be found on our web site www.cet-inc.com under Technology Transfer/CET's Newsletter/July. Updates on developments in reference to the Statewide Building Code will also be posted on our web site. The full text of the Act 45 is available on the web at www.legis.state.pa.us under Session Information/Electronic Bill Room/Senate Bill 647.

Storm Sewer Systems May be Subject to NPDES Permitting

EPA recently announced that operators of regulated small municipal separate storm sewer systems (MS4s) may be required to obtain a National Pollutant Discharge Elimination System (NPDES) permit and develop a storm water management program designed to prevent harmful pollutants from being washed by storm water runoff into the MS4 (or from being dumped

directly into the MS4) and then discharged from the MS4 into local waterbodies.

The existing regulatory definition of an MS4 (40 CFR 122.26(b)(8)) is "a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

- (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created to or pursuant to State law)...including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges into waters of the United States.
- (ii) Designed or used for collecting or conveying storm water;
- (iii) Which is not a combined sewer; and
- (iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2."

In practical terms, operators of MS4s can include municipalities and local sewer districts, State and Federal departments of transportation, universities, hospitals, military bases, and correctional facilities.

Regulated small MS4s located in an "urbanized area" (UA), as defined by the Bureau of the Census, or located outside of a UA and brought into the program, on a case-by-case basis, by the NPDES permitting authority will be affected.

Readers are urged to review EPA's website found at <http://www.epa.gov/owm/sw/phase2/index.htm> and take steps to determine if they fall under the requirements of this new program.

EPWPCOA Forum set for April 26-27, 2000

Eastern PA Water Pollution Control Operators Assoc (EPWPCOA). 9th Annual Industrial Waste Pretreatment Forum sponsored by the Industrial Waste Committee of the Association. Co-sponsored by US-EPA Region III and PA DEP. Lantern Lounge, Myerstown, PA. This forum has been planned for the public sector and private industries that deal with pretreatment and pollution prevention issues. This is your opportunity to ask questions of the experts. For more information, contact EPWPCOA at 125 West Maple Avenue, Myerstown, PA 17067-1232; phone number (717) 866-4620; fax number (717) 866-6789.

CET would like to send you a 3-ring notebook that you can use to collect and organize your *etcetera* newsletters. Please contact Linda Bair, CET Huntingdon Office, at 1-800-643-8260 if you would like a notebook sent to you.

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