



DEPARTMENT OF  
**ECOLOGY**  
State of Washington

## **Guidance Manual**

### **Using NEWLL11.xlsm to Develop Local Discharge Limitations**

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# **Guidance Manual**

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## **Using NEWLL11.xlsm to Develop Local Discharge Limitations**

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# Section I    General Use of the Excel Workbook NEWLL11.xlsm

## **Description**

This workbook is a tool consisting of nine worksheets, which include visual basic subroutine modules and macros developed to run using the “Office 2007” edition of Microsoft’s Excel™ program. This edition supersedes earlier versions of this spreadsheet. If Ecology must update this program to maintain its functionality as the version of Microsoft’s Excel™ program used by Ecology changes, we will focus on maintaining the present features and format, avoiding changes significant enough to require corresponding updates to the user’s manual if possible. [Link to workbook.](#)

## **Use**

The purpose of this workbook is to help municipalities develop “technically based” limits for various types of pollutants (conservative, non-conservative, toxic, reactive, and conventional). Such limits address the threats such pollutants pose to their sewers and sewage treatment facilities. Use of this spreadsheet informs and automates the process as much as possible. However, it cannot replace a good understanding of the theory and practice of developing, codifying, and applying local limits.

## **Licensing**

This spreadsheet belongs to the citizens of the state of Washington who paid for its development. Staff of the Department of Ecology (Ecology) and municipalities in Washington State that operate Publicly Owned Treatment Works (POTWs) and consultants in their employ are the intended users and may freely use this tool. For any other use, please contact the Ecology Publications office to ensure authorization. Ecology does not authorize any private licensing or copyrighting of this spreadsheet in whole or part. Any use that builds upon this work must properly credit the State and be free to use and distribute.

## **Value**

Local limits that are “technically based” allow the pretreatment “Control Authority” (either Ecology or the delegated pretreatment program) to issue permits for discharges to the POTWs that appropriately limit pollutants and are legally defensible. Such limits are necessary to protect the POTW, its processes, sludges, and receiving waters.

## **Relationship to other guidance**

Ecology designed this spreadsheet as a tool for automating the calculations (to the extent possible) in keeping with Ecology’s policy on developing Local Limits. Please refer to that policy (and the references it cites) for background on how to determine pollutants of concern, do sampling, and employ local limits.

## **Relationship to prior editions**

This, the 11th edition, revises the discussion of how to use the workbook to develop limits for non-conservative pollutants (that is, those that biodegrade or volatilize), pollutants for which the POTW was designed to treat (for example BOD, TSS, and ammonia). This version drops “Inorganic Arsenic” from those metals that can be automatically selected. It completely replaced the spreadsheet on OSHA standards to reflect new state rules. It removed the Ecology spreadsheet for statistically determining a POTW’s monthly limits based on WQ criteria. It added a spreadsheet of Henry’s Law Constants for use in estimating appropriate limits to prevent explosions. It re-organized the charts in the Toxic-Explosive Limits workbook to include a summary table at the top. It includes a companion “example” spreadsheet completed for a (fictional) POTW “NEWLL11-Example” to illustrate some of the flexibility and utility of the workbook.

## **Relationship to the overall task of establishing local limits**

The spreadsheet is principally designed to calculate the maximum allowable limits for certain pollutants under specific presumptions, and to divide this loading among the “industrial” flows. It cannot replace good judgment or anticipate pollutants of concern. Ecology recommends POTWs also include limits for total fats, oils and greases (FOG), petroleum based FOG, pH, TSS, and oxygen demanding pollutants (BOD and ammonia). When receiving toxic and explosive pollutants, Ecology also recommends the POTW develop and codify limits for such pollutants. Ecology expects those using this spreadsheet will request Ecology approval of any new or modified local limits and that delegated pretreatment programs will follow the procedures for program modifications in 40 CFR 403.18. After approval, the municipality must codify the limits in a local ordinance to be enforceable.

## **Disclaimer**

Neither the author nor the Department of Ecology makes any claims as to the accuracy or the utility of this spreadsheet to a particular application. It is a complex tool that Ecology initially developed for internal use to simplify developing “technically based” local limits. While Ecology may require municipalities to develop local limits, we do not require any person to use this spreadsheet to accomplish that task. As a sophisticated tool that is periodically updated, it will doubtless have some bugs despite Ecology attempts to ensure its accuracy and utility. That said, Ecology cannot assume any responsibility for errors in the program or resulting from the use of misuse of this program. Ecology advises users of this spreadsheet to always double check the spreadsheet’s results with the formulas contained in EPA’s guidance manual on Local Limits. Users of this spreadsheet must have a good familiarity with the Excel® spreadsheet program

## **Details on contents**

The nine spreadsheets in the NEWLL11.xlsm workbook have distinctly different functions. The first four (below) are linked together and thus changes on one are reflected in the others. The other five are stand alone worksheets. This manual will show you how to enter data and interpret the results to get the most from this worksheet. Following sections will describe how to enter data into, or otherwise make full use of each of these spreadsheets.



These are the individual worksheets included in this workbook:

**Basic Data** – Enter basic information about the plant, which pollutants to develop limits for, and how to do the calculations.

**Sample Data** – Enter sample results from the influent, primary clarifier effluent, final effluent, biosolids, industrial, and ambient (receiving water) sampling data for pollutants of concern in the worksheet.

**Local Limits** – Make pollutant specific adjustments to how local limits are calculated including adjusting the flows over which pollutant loadings are distributed.

**POTW Limits** – Look up (in the lower section) and tabulate (in the upper section) limits that the POTW must meet for any pollutant not already listed and for which water quality criteria exist.

**Non-Conservative** – Separate worksheet describing the adjustments to make to the spreadsheet when dealing with non-conservative toxic pollutants.

**Conventional Poll Tool** – Separate worksheet for graphically showing the POTW's decisions on allocating their capacity for treating conventional pollutants, managing the POTW capacity as a resource, and limiting loadings to the POTW.

**Toxic-Explosive Limits** – Separate worksheet to tabulate limits to protect against explosions and vapor toxicity. It contains the formulas, methodology, and tabulated data for deriving such limits. It includes and expands on EPA's tables.

**RREL Henry's Law constants** – An unlinked table of reference data (including Henry's Law Constants and molar weights) gleaned from EPA Program RREL Treatability Database for use in the Toxic-Explosive Limits worksheet.

**WA-OSHA-STDS** – Unlinked table of exposure limits from WAC 296-841-20025 for use in the Toxic-Explosive Limits worksheet.

## **Before you start**

### **First**

Ecology's policy on developing local limits describes the general process for developing local limits. It describes how to do an initial screening, determine pollutants of concern, develop a sampling plan, document the basis for the limits proposed, propose limits to Ecology, and codify limits. This manual on using the spreadsheet does not cover these topics. Please refer to that policy and relevant texts such as Developing Local Limits (EPA, 2004) and Ecology's Guidance for Developing Quality Assurance Project Plans to get appropriate data for developing local limits. This manual presumes that you have properly sampled for all pollutants of concern and are ready to enter the data you have in order to develop local limits.

### **Second**

As a precautionary note, before entering any data, we advise saving an unaltered copy of the workbook and the workbook example in a safe location. While you will want to alter

(customize) the spreadsheet to accommodate your particular situation, many cells include references to other cells in other spreadsheets. If the content of the cell is a link to another cell, changing the contents will delete the link. Breaking the links in the linked sheets may compromise the accuracy or functionality of the workbook.

### **General methodology**

1. Review Local Limits policy and spreadsheet instructions. Coordinate your plans w/ Ecology.
2. Enter the basic information on the Basic Data sheet in the yellow color cells (default colors can vary, see detailed spreadsheet instructions if in doubt.).
3. Enter Monitoring Data (influent, primary effluent, final effluent and sludge) in Sample Data rows 14-18 for sample 1, rows 24-28 for sample 2, etc., for up to the last 20 samples.
4. Enter average ambient and industrial pollutant levels in Sample Data rows 9 and 10.
5. Refine how Local Limits calculates limits for each pollutant.
6. Refine the Local Limits worksheet to reflect pollutant specific decisions.
7. Enter Data in the Conventional Poll Tool tab for BOD, TSS, and Ammonia (see example).
8. Evaluate appropriate limits for toxic-explosive pollutants which may be discharged.
9. Compile limits and send this spreadsheet, the proposed ordinance, and a cover letter to Ecology.
10. Develop a plan for filling any data gaps and to periodically re-confirm limits are protective.

These ten steps are described in greater detail below.

### **Step 1: Review policy and instructions. Coordinate the plan**

It will be up to you (the proponent and author of the rationale for the proposed limits) to defend the local limits derived whether you use this spreadsheet tool or not. Therefore, you should obtain a good working knowledge of EPA's guidance, Ecology's policy, and the theories behind this spreadsheet before starting the process of developing local limits.

### **Step 2: Enter basic data about the POTW**

The information required in this first spreadsheet is largely self-explanatory. In general, you should use values that reflect the reasonable worst case situation, not the absolute worst case. For example, for the hardness of the receiving waters, if the minimum hardness is 25, but the minimum for any 7-day period is 35, then 35 may be a more appropriate value to use. This is because there are a number of variables involved, and if one were to take the *worst case* for each, the resulting limits would be protective of a situation that is not likely to ever actually occur. For flow to the POTW, use a low flow summer month, but for sludge production, an annual average is typically good enough. As far as the methodology for determining the local limits goes, understand that you can adjust the methodology for a particular pollutant in the Local Limits worksheet.

### **Step 3: Enter sampling data**

The second sheet for data entry is the Sample Data worksheet. This is used to enter data from sampling of the POTW's influent, primary clarifier effluent, final effluent, biosolids, receiving waters, and industries. It also has a space for recording the detection limit (for the liquid samples). Enter wastewater sample results in units of  $\mu\text{g/l}$ , and biosolids sample results as  $\text{mg/kg}$  (report biosolids on a dry weight basis). Rows 3-8 of the spreadsheet show the average and a statistical analysis of all non-blank data points. These values are used by the Local Limits worksheet. Placing a value or a "0" in the cell keys the program to include the cell in averaging and statistical analysis. So do not enter a "0" where there is no data. Just leave the cell blank in such cases to avoid skewing the data. (See Q&A section for how to handle non-detects.)

### **Step 4: Enter ambient and industrial concentrations**

For ambient (receiving water) monitoring and industrial pollutant concentrations, this spreadsheet has two rows (9 and 10) for entering the average concentrations. Due to the limits in how complicated the spreadsheet can be, the user must average the available data in a separate worksheet (you may add worksheets to the NEWLL11.xlsm workbook by clicking on the *insert worksheet* tab on the far right of the other worksheet tabs). The ambient and industrial concentrations are important to a defensible analysis. The concentration of each pollutant in receiving waters (row 9) can greatly affect the amount of loading available to the POTW, and hence the local limits.

The concentrations (and hence loadings) already discharged from industries (row 10) is also an important factor in developing a local limit. Entering this value allows the spreadsheet to properly attribute headworks loadings to existing industry and *domestic* sources. Presuming that existing industries are discharging at the same concentration rates as domestic sources can result in lower local limits than necessary. So while it can be justified as a conservative presumption, it may be worth the time and effort to collect actual data from industries on all pollutants for which local limits are being proposed.

### **Step 5: Refine how Local Limits calculates limits for each pollutant**

After choosing the general method of calculating local limits in the Basic Data worksheet (rows 35-39), and entering sampling data in the Sample Data worksheet, the Local Limits worksheet should be giving you a proposed local limits (row 77) for each pollutant of concern. In some cases you will receive error messages. At this point review the data in the Local Limits worksheet, evaluate the reason for any error messages, and decide whether to adjust the presumptions to allow the spreadsheet to yield a proposed limit. The most common error message is generated when you have not allowed the macros and visual basic subroutines to run on your computer (many times these features are turned off as the default to enhance workstation security). The second most common errors are sample data transcription errors. The third most common error is making inappropriate data processing choices (for example, if there is no sampling data for a pollutant, and you have selected [in Basic Data] to use actual sampling as a default). In such cases, you will need to change that choice for that particular pollutant (under the column for that pollutant and in the Local Limits worksheet rows 50-54)

## **Step 6: Refine the Local Limits worksheet to reflect pollutant specific decisions**

The *default* methodology (passed on from rows 35-39 of the Basic Data worksheet to rows 50–54 of the Local Limits worksheet) may not be appropriate for all pollutant limits. There may be good reasons for handling pollutants differently. For example, the POTW may want to allocate loadings for a particular pollutant (for example mercury) over a smaller flow base. To do this, locate the column in the Local Limits spreadsheet that corresponds to that pollutant (column L for mercury), find the cell which contains the *default* information (row 15 for industrial flow), and change the cell (L15) to the desired value.

Note that after doing this, the link to the original cell will be lost. So changing the *default* value for this parameter in the Basic Data worksheet will no longer alter that cell's value. The link can be restored by either consulting the original *template* spreadsheet or often by dragging the link from a cell adjacent to the left or right of the altered cell in the Local Limits worksheet.

You may also find that if you divide the available headworks loadings for a pollutant over the entire industrial flow base, you get a limit (applicable to all industries) that is not economically feasible for the industries which discharge the pollutant. Where you have monitoring that confirms certain high flow users are not discharging a pollutant and you have a control mechanism that would prohibit them from starting to do so, you can remove their flows from the flow base over which to divide the available loadings for that pollutant.

## **Step 7: Enter data in the conventional pollutant tab for BOD, TSS, and ammonia**

The NEWLL11 spreadsheet has a tab (Conventional Poll Tool) with some graphs for displaying and tracking loadings from different sources as a proportion of the POTW's total capacity. The NEWLL11-example.xlsm spreadsheet shows how a POTW might use these to assess where they are with respect to their allowable loadings and set loading allocations from which they can sell capacity to Significant Industrial Users (SIU's). Portioning out load allocations is a local decision, and thus this worksheet is primarily for the benefit of the local POTW. The POTW can divide its available loadings among industrial and domestic needs in any manner that assures its protection against an organic and hydraulic overload. Ecology expects the POTW will decide how much of its presently recognized loading capacity to earmark for domestic and industrial contributions, let Ecology know what these decisions are, and carefully manage its loadings within these constraints (in concert with Ecology). The POTW should describe what compensation is required for allotting an industry a flow and loading capacity (connection or capacity fees), and how payment for actual discharges (monthly bills) are assessed.

## **Step 8: Evaluate limits for toxic or explosive pollutants**

POTWs must develop limits for toxic or explosive pollutants to protect the public and their workers when such pollutants are likely to be discharged to them. The point of concern in such cases is where the discharge enters the public sewer system. So, unlike metals, setting limits for such pollutants doesn't involve estimating and dividing up a *maximum allowable headworks loading*. The example spreadsheet shows a table with limits for protection against toxic and explosive gases. This summary table lists pollutants of concern for a particular POTW based on its industries. It has column for the threshold limits gleaned from each of the two larger

reference tables (one for vapor toxicity, and one for explosivity), and a column for the proposed local limit (the more stringent). Looking up the threshold limits in the tables is fairly straight forward (and so we've tried to make these tables as large as possible). However, the process of developing limits *from scratch* requires knowledge of the equations contained in the spreadsheet that goes beyond this overview. In such cases, please read the 1992 EPA guidance manual *Guidance to Protect POTW Workers from Toxic and Reactive Gases and Vapors* Chapters 2-6 (50 pages total). Each Ecology regional office has a pretreatment engineer in the Water Quality program who can Email a scanned version of this manual to you.

### **Step 9: Compile limits and send the analysis, spreadsheet, and proposed ordinance to Ecology for approval**

To be legally defensible and have continuing utility, to author must document the thought process that the municipality uses to arrive at the limits it believes necessary to protect the POTW. The municipality should propose the local limits (with this supporting documentation) to Ecology. Important documentation includes:

- a. The overall strategy, including the sampling plan and data used.
- b. Site specific information used such as sample results, ambient (receiving water) data, harmful effects that may be from industries, and how to allocate the POTW's loading capacities.
- c. Presumptions made based on the information available.
- d. Decisions reached about which pollutants to limit and how to manage the available headworks loading capacity for each.
- e. The local limits which arose from the analysis.
- f. How the limits will be codified.
- g. The triggers are for revisiting the local limits (for example, increased loading by X% and every Y years).

Municipalities that are delegated to run pretreatment program must ensure that any revisions to their present local limits meet the requirements for program modifications described in federal rules at 40 CFR part 403.18. Municipalities required to develop local limits by their NPDES permit must follow the requirements for submittal of reports under that permit (for example, signature, certification, content).

### **Step 10: Develop a plan for filling any data gaps and periodically confirming that the limits provide the necessary protections to the POTW**

The ongoing maintenance of the local limits is an important, but often overlooked task. The POTW should make a note of the Maximum Allowable Headworks Loading (MAHL). This value is found on the Local Limits worksheet tab row 73. A good way to monitor changes is to track the mass of the pollutant in influent samples (concentration in the influent times flow on the date of sampling) and how this number changes each year. This value is found in row 65 of

this worksheet. If the loading being received at the POTW (indicated by sampling over the current year) increases in subsequent years and the proportion of the MAHL is significant, the POTW should investigate further. It may find that further controls are needed, or more sampling from trunk lines or industries for that pollutant is needed to find new or changed discharges.

## Common questions answered

### Can I develop local limits without sampling data?

The spreadsheet has a *default* mode that can be used where there is no sampling data, (in such case, just enter “N” in Basic Data rows 35, 38, and 39.) Such limits are better than nothing, but may meet the *technically based* standard, or fully protect the POTW. Therefore, such an approach should be used only as a stopgap measure or last resort. In this mode, the Local Limits worksheet calculates limits based upon assumed *typical* wastewater strengths and *typical* removal efficiencies. However, this doesn’t guarantee that the resultant local limits are protective of any particular POTW. Because each POTW is different, Ecology advises *always* using site specific sampling data and removal rates. The minimum recommended data set is eight (8) sample results (recommended regime is two consecutive days for four consecutive quarters).

### How do I handle non-detect data (in the Sample Data worksheet)

It often happens that metals are not detectable in the influent and/or effluent at a level that the laboratory is comfortable quantifying. How this situation is handled is critical to avoid skewing the data. The ideal situation is to avoid the situation altogether, which is why the most sensitive methods of sampling should always be used for initial sampling and less sensitive methods used only if initial sampling shows that a less sensitive method will do fine. For ambient monitoring, use of sensitive methods is doubly important because of the low concentrations anticipated. To obtain the best data and prevent false positive results, EPA has developed Method 1669 for sample collection at these low levels. This sample method also lists the appropriate companion *clean sample* analysis methods.

If you can’t avoid non-detects, here is how we suggest you handle them: When most of the data points (2/3 or more) produce quantifiable values in a data set, Ecology recommends considering the non-detect data points to be at the detection limit. Where a good share (1/3 to 2/3) of the data points are non-detects, Ecology recommends presuming these values are 1/2 the detection limit. Where most of the data points are non-detects (2/3 or more), it makes sense to try to find a more sensitive method. If you already were using the most sensitive method, Ecology recommends considering these to be “0” for purposes of developing local limits. Where both the influent and effluent values are “0” Ecology recommends throwing out the data point (not entering it in the spreadsheet at all). When over 2/3 of the influent and effluent data points are non-detects and there is a biosolids standard, you may wish to consider only that data. The spreadsheet estimates a local limit using the allowable proportional increase in biosolids as a measure of appropriate local limits. The results of this method of calculating local limits are shown on row 70 of the Local Limits spreadsheet, Limit Using Proportional Biosolids Increase.

In documenting the results of samples analyzed in order to develop local limits, describe how you decided to handle non-detects. Also, consider modifying the sample collection plan if, in initial sampling, neither influent nor effluent concentrations are detected. In such cases conduct subsequent sampling using a more sensitive method if possible. Where you switch to a more rigorous sampling and analysis protocol, it often makes sense to discard the previously collected data. In such cases, simply document this rationale.

### **Do I need to be concerned that the limits are total metals while the criteria are for dissolved metals?**

The Sample Data and Local Limits worksheets presume effluent limits for all metals except hexavalent chromium are expressed as total metals limits. This is because typically the limits on the POTW will be expressed as total metals as well due to the inability to predict with confidence what changes to the ions will occur after discharge to the receiving environment. Typically, hexavalent chromium limits are achievable when imposed as a total chromium limit. This is a conservative approach and saves doing both a hex-chrome and total chrome sample analysis.

The workbook can develop limits for metals or other pollutants for which a water quality standard applies to a specific form or ion. This is how standards for tri-butyl tin are implemented. Dissolved standards apply to cadmium, copper, lead, nickel, silver, and zinc, while cyanide has a similar *weak and disassociable* standard; however, rules for permitting presently require metals limits for these metals to be for the total metal. Therefore, local limits reflect this permitting methodology in establishing local limits as *total metal* limits. The process of developing a local limit supportive of a *dissolved* standard requires only sampling for the dissolved form. Enter the dissolved metal concentrations from influent and effluent sampling (and ambient monitoring) in the Sample Data worksheet instead of total metals.

### **Do I need monthly as well as daily local limits?**

This program calculates only daily limits. It uses the formulas in EPA's Technical Support Document for Water Quality based limits to derive daily limits that are protective of the water quality standards that would apply to an NPDES permit. Because a POTW with a toxic pollutant limit would have a daily limit, protection of violation of this daily limit with daily pretreatment standards is appropriate. Since some samples must be taken as grab samples (pH, O&G, cyanide, phenols), the Ordinance should clarify whether all grab samples are subject to local limits. Some approval authorities (states and EPA regions) have been proponents of also deriving and codifying monthly limits in addition to daily limits. In such cases, the POTW would have to presume some frequency of monitoring to apply this to the users.

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## Section II Equations Used to Determine Local Limits

Determining local limits by manual calculations is a multiple-step process. A spreadsheet, however, displays the results instantaneously based on the data entered. Therefore, it is important to enter all data before reviewing the answers yielded by this spreadsheet. Four of the spreadsheets are linked so data is transferred between them. These are Basic Data, Sample Data, POTW Limits, and Local Limits. The Local Limits worksheet receives key information used to derive local limits from the first three listed worksheets. These are the Basic Data worksheet (rows 3, 5, 7, 9, 13-21, 50-54, and 78), the POTW Limits worksheet (rows 24-26), and the Sample Data worksheet (rows 33-34, 37-39, 42-43). The Local Limits spreadsheet shows few intermediate calculations. It derives a local limit based on compliance with several criteria (rows 54-60), displays the lowest limit to line 77, subtracts the desired reserve (from Basic Data cell C40), and displays the result in line 78.

The spreadsheet uses the “Uniform Allocation Method” to derive local limits by uniformly distributing the allowable headworks loadings among the industrial flow base shown in Local Limits row 15. This value comes from Basic Data line 26 Industrial Flow by default, but for metals for which there are fewer sources, the industrial flows contributing a particular pollutant may be reduced for a specific pollutant. This alternative method of establishing local limits is known as the “contributing flows” methodology. In describing the rationale for the limits, you will need to describe which methodology was used, and the basis for the flows used. The contributing flows method is defensible when the POTW has collected sample data from users whose flows are not included in the flow base for a particular pollutant. The sample data needs to confirm that non-domestic dischargers other than those that comprise the flow base for this pollutant are *not* discharging the pollutant above domestic levels.

Another way to allocate available industrial loadings is on a mass basis. EPA promotes the use of mass based limits in its 2005 pretreatment streamlining rule, and the concept is gaining favor by aligning water conservation efforts with pretreatment oversight. This version (11) displays the loadings coming into and out of the POTW in rows 65-67, and the Maximum Allowable Industrial Loading (MAIL) on Local Limits row 74. This value would form the basis for a mass based allocation scheme. Applicable EPA manuals provide greater detail on how to develop mass based local limits. The POTW should properly document its methodology if pursuing this alternative. Understand, however, that mass based limits will require greater maintenance. Accordingly, Ecology will want to see, in proposals contemplating the use of mass-based limits, who will maintain these limits, how frequently they will be reviewed, and how the sufficiency of these limits will be evaluated.

### **Formulas 1-3: Maximum Allowable Headworks Loadings for compliance with Water Quality criteria, Activated Sludge Inhibition, and Anaerobic Digester Inhibition.**

In order to determine compliance with Water Quality Standards (and hence NPDES Permit limits), the spreadsheet uses several equations to determine the Maximum Allowable Headworks Loading (MAHL). The MAHL is the maximum loading of the pollutant that the POTW can accept and still maintain compliance with each of these criteria. EPA guidance lists the following formula as appropriate for this purpose:

**EPA Formula:**  $L_{IN} = (8.34) * [C_{CRIT} (Q_{STR} + Q_{POTW}) - (C_{STR} * Q_{STR})] / (1 - R_{POTW})$

Where:

- $L_{IN}$  = Allowable Influent Loading or Maximum Allowable Headworks Loading (MAHL)
- $C_{CRIT}$  = Water Quality Standard in mg/l (either acute or chronic standard)
- $Q_{STR}$  = Receiving stream (upstream) flow, in MGD
- $Q_{POTW}$  = Flow into the POTW, in MGD
- $C_{STR}$  = Receiving stream background level, mg/l
- $R_{POTW}$  = Removal efficiency across the POTW, as a decimal

However, EPA’s formula presumes the discharge is allowed to bring the entire receiving stream up to the point where it is at the criteria. Washington’s water quality standards allow using only a fraction of the receiving stream for dilution. So, to use this equation in Washington, we must replace  $Q_{STR}$  with  $Q_{POTW}$  multiplied by the acute or chronic mixing zone ratios (AMZR, or CMZR). Often, however, it is the Dilution Factor which is listed. These numbers are related. The mixing zone ratio is the dilution factor minus 1. Therefore, the AMZR = Acute Dilution Factor - 1 (DAF-1) and CMZR = Chronic Dilution Factor - 1 (DFC-1). The equation can also be expressed in terms of loadings:

**(Influent loading capacity) = conversion factor \* [(max loading)-(background loading)] / (proportion passing through the POTW)**

Expanding the equation:  $L_{IN} = [(8.34) * C_{CRIT} (Q_{STR} + Q_{POTW}) - (8.34) * (C_{STR} * Q_{STR})] / (1 - R_{POTW})$

replacing  $L_{IN} = [(8.34) * (C_{CRIT}) * (Q_{POTW} * (ADF-1) + Q_{POTW}) - (8.34) * (C_{STR} * Q_{POTW} * (ADF-1))] / (1 - R_{POTW})$

reducing yields for acute(a) and chronic(c) standards:

**1.  $L_{INa,c} = (8.34 * Q_{POTW}) * (C_{CRIT} * DF_{A,C} - C_{STR} * (DF_A - 1)) / (1 - R_{POTW})$**

Where the POTW has been given an effluent limit for a pollutant, the process of deriving the limit will already have accounted for the dilution ratios and background concentrations. Therefore, using an effluent limit is numerically much easier. Previously, there was a separate column for entering any POTW effluent limits. That was the subject for a lot of confusion. Here is what to do if the POTW has an effluent limit: Look in the Local Limit spreadsheet. Find the column for the pollutant. Check rows 24-26 to see if any of these three values is blank. If so, enter the POTW limit in that blank space, and enter the value of 1.0 for mixing zone ratio for that parameter. For example, if the POTW has a copper limit of .02 mg/l, enter .02 in cell J26 and 1 in cell J19. The corresponding local limit will appear in rows 57-59 of the Local Limits worksheet (depending on whether the POTW limit was substituted for the acute, chronic, or water quality criterion respectively). Mathematically, when using a value of 1.0 for the dilution factor, the allowable headworks loading is:

$$2. L_{INt} = (8.34 * Q_{POTW}) * (TSDVAL) / (1 - R_{POTW})$$

The following cross references show the terms using the labels used in the LOCLIM.xls spreadsheet visual basic code (as used in section IV).

DFa = ACUTEDF (acute dilution factor)

DFc = CHRONDF (chronic dilution factor)

QPOTW = POTWFLOW (The flow coming into the POTW)

C<sub>CRIT</sub> = ACUTELIM or CHRONLIM (acute or chronic criteria depending on the case)

C<sub>STR</sub> = BGCON (or “0” if BGLOAD = “N”) (background concentration)

R<sub>POTW</sub> = ACTREMRT (or BOOKREMRT if USEACTREM = “N”) (removal rate of the pollutant between the influent and effluent of the POTW)

TSDVAL = The equivalent effluent limit considering the desired confidence level, statistical variability, and mixing zone ratios. This number comes from the NPDES permit for the POTW.

### Activated sludge and anaerobic sludge digester inhibition levels

The following equation established the maximum allowable headworks loading for ensuring that the biological processes used in activated sludge/anaerobic sludge digestion processes are not disrupted and is based upon the minimum reported threshold inhibition levels.

Protection against activated sludge inhibition is important for the vast majority of POTWs that use a suspended bacteria population for treatment (including Membrane Bio-Reactors).

Secondary treatment plants such as trickling filter, biological contactors, and fixed film treatment systems may be more or less sensitive to specific pollutants. If you have such a plant, enter “O” for Other on Type of Plant, or disregard the resultant limits for protection of activated sludge processes.

### Equation 3

This equation calculates the influent loading at the inhibition threshold. Since activated sludge processes aren’t exposed to solids removed in the primary clarifier, the primary removal rate establishes the proportion of the influent loading that is seen in the secondary processes. If the POTW does not have primary clarifiers, a primary removal rate of 0% should be used in this equation. If you enter, in Sample Data, the same values in sample #1 for influent and primary clarifier effluent, this will show a 0% primary removal rate and it will pass this value to the Local Limits worksheet.

$$3. L_{IN(as, ad)} = \frac{8.34 * (C_{INH(as, ad)} * Q_{POTW})}{1 - R_{PRIM}}$$

Where:  $L_{INas,ad}$  = The maximum headworks loading which still protects against interference with activated sludge or anaerobic digester processes.  
 $C_{INH(ad)}$  = ADINHLIM; the influent concentrations corresponding to possible anaerobic sludge digestion inhibition.  
 $C_{INH(as)}$  = ASINHLIM; the influent concentration corresponding to possible activated sludge process inhibition.  
 $R_{PRIM}$  = ACTPRIM or BKPRIM if USEPRIREM = "N". This is the percentage of the pollutant that is removed across the primary clarifier (primary removal rate).

**Equation 4:** This equation converts the respective maximum allowable headworks loadings to equivalent Local Limits. It subtracts the domestic loading and then divides it by the industrial flows:

<b>4. <math>LL_{(a, c, h, ad, or as)} = (L_{IN(a,c,t, ad, or as)} - 8.34*(C_{DOM})*(Q_{POTW} - Q_{IND})) / (Q_{IND} * 8.34)</math></b>
--

Where:  $C_{DOM}$  = Domestic concentration of the pollutant. Value assigned by the spreadsheet is:

$C_{DOM}$  = AVEINFCON if USESAMDOM = "Y" and EXISTSOURCE = "N";  
 $C_{DOM}$  = EQDOMCON if USESAMDOM = "Y" and EXISTSOURCE = "Y";

and

$C_{DOM}$  = BOOKDOMCON when USESAMDOM = "N".

$Q_{IND}$  = INDFLOW

$LL_{(a, c, t, ad, or as)}$  = The local limit (in mg/l) obtained by dividing the available headworks capacity (in lbs) by pounds of industrial flow for either (a)cute, (c)hronic, or (h)uman health based limits. This limit is calculated in this manner for Acute, Chronic, and TSD limits.

**Equation 5**

The equations for deriving the maximum allowable headworks loadings and Local Limits based upon protecting beneficial biosolids uses were derived using the two methods described in this section (below). These formulas, (5-8), make the most of available biosolids data, which is ideal for developing limits for the protection of biosolids uses. As an added bonus, it allows the calculation of limits for non-conservative pollutants. The default way to calculate compliance with sludge limits is to presume that pollutants that are not exiting in the effluent are in the sludge. Using actual sludge concentrations is a more defensible approach and allows this spreadsheet to work for non-conservative pollutants as well. For reference, for protection of sludge quality, the EPA Local Limits manual uses the following formulas:

**For Conservative Pollutants:**

**For Non-Conservative Pollutants\*:**

<b>5a. <math>L_{HW} = \frac{(8.34)*(C_{SLCRIT})*(PS/100)*(Q_{SLDG})}{R_{POTW}}</math></b>	$L_{HW} = L_{INF} * \frac{C_{SLCRIT}}{C_{SLDG}}$
---	--

Where:

- $L_{HW}$  = Allowable influent loading, lbs/d
- $C_{SLCRIT}$  = Sludge disposal criterion, mg/kg dry sludge
- PS = Percent solids of sludge to disposal
- $Q_{SLDG}$  = Sludge flow to disposal, MGD
- $R_{POTW}$  = Removal efficiency across the POTW as a decimal
- $L_{INF}$  = POTW influent pollutant loading, lbs/d
- $C_{SLDG}$  = Pollutant level in sludge to disposal, mg/kg dry sludge

\* Page 3-11 of EPA's Guidance Manual on Development of Local Limits Under the Pretreatment Program

Sludges tend to *cook down* during digestion, and it's the final concentration after digestion that is limited. Because of this, the wasting rate ( $Q_{SLDG}$ ) is not the best representation of the mass of *final* sludge sent to disposal. To improve accuracy, we can substitute the dry sludge production rate in tons per day times a conversion factor (.002) for the sludge wasting rate. (Note, “.002” = 2,000 lb/ton divided by 1,000,000 ppm). This makes the same formula:

$$5b. L_{IN} = \frac{(C_{SLCRIT}) * (.002) * (Q_{DRYSLDG})}{R_{POTW}}$$

Where:

$C_{SLCRIT}$  = SLCONLIM, This is the concentration limit which the sludge must meet in parts per million. This value changes depending on whether the user chooses to meet Unrestricted or Ceiling Level sludge metals concentrations. It uses the concentration limits found in 40 CFR part 503 and 173-308-160 WAC tables 1 & 3.

$Q_{DRYSLDG}$  = SLPRODRT, This is the rate at which sludge is produced in U.S. tons per day on a dry weight basis. This information needs to correspond to the average POTW flow entered for the results to be meaningful. In the absence of any site specific data, the program will suggest, just to the right of basic data cells 31C&32C, a value that corresponds to 300 mg/l of sludge production times the influent flow rate (MGD) times 8.34 lb/gallon divided by 2000(lb/ton). This yields an answer in tons/day that is typical for many POTWs. If the value used is less than half or more than double the value suggested, please check it closely.

$R_{POTW}$  = ACTREMRT (or BOOKREMRT if USEACTREM = “N”) This is the average overall removal rate of pollutants through the entire POTW. This value is either the average as shown from sampling, or is taken from EPA estimates of average removal rates depending on how limits are selected to be computed.

### Equation 6 – Estimate of the Current Headworks Loading Implied by Biosolids Data

$$6. L_{CHW} = \frac{(C_{SL}) * (.002) * (Q_{DRYSLDG})}{R_{POTW}}$$

$L_{CHW}$  = Current Headworks Loading as indicated by sampling (row 66 of Local Limits)

$C_{SL}$  = SLCON; This is the average level of the pollutant in the sludge. When using sample data to compute local limits, this value will be the average sludge concentration. Otherwise, this value is 500 times the product of the book domestic concentrations, the book removal rate, and the total POTW flow divided by the dry sludge production rate. By this method, when multiplied out, the terms cancel out and the current headworks loading becomes equal to the book domestic concentration times the POTW flow (as in the previous equations).

**Equation 7 – Crediting the Present Loadings of Existing Sources** (“Credit Present Loading of Existing Sources (Y/N)” = Y) This equation reduces the influent concentration by an amount consistent with the industrial flows and concentration. The domestic concentration (row 25 of Local Limits) is reduced when “Y” is entered in row 51. Otherwise it’s simply the average influent level (row 38) or .

$$7) C_{EQDOM} = \frac{(Q_{POTW} * C_{INF}) - (Q_{IND} * C_{IND})}{Q_{POTW} - Q_{IND}}$$

$C_{EQDOM}$  = EQDOMCON: The equivalent domestic concentration after removing industrial flows and loadings from the headworks flow and loadings.

$C_{INF}$  = AVEINFCON: The influent concentration at the POTW as determined by sampling.

$C_{IND}$  = INDCON: The average concentration of industrial wastewater (Sample Data row 10).

When blank, the current industrial load will be presumed 0. This can lead to lower local limits that necessary. In systems with several users, use the flow weighted average concentration.

**Equation 8 – Estimating Local Limits (the below equation shows the formula based on protection of sludge quality)** Local Limits row 60). Local limits for protection against WQ criteria or inhibition are not shown, but use the same general methodology:

$$8) LL_{SL} = \frac{L_{IN} - (L_{CHW} - L_{IND})}{Q_{IND} * 8.34}$$

$LL_{SL}$  = Local limits for sludge protection

$L_{IN}$  = Maximum Allowable Headworks Loading (see equations 5a and 5b)

$L_{CHW}$  = Current headworks loading (see equation 6)

$L_{IND}$  = Industrial loading (=  $C_{IND} * Q_{IND}$ )

$Q_{IND}$  = Industrial flow base

## **Section III Visual Basic Formulas Used to Determine Local Limits**

This section shows the visual basic codes for seven functions (one on each page) that translate the above formulas into the format used by Excel®'s Visual Basic Translator. The functions each return the Local Limit that equates to protection of the POTW for one of the seven criteria. These formulas involve more than simply translating the above formulas because they allow the user several computational options. These include the option to use data from sampling, compensate for the fact that there are existing users that are discharging already, use removal rates from sampling, etc. The use of conditional branching dictates a number of simple intermediate code steps (which could be done in the Excel spreadsheet) or a more comprehensive visual basic statement. This spreadsheet uses the latter option for the more complex code.

To view or edit these formulas, open the Excel Workbook and then click on the Tools menu and pull the mouse arrow down to Macro and then from the six options select Visual Basic Editor. The Visual Basic editor window will then open up. If you don't have within this a smaller window that says Project - Newll6.xlw, then within the Visual Basic editor screen click on the View menu and then select Project Explorer. Click Newll6.xls to open the project, and double click on "Function" to open up the function module where the code resides. You may now edit the functions and when you exit if you save the worksheet, your work will be saved.

```

Function Acute(POTWFLOW, DOMFLOW, INDFLOW, ACUTEDF, ACUTELIM, ESTINDUSCON, BGCON,
EQDOMCON, BOOKDOMCON, AVEINFCON, ACTREMRT, BOOKREMRT, USESAMDOM, EXISTSOURCE,
INCLBGCON, USEACTREM)
  If ACUTELIM = "NA" Then
    Acute = "NA"
    GoTo 90
  End If

  If USESAMDOM = "Y" Or USESAMDOM = "y" Then
    GoTo 20
  Else
    GoTo 30
  End If

20  If EXISTSOURCE = "Y" Or EXISTSOURCE = "y" Then
    DOMCON = EQDOMCON
    GoTo 40
  Else
    DOMCON = AVEINFCON
    GoTo 40
  End If

30  DOMCON = BOOKDOMCON

40  If INCLBGCON = "Y" Or INCLBGCON = "y" Then
    BGLOAD = (ACUTEDF - 1) * BGCON
  Else
    BGLOAD = 0
  End If

50  If USEACTREM = "Y" Or USEACTREM = "y" Then
    REMRATE = ACTREMRT
  Else
    REMRATE = BOOKREMRT
  End If

60  MAXACUTELOAD = (8.34 * POTWFLOW * (ACUTEDF * ACUTELIM - BGLOAD)) / (1 - REMRATE)

70  CURRENTLOAD = 8.34 * DOMCON * (POTWFLOW - INDFLOW)

80  If MAXACUTELOAD <= 0 Then
    Acute = 0
  Else
    Acute = (MAXACUTELOAD - CURRENTLOAD) / (INDFLOW * 8.34)
  End If
90
End Function

```



Function Chronic(POTWFLOW, DOMFLOW, INDFLOW, CHRONDF, CHRONLIM, ESTINDUSCON, BGCON, EQDOMCON, BOOKDOMCON, AVEINFCON, ACTREMRT, BOOKREMRT, USESAMDOM, EXISTSOURCE, INCLBGCON, USEACTREM)

```
If CHRONLIM = "NA" Then
  Chronic = "NA"
  GoTo 90
End If
```

```
If USESAMDOM = "Y" Or USESAMDOM = "y" Then
  GoTo 20
Else
  GoTo 30
End If
```

```
20  If EXISTSOURCE = "Y" Or EXISTSOURCE = "y" Then
    DOMCON = EQDOMCON
    GoTo 40
    Else
    DOMCON = AVEINFCON
    GoTo 40
    End If
```

```
30  DOMCON = BOOKDOMCON
```

```
40  If INCLBGCON = "Y" Or INCLBGCON = "y" Then
    BGLOAD = (CHRONDF - 1) * BGCON
    Else
    BGLOAD = 0
    End If
```

```
50  If USEACTREM = "Y" Or USEACTREM = "y" Then
    REMRATE = ACTREMRT
    Else
    REMRATE = BOOKREMRT
    End If
```

```
60  MAXCHRONLOAD = (8.34 * POTWFLOW * (CHRONDF * CHRONLIM - BGLOAD)) / (1 - REMRATE)
```

```
70  CURRENTLOAD = 8.34 * DOMCON * (POTWFLOW - INDFLOW)
```

```
80  If MAXCHRONLOAD <= 0 Then
    Chronic = 0
    Else
    Chronic = (MAXCHRONLOAD - CURRENTLOAD) / (INDFLOW * 8.34)
    End If
```

```
90
```

```
End Function
```

Function TSDlim(POTWFLOW, DOMFLOW, INDFLOW, CHRONDF, TSDVAL, ESTINDUSCON, BGCON, EQDOMCON, BOOKDOMCON, AVEINFCON, ACTREMRT, BOOKREMRT, USESAMDOM, EXISTSOURCE, INCLBGCON, USEACTREM)

```
If TSDVAL = "NA" Then
  TSDlim = "NA"
  GoTo 90
End If
```

```
If USESAMDOM = "Y" Or USESAMDOM = "y" Then
  GoTo 20
Else
  GoTo 30
End If
```

```
20  If EXISTSOURCE = "Y" Or EXISTSOURCE = "y" Then
    DOMCON = EQDOMCON
    GoTo 40
  Else
    DOMCON = AVEINFCON
    GoTo 40
  End If
```

```
30  DOMCON = BOOKDOMCON
```

```
40  If INCLBGCON = "Y" Or INCLBGCON = "y" Then
    BGLOAD = 0
  Else
    BGLOAD = 8.34 * (CHRONDF - 1) * BGCON * POTWFLOW
  End If
```

```
50  If USEACTREM = "Y" Or USEACTREM = "y" Then
    REMRATE = ACTREMRT
  Else
    REMRATE = BOOKREMRT
  End If
```

```
60  MAXTSDLOAD = (8.34 * ((TSDVAL * POTWFLOW) + BGLOAD)) / (1 - REMRATE)
```

```
70  CURRENTLOAD = 8.34 * DOMCON * (POTWFLOW - INDFLOW)
```

```
80  If MAXTSDLOAD <= 0 Then
    TSDlim = 0
  Else
    TSDlim = (MAXTSDLOAD - CURRENTLOAD) / (INDFLOW * 8.34)
  End If
```

```
90
End Function
```

Function Sludge(TYPELIM, POTWFLOW, INDFLOW, SLPRODRT, CLASACON, CEILCON, ESTINDCON, EQDOMCON, BOOKDOMCON, AVESLCON, AVEINFCON, ACTREMRT, BOOKREMRT, USESAMDOM, EXISTSOURCE, INCLBGCON, USEACTREM)

```
10 If CEILCON = "NA" Then
    Sludge = "NA"
    GoTo 110
End If

15 If USESAMDOM = "Y" Or USESAMDOM = "y" Then
    DOMCON = EQDOMCON
    SLCON = AVESLCON
    HWCON = AVEINFCON
    Else
    DOMCON = BOOKDOMCON
    SLCON = (8.34 * 1000000 * BOOKDOMCON * BOOKREMRT * POTWFLOW) / (SLPRODRT * 2000)
    HWCON = BOOKDOMCON
    End If

20 If EXISTSOURCE = "Y" Or EXISTSOURCE = "y" Then
    INDCON = ESTINDCON
    Else
    INDCON = 0
    End If

30 If TYPELIM = "A" Or TYPELIM = "a" Then
    SLCONLIM = CLASACON
    Else
    SLCONLIM = CEILCON
    End If

40 INFLOAD = 8.34 * POTWFLOW * HWCON

50 MAXSLLOAD = (SLCONLIM * SLPRODRT * 0.002)

60 CURRSLLOAD = SLCON * SLPRODRT * 0.002

70 DOMLOAD = 8.34 * POTWFLOW * DOMCON

80 If USEACTREM = "Y" Or USEACTREM = "y" Then
    REMRATE = CURRSLLOAD / INFLOAD
    Else
    REMRATE = BOOKREMRT
    End If

90 If EXISTSOURCE = "Y" Or EXISTSOURCE = "y" Then
    INDSLLOAD = CURRSLLOAD * ((INDFLOW * INDCON) / ((INDFLOW * INDCON) + (POTWFLOW *
DOMCON)))
    Else
    INDSLLOAD = 0
    End If

100 If MAXSLLOAD <= 0 Then
    Sludge = 0
    Else
    Slhwload = (MAXSLLOAD - (CURRSLLOAD - INDSLLOAD)) / REMRATE
    Sludge = Slhwload / (INDFLOW * 8.34)
    End If
110 End Function
```

Function ASInhib(POTWTYPE, POTWFLOW, INDFLOW, ASINHLIM, ESTINDCON, EQDOMCON, BOOKDOMCON, AVEINFCON, ACTPRIREM, BKPRIREM, USESAMDOM, EXISTSOURCE, USEPRIREM)

```
2  If ASINHLIM = "NA" Then
    ASInhib = "NA"
    GoTo 100
End If

5  If POTWTYPE = "A" Or POTWTYPE = "a" Then
    GoTo 10
Else
    ASInhib = "NA"
    GoTo 100
End If

10 If USESAMDOM = "N" Or USESAMDOM = "n" Then
    GoTo 30
End If

20 If EXISTSOURCE = "Y" Or EXISTSOURCE = "y" Then
    DOMCON = EQDOMCON
Else
    DOMCON = AVEINFCON
End If
GoTo 40

30  DOMCON = BOOKDOMCON

40  If USEPRIREM = "Y" Or USEPRIREM = "y" Then
    REMRATE = ACTPRIREM
Else
    REMRATE = BKPRIREM
End If

MAXASLOAD = (8.34 * ASINHLIM * POTWFLOW) / (1 - REMRATE)

CURRENTLOAD = 8.34 * DOMCON * (POTWFLOW - INDFLOW)

90  If MAXASLOAD <= 0 Then
    ASInhib = 0
Else
    ASInhib = (MAXASLOAD - CURRENTLOAD) / (INDFLOW * 8.34)
End If

100 End Function
```

Function Digestor(DIGTYPE, POTWFLOW, INDFLOW, DIGFLOW, ADINHLIM, ESTINDUSCON, EQDOMCON, BOOKDOMCON, AVEINFCON, ACTREMRT, BOOKREMRT, USESAMDOM, EXISTSOURCE, USEACTREM)

```
2  If ADINHLIM = "NA" Then
    Digestor = "NA"
    GoTo 100
End If

5  If DIGTYPE = "Y" Then
    GoTo 10
Else
    Digestor = "NA"
    GoTo 100
End If

10 If USESAMDOM = "N" Or USESAMDOM = "n" Then
    DOMCON = BOOKDOMCON
    GoTo 40
End If

20  If EXISTSOURCE = "Y" Or EXISTSOURCE = "y" Then
    DOMCON = EQDOMCON
    GoTo 40
    Else
    DOMCON = AVEINFCON
    GoTo 40
    End If

40  If USEACTREM = "Y" Or USEACTREM = "y" Then
    REMRATE = ACTREMRT
    Else
    REMRATE = BOOKREMRT
    End If

60  MAXDIGLOAD = (8.34 * ADINHLIM * DIGFLOW) / REMRATE

70  CURRENTLOAD = 8.34 * DOMCON * (POTWFLOW - INDFLOW)

90  If MAXDIGLOAD <= 0 Then
    Digestor = 0
    Else
    Digestor = (MAXDIGLOAD - CURRENTLOAD) / (INDFLOW * 8.34)
    End If

100 End Function
```

Function HHealth(POTWFLOW, DOMFLOW, INDFLOW, HHlthDF, HHlthLIM, ESTINDUSCON, BGCON, EQDOMCON, BOOKDOMCON, AVEINFCON, ACTREMRT, BOOKREMRT, USESAMDOM, EXISTSOURCE, INCLBGCON, USEACTREM)

```
If HHlthLIM = "NA" Then
  HHealth = "NA"
  GoTo 90
End If
```

```
If USESAMDOM = "Y" Or USESAMDOM = "y" Then
  GoTo 20
Else
  GoTo 30
End If
```

```
20 If EXISTSOURCE = "Y" Or EXISTSOURCE = "y" Then
  DOMCON = EQDOMCON
  GoTo 40
  Else
  DOMCON = AVEINFCON
  GoTo 40
  End If
```

```
30 DOMCON = BOOKDOMCON
```

```
40 If INCLBGCON = "Y" Or INCLBGCON = "y" Then
  BGLOAD = (HHlthDF - 1) * BGCON
  Else
  BGLOAD = 0
  End If
```

```
50 If USEACTREM = "Y" Or USEACTREM = "y" Then
  REMRATE = ACTREMRT
  Else
  REMRATE = BOOKREMRT
  End If
```

```
60 MAXHHLOAD = (8.34 * POTWFLOW * (HHlthDF * HHlthLIM - BGLOAD)) / (1 - REMRATE)
```

```
70 CURRENTLOAD = 8.34 * DOMCON * (POTWFLOW - INDFLOW)
```

```
80 If MAXHHLOAD <= 0 Then
  HHealth = 0
  Else
  HHealth = (MAXHHLOAD - CURRENTLOAD) / (INDFLOW * 8.34)
  End If
```

```
90 End Function
```

# Section IV Detailed Explanation of the Spreadsheet

Basic Data Rows 19-22 (below) are translated to Local Limits rows 2-5

Name of Facility: _____	(self explanatory)
Point of Contact: _____	
Person Entering Data: _____	
Reviewer: _____	
<b>GENERAL INFORMATION:</b>	
Receiving Water Hardness (if fresh)	19 <----- Number must be between 25 and 400
(M)arine, (F)resh, or (B)oth Discharges	20 <----- Enter only letters "M", "F", or "B"
Sludge: Class A (A) or (C)eiling level	21 <----- Enter only letters "A" or "C"
Plant: (A)ctivated sludge or (O)ther	22 <----- Enter only letters "A" or "O"

**Cell C19:**

- ENTER: The hardness of the receiving water immediately upstream of the discharge.
- IMPORTANCE: Several freshwater metals standards vary based on the receiving water hardness.
- HOW DETERMINED: Hardness varies with flow volume and season. If known, enter the hardness at the critical flow condition. If a range of hardness is known, you may enter an average value. Receiving water hardness is typically higher at the critical low flow condition, and pollutants limits are lower at lower hardness values.
- HOW USED: This data is passed to a spreadsheet which computes the actual water quality limits for the receiving water, which are returned to lines 19 and 20.

**Cell C20:**

- ENTER: The receiving water type based on salinity.
- IMPORTANCE: Water quality limits for metals differ for fresh water and salt water.
- HOW DETERMINED: Enter "F" for receiving water salinity at or below 1 part per thousand 95% of the time. Enter "M" when receiving water salinity is at or above 10 parts per thousand 95% of the time. Enter "B" if the receiving water salinity falls between these two standards.
- HOW USED: This information is passed to a spreadsheet which along with the information in box 1 returns the appropriate water quality standard. For "B" discharges, the lower limit is returned.

**Cell C21:**

- ENTER: Whether the intended sludge requires the sludge to meet class A biosolids metals concentrations (unrestricted use) or ceiling level concentrations (for loading based applications).
- IMPORTANCE: Local limits must be protective of the intended beneficial uses of biosolids. Since the standards vary depending on the intended biosolids use, this box allows the use to be input.
- HOW DETERMINED: Based upon the POTW's biosolids management plan, or other related biosolids use plan or permit issued pursuant to 40 CFR part 503.
- HOW USED: The data input here selects whether line 24 (class A standards) or line 25 (ceiling concentration standards) is used in developing local limits protective of biosolids uses.

**Cell C22:**

- ENTER: Whether the plant is activated sludge "A" or something else "O".
- IMPORTANCE: This is used to determine whether local limits must also protect against activated sludge inhibition.
- HOW DETERMINED: If you are unsure, contact the POTW or review the facility engineering report.
- HOW USED: In Part VII an "Activated Sludge Inhibition" local limits value is returned if box 4 is "A".

“Basicdata” Rows 12-20 (below) are translated to “Loclimit.xls” rows 9-17, but may be edited for particular pollutants

Total Plant Flow (in MGD)	<b>C24</b>	<----- For flows typically the most critical situation (one that yields the lowest local limits) is the lowest flow month, but run several scenarios if there is any doubt. Adopt the lowest limits.
Domestic Flow (in MGD)	<b>C25</b>	<----- From NPDES Permit Fact Sheet
Industrial Flow (in MGD)	<b>C26</b>	<----- From NPDES Permit Fact Sheet
Infiltration/Inflow (by subtraction)		<----- Enter Chronic DF if not otherwise determined
Acute Dilution Factor	<b>C28</b>	<----- recommend: 0.015 MGD @ 2% solids
Chronic Dilution Factor	<b>C29</b>	<----- recommend: 1.251 T/D
Dilution Factor for Human Health Based WQ	C30	
Digester Flow (in MGD)	<b>C31</b>	
Dry Sludge Production Rate (US Tons/day)	<b>C32</b>	

**Cell C24:**

- ENTER: The average dry weather monthly POTW flow
- IMPORTANCE: Local limits are based upon the available headworks loadings for non-domestic dischargers. When POTW flows at critical conditions are entered, the local limits will protect the POTW from pass through when these conditions occur.
- HOW DETERMINED: Flow volume varies seasonally. If known, enter the average POTW flow during low flow months. When doing a “what if” analysis for determining limits when POTW flow reaches design flow, ensure that Industrial flows are appropriately increased as well.
- HOW USED: This flow volume is used to determine the maximum headworks loadings that can enter the POTW based upon protection of water quality, interference, and sludge protection.

**Cell C25:**

- ENTER: The domestic flows which correspond to the POTW flow entered in box 1.
- IMPORTANCE: Accurately partitioning POTW flows into Domestic, Industrial, and I&I is important since each has a different level of pollutants. I&I flows are assumed to not have pollutant loadings. If this is known or suspected to be the case, include I&I flows as domestic flows.
- HOW DETERMINED: The lowest flow period at the POTW during the last year, (assuming negligible I&I) minus industrial sources should closely approximate the current domestic loading.
- HOW USED: The headworks loading from domestic sources is based on this number times the domestic pollutant concentration (known or assumed), and a conversion factor (pounds per gallon) to produce a loading in pounds. The available headworks loading is reduced by this amount to yield the headworks loading available for non-domestic sources.

**Cell C26:**

- ENTER: The total of all known or Permitted non-domestic flow rates.
- IMPORTANCE: This establishes the flow over which to divide the available headworks loading for each pollutant. Local limits are protective for this volume of industrial discharge of each pollutant.
- HOW DETERMINED: Discharge permits typically include discharge flow and specific pollutant limits. Use each industry’s maximum permitted flow rate even if industries typically discharge at less than this level unless provisions limiting the discharge during critical periods for the POTW. This number may be entered separately for each pollutant (for limits based on contributory flow). For example: if only one industry discharges Cadmium, this box in the Cadmium column may contain only this discharger’s flow volume. The resulting local limit would be protective of the POTW only when this was the only source of Cadmium, and if/when another User began discharging Cadmium, the limit would no longer be protective of the POTW.
- HOW USED: This variable is used by the functions which compute local limits as the volume of flow over which available headworks loading is divided.



**Cell C28:**

- ENTER: Acute Dilution Factor
- IMPORTANCE: In determining water quality based limits, this factor determines the amount of dilution afforded at the point where the effluent must meet acute water quality standards.
- HOW DETERMINED: The NPDES Permit for the POTW will specify this number. In new construction, or increased flow over previous permits, the Department will develop this number.
- HOW USED: This number is combined the acute water quality limit on the first line of part III and the background concentration to derive the maximum allowable pollutant concentration in the effluent which the POTW must meet.

**Cell C29:**

- ENTER: Chronic Dilution Factor
- IMPORTANCE: This factor determines the amount of dilution afforded to the effluent at the point where it must meet chronic water quality standards.
- HOW DETERMINED: This number, like the acute dilution factor, is determined by the NPDES permit writer using computer modeling. It is technically the inverse of the percent of the effluent in the stream flow at the edge of the mixing zone during critical (7Q10) conditions.
- HOW USED: The use of this number is analogous to how the acute dilution factor (above) is used.

**Cell C30:**

- ENTER: Chronic Dilution Factor
- IMPORTANCE: This factor determines the amount of dilution afforded to the effluent at the point where it must meet quality standards for protection of human health for carcinogen or non-carcinogen effects. When handling both carcinogens and non-carcinogens, address a particular pollutant by editing row 15 of the "Loclimit.xls" worksheet.
- HOW DETERMINED: This number is determined by the NPDES permit writer using computer modeling and is the inverse of the percent of the effluent in the stream flow at the edge of the mixing zone during conditions applicable to human health based WQ stds (30Q5) conditions. If unknown, it is acceptable to use the Chronic Dilution Factor.
- HOW USED: The use of this number is analogous to how the acute and chronic dilution factors (above) are used.

**Cell C31:**

- ENTER: Digester flow in MGD during the flow conditions used in boxes 1-3.
- IMPORTANCE: Pollutants partition in the primary clarifier and only a portion pass into the activated sludge process train. This number is used to account for this partitioning.
- HOW DETERMINED: The POTW records, or design dry weather digester flow estimates from the facility's engineering report. If you don't have a clue about what this is, the cell to the right has a suggested value @ 2% solids
- HOW USED: This number is passed to the local limits calculations in part VI.

**Cell C32:**

- **ENTER:** Sludge volume produced in dry US tons per day.
- **IMPORTANCE:** This number is critical in determining what volume of pollutants is captured by the biosolids. Since metals which enter the POTW in the influent must either leave by way of the biosolids or the effluent, a mass balance between the influent and biosolids can indicate the effluent concentrations. The sludge concentrations can also be used to determine both influent and effluent concentrations by assuming a removal rate (the typical percentage of the metal which partitions into the sludge at a similar POTW). This should be done only when the most sensitive sampling and analysis methods cannot detect the pollutant in the influent.
- **HOW DETERMINED:** This is determined by POTW's records, and normalized for a single day. If you don't have a clue what this is, the cell to the right has a suggested value @ 300 mg/L removed solids per day (shown here @ 1mgd).
- **HOW USED:** The spreadsheet uses this number in Part VII and Part VIII to evaluate how well the data correlates to influent and effluent sample results and typical removal rates.

<b>Default Method for Calculating Limits*</b>		
Sampling Data Available (inf, eff, sludge) (Y/N)	<b>C35</b>	<--- "Y" if sampling data available, otherwise defaults presumed
Credit present loading of existing sources (Y/N)	<b>C36</b>	<-- reduce influent to domestic using "loclimit.xls" row 28
Adjust for receiving water pollution (Y/N)	<b>C37</b>	<-- requires receiving water data in "loclimit.xls" row 29
Use Observed Overall Removal Rate (Y/N)	<b>C38</b>	<-- Always say "Y" if good data available from the POTW
Use Observed Primary Removal Rate (Y/N)	<b>C39</b>	<-- If primary effluent sample data is obtained say "Y"
Fraction of Loading Capacity held in reserve	<b>C40</b>	<-- Enter .1 for 10%, etc.

\* **Customize as needed for specific pollutants at "LOCLIMIT.XLS" Rows 45-49**