HEADWORKS ANALYSIS

WORKSHOP

[Updated 1/2017]

DWR
Division of Water Resources

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Workshop Overview

- Data Needed For Headworks Analysis
- Steps For Headworks Analysis
- Documents Needed to Submit Headworks Analysis

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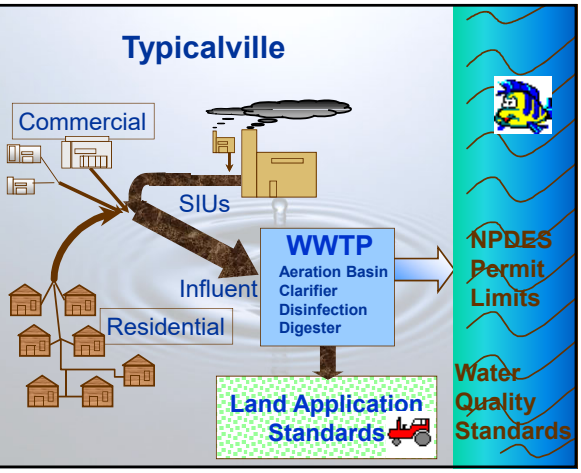
Typicalville



Data Needed For HWA

- Determine HWA Data Time Period
- DMR & Long/Short Term Monitoring Data
- NEW Site-Specific Water Quality Standards
- POTW Design Data for Conventional Pollutants
- SIUs Load To POTW
- Uncontrolled Load To POTW
- Sludge Data

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Define HWA Time Period

Based on number of influent and effluent data sets for the least frequently sampled Pollutant of Concern (POC)

Division approved LTMP/STMP defines:

- Proper sampling locations
- Proper pollutants of concern
- Correct detection levels
- Frequencies

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Full Programs HWA Time Period: Long Term Monitoring Plan

To provide adequate data set for HWA:

- Need at least 12 sets of influent and effluent data for least sampled POC -
  - Quarterly sampling data for 3 years

    OR
  - Monthly sampling data for 1 year
- Once define period, use all available data for entire 1 or 3 years, including DMR data

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Modified Programs HWA Time Period Short Term Monitoring Plan

To provide adequate data set for HWA:

- Need at least 4 sets of influent and effluent data for least sampled POC
  - Quarterly sampling data for 1 year
    - To cover all seasons
- Once define period, use all available data for entire 1 year, including DMR data

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Steps For Headworks Analysis

- Gather POTW General NPDES Information
- Collect POTW Design Information
- Calculate Plant Removal Rates
- Determine Site-Specific WQS NEW
- Calculate Allowable Pass Through Load
- Calculate Allowable Biological Inhibition Load
- Calculate Allowable Load Using Sludge Criteria
- Develop Maximum Allowable Headworks Load
- Calculate SIUs Load to POTW
- Evaluate Uncontrolled Load to POTW
- Determine Maximum Allowable Industrial Load
- Allocate SIU Local Limits

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Review HWA spreadsheet: Info from NPDES Permit

- **In General Info Section of HWA Tab 3-A, page 2**
  - **NPDES Permit Number – Cell C4**
    - **Tab 3-B, page 12**
  - **NPDES Permitted Flow - Cell C7**
    - **Tab 3-B, page 13 & 14**
  - **Stream Classification – Cell C11**
    - **Tab 3-B, page 13**

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Review HWA spreadsheet: Info from Program Info Sheet

- Tab 3A Page 2
- 7Q10 – in mgd – Cell C10
  - Tab 3-B, page 15
  - Can also find in NPDES fact sheet or from NPDES unit, but will be in cubic feet per second --- must convert to mgd.
    cfs * 0.646 = mgd
- Verify Program Info sheet has correct NPDES Permit Number, Permitted Flow, and Stream Classification

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POTW Removal Rates

What Do I Need To Calculate Removal Rates?

- **<u>All</u> DMR and LTMP/STMP data for HWA time period**
- **Removal Rate Equation**
- **Literature Removal Rates**

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Plant Removal Rates Calculation

Removal Rate equation:

Using unpaired sampling data

Mean Removal Rate, RR = $((C_I - C_E)/ C_I) * 100$

RR = Removal Rate, %

C_I = Average Influent Concentration, mg/l

C_E = Average Effluent Concentration, mg/l

Methodologies:

Unpaired sampling (Division recommends)

Paired sampling

Decile approach

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Plant Removal Rates Calculation

- **Use DMR data - Tab 3-B, pages 16 and 17**
  - **To calculate average POTW flow**
  - **To calculate average influent and effluent of BOD, TSS, and any other available pollutants**
  - **If have Below Detection Level (BDL) data…**
    - **and that BDL was treated as zero when calculating DMR Monthly Ave….**
    - **must recalculate DMR Monthly Average using ½ detection level**

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Plant Removal Rates Calculation

- **Tab 3-B, pages 16 and 18**
- **Use LTMP/STMP data for rest of metals and other POCs:**
  Tab 3-B, pages 16 and 18
  - **Non-NPDES limits page POCs**
  - **Influent**
- **If Below Detection Level (BDL) data, enter "<" sign in "<" column, and detection level in other cell**

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Removal Rate Calculations

- Enter data for every month and every LTMP/STMP sample for the whole HWA Data Time Period
- If update spreadsheet as receive LTMP/STMP results each quarter:
  - less typing at HWA time
  - verify met LTMP/STMP Detection Levels (DLs)… …and get sample re-analyzed before lab tosses sample
  - can review trends in data, outliers, etc.

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When Do I Use Literature RRs?

- More than 50% of data collected is below detection level
- Small or a misrepresentative data set
- Any Questions? Call PERCS or Consult *The Comprehensive Guidance for Pretreatment Programs in North Carolina*, Chapter 5, Section 5-D, page 1

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Review HWA spreadsheet

- **Tab 3-A, page 2**
- **Average POTW Flow in cell C8**
- **Removal Rates in column C**
- **Removal Rate Sources in column D**

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- Removal Rate Guidance in Tab 1 of your Manual
- Unit Conversion Guidance in Tab 1 of your Manual

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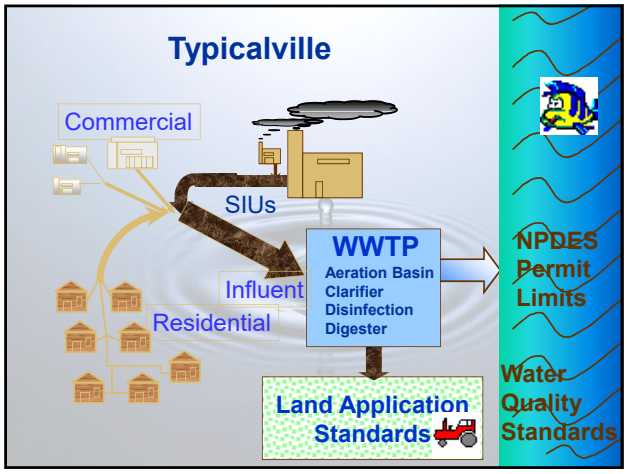

Three Limiting Criteria for Developing Maximum Allowable Headworks Load

1. Pass Through
   a. NPDES Limit
   b. NC-Water Quality Standard
   c. Design
2. Biological Processes Inhibition
   a. Activated Sludge/Nitrification Inhibition
   b. Anaerobic Digester Inhibition
3. Sludge Quality - 503 Regulations
   a. Land Application
   b. Incinerator
   C. Landfill

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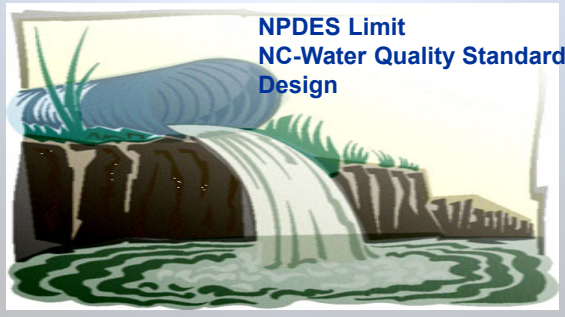
Pass Through Criteria



NPDES Limit
NC-Water Quality Standard
Design

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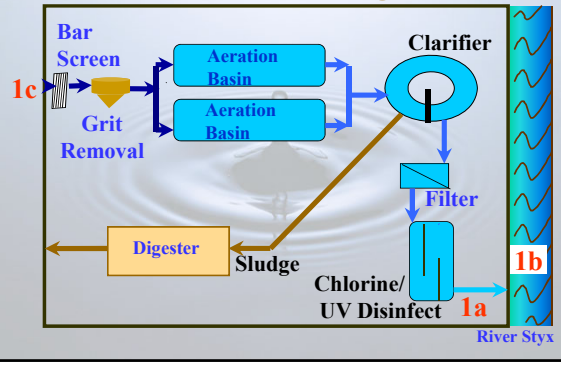
Limiting Criteria Pass Through



What Do I Need To Calculate Pass Through Allowable Headworks Load (AHL)?

- Current NPDES Permit – Tab 3-B, pages 12-14
  - Which parameters are limited?
  - New NPDES limits expected/drafted?
- NC-Water Quality Standards -
  - All parameters not limited in your NPDES
  - Receiving Stream Classification
- Pass Through Equation
- Removal Rates – Tab 3-B, pages 20-25
- Average POTW Flow (NOT Permitted flow)

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AHL: Pass Through Criteria

Based on NPDES Limit

- **Allowable Headworks Loading (AHL) based on Passthrough/NPDES =**

$$\frac{(8.34)\left[\text{NPDES Limit, mg/l}\right]\left[\text{POTW Average Flow, mgd}\right]}{(1 - \text{POTW RR, as decimal})}$$

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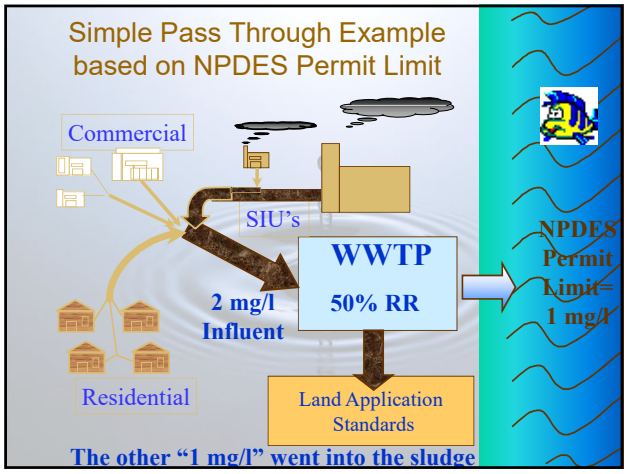
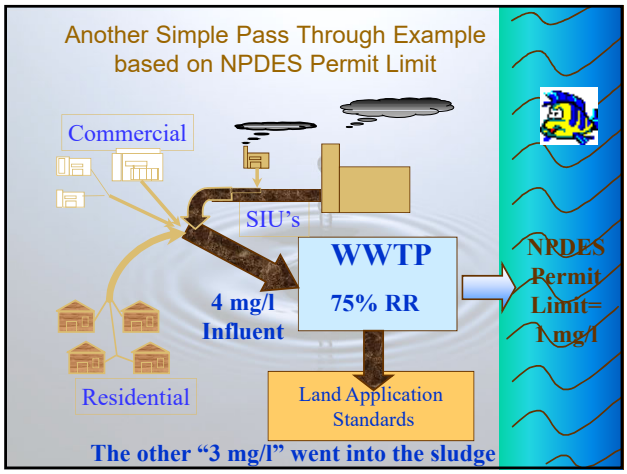
Simple Pass Through Example based on NPDES Permit Limit



Another Simple Pass Through Example based on NPDES Permit Limit



Review HWA Spreadsheet

- Tab 3-A, page 2
- NPDES Limits in column B
  - If have more than one limit for same parameter, enter most stringent.
  - Consider entering potential new NPDES limits?
  - Watch Units –
    - 50 ug/l limit = 0.05 mg/l
    - 224 ng/l limit = 0.000224 mg/l
- Pass through NPDES AHLs calculated in Column E

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AHL: Pass Through Criteria Based on Total Metal Allocated or WQS

NEW

- Allowable Headworks Loading (AHL) based on Pass Through/WQS =

$$(8.34)\left[\text{Total Metal Allocated, mg/l}\right]\left[\frac{\text{POTW Average Flow, mgd} + \text{Receiving Stream 7Q10, mgd}}{(1 - \text{POTW RR, as decimal})}\right]$$

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Permitting – Reasonable Potential Analysis

Hardness-Dependent Metals - Freshwater

- Reasonable Potential Analysis (RPA) is used
  - To determine the need for water quality based effluent limits
  - To estimate the 95th percentile upper concentration of each pollutant
  - To calculate the allowable effluent concentration (permit limit) for each pollutant
  - If your permit was issued prior to April 6, 2016 you can use the total metal water quality standards (yellow sheet)

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Permitting – RPA

Hardness-Dependent Metals - Freshwater

- Information needed to perform RPA
  - 7Q10, critical low flow
  - Effluent and upstream hardness
  - Permitted flow
  - Receiving stream classification
- Combined hardness is calculated as follows:

$$\frac{(\text{Permitted flow, cfs} * \text{avg effluent hardness, mg/l}) + (\text{7Q10, cfs} * \text{avg upstream hardness, mg/l})}{(\text{Permitted flow, cfs} + \text{7Q10, cfs})}$$

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Calculator Notes

a. Denotes metals for which Aquatic Life Criteria are expressed as a function of total hardness.

*Arsenic has a Human Health standard of 10 ug/L which is more stringent than the freshwater standards. The Permit limit for arsenic would be determined by taking the Human Health Standard and dividing it by an IWC based on the mean annual flow of the receiving stream and the permitted plant flow.

IWC = Permitted Flow ÷ (Permitted Flow + mean annual average)

** Nickel has a Water Supply standard of 25 ug/L and in most cases is more stringent than the freshwater standard. The Permit limit for nickel using the 25 ug/L WS standard would be determined by dividing 25 by an IWC based on the 7Q10 summer flow of the receiving stream and the permitted flow.

IWC = Permitted Flow ÷ (Permitted Flow + 7Q10 summer)

A fixed value of 10 mg/L will be used for TSS.

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Which Stream Standard?

(RPAs evaluated with dissolved metals)

- **Receiving Stream Classification**
  - **Class C, C-NSW, C-Swamp & B streams**
    - **Use total metal allocated to Permittee for hardness dependent metals**
    - **Use more stringent of chronic and acute**
    - **Arsenic – use more stringent human health**
    - **Chromium – use Cr VI criteria**
  - **Water Supply**
    - **Use more stringent nickel criteria**
    - **Include molybdenum**
  - **Trout Waters**
    - **Use more stringent cadmium criteria**

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Which Stream Standard?

- Tab 3-B, page 13 - Typicalville is Class Water Supply V
- Tab 3-A, page 2, cell C11
- Calculator Total Metal Allocated
  - Nickel – 25 ug/l (Class C = 37 ug/l)
  - Arsenic – 10 ug/l (Human Health)
  - Chlorides – 250 mg/l
  - Sulfates – 250 mg/l

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AHL: Pass Through Criteria

Based on Nickel Total Metal Allocated

- Allowable Headworks Loading (AHL) for Nickel based on Pass Through/TMA =

$$\frac{(8.34)(0.025\ mg/l)\ (2.809+38.76\ mgd)}{(1-0.42)} =$$

14.94 lbs/day nickel allowed at influent to not violate NC WQS for Water Supply

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Review HWA Spreadsheet

- Tab 3-A, page 2
- Stream Standards in column F
  - If more than one Standard for same parameter – eval. rec. stream class.
  - Do not enter standards where have NPDES Permit Limits
- Stream Standard Sources in column G
- Pass through Water Quality Stream Standard AHLs calculated in Column H

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Which Stream Standard?

(RPAs evaluated w/"old" WQS)

- Receiving Stream Classification
  - Class C – Use "Aquatic Life"
  - Class Water Supply (WS) and Trout –
    - Use WS/Trout if available.
    - Otherwise use Aquatic Life
  - High Quality Waters (HQW), Outstanding Resource Waters (ORW), or any with a "+" or "Critical Area" -
    - Contact PERCS

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Which Stream Standard?

- Tab 3-B, page 12 - Typicalville is Class Water Supply V
- Tab 3-A, page 2, cell C11
- Tab 1 – HWA numbers
  - Nickel – 25 ug/l (Class C = 88 ug/l)
  - Arsenic – 10 ug/l (Class C = 50 ug/l)
  - Chlorides – 250 mg/l
    - versus 230 mg/l Action Level for Class C
  - Sulfates – 250 mg/l
- Tab 3A, page 2, "comment boxes" for cells F27-F38

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Action Level POCs

Action Level Parameters in NC are:
Copper, Silver, Zinc, Fe, and Chlorides

Do not enter WQ Action Levels for Action Level Parameters, ***UNLESS***
The POTW is failing Toxicity and an Action Level Pollutant is the cause for failing.

….Remember, for Water Supply receiving streams, Chlorides is Water Quality Standard, so must enter in HWA if Chlorides is POC for your POTW

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What If 7Q10 Flow = Zero?

Typicalville has positive flow river– 7Q10 = 38.76 MGD

- **Allowable Headworks Loading (AHL) for Nickel based on Pass Through/WQS**

AHL = (8.34)(0.025)(2.809 + 38.76)
(1 – 0.42)

AHL = 14.9433 lbs./day

What if your 7Q10 were Zero?

AHL = (8.34)(0.025)(2.809 + 0)
(1 – 0.42)

AHL = 1.010 lbs./day

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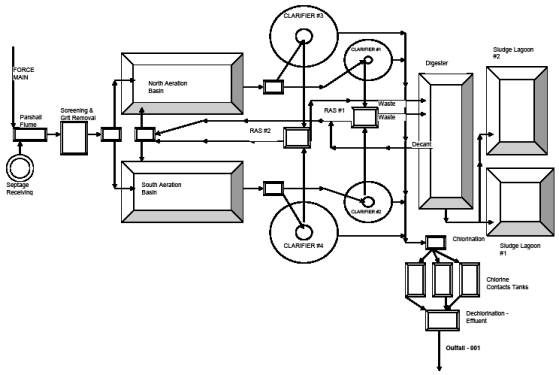
Design



AHL: Conventional/Design Pollutants

- **The engineers who designed your POTW designed it to be able to treat a specific target or "design" influent value for selected parameters and still meet your NPDES limit.**
- **Most/all POTWs have Design for BOD+TSS**
- **Some/many have Design for NH3**
- **Some/fewer have Design for Total Phosphorus (TP), and maybe even Total Nitrogen (TN)**

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AHL: Conventional/Design Pollutants

AHL_{Design} =
(8.34)(Design Influent, mg/l) (Design flow, MGD)

Use average Design values, not max or peak

- Where are my Design values?
  - O&M Manual
  - Plans and Specs
  - Engineer's Calculations
  - Tab 3-B, page 27
- What about:
  - Upgrades
  - Expansions
  - New design parameters

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Review HWA Spreadsheet

- Tab 3-A, page 2
- Design Criteria in cells G17 – G21
  - If have more than one Design Criteria for same parameter, enter most stringent
- If your Design POC is not in HWA spreadsheet, contact PERCS
- Design AHLs calculated in Column I

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AHL: Conventional/Design Pollutants

- All NC POTWs must enter Design Criteria in HWA for all parameters with Design Criteria
- Then evaluate Design Load and compare to the NPDES Load, in both mg/l and lbs/day
- NPDES < Design, use NPDES as MAHL
  - May be able to use Design if under-loaded
  - Contact PERCS to discuss
- Design < NPDES, use Design as MAHL
  - Remember that's all MAHL you will ever have
  - Not happy? - More in a minute
- To select Design as MAHL, put X in cells J17–J21
  - Tab 3-A, page 2

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AHL: Conventional/Design Pollutants

- Sometimes a WWTP can actually treat wastewater better than the design criteria set by the engineer.

- MAHL > Design Criteria may be approved with:
  - Design Multiplier of 1.5
  - Historic Data => Design Load?
  - NC Professional Engineer provides new Stamped Design Calculations
  - Other Compelling Argument?

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AHL: Conventional/Design Pollutants

- Specific guidance on web-site NOW!
  And in Tab 1 of your Manual
  Feb 2007, Dec 2007, Dec 2008

- Applies to
  BOD, TSS, NH3, and Phosphorus
- Recommend apply to Total Nitrogen

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AHL: Conventional/Design Pollutants - Typicalville

Typicalville used the Design Multiplier of 1.5

- See discussion in HWA Narrative
- Tab 3-A, page 1C

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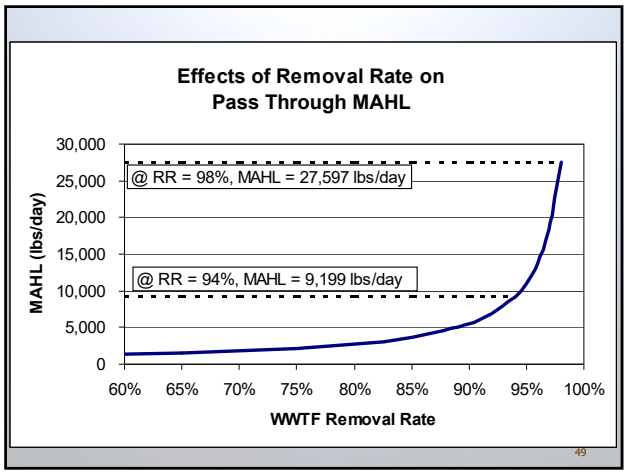
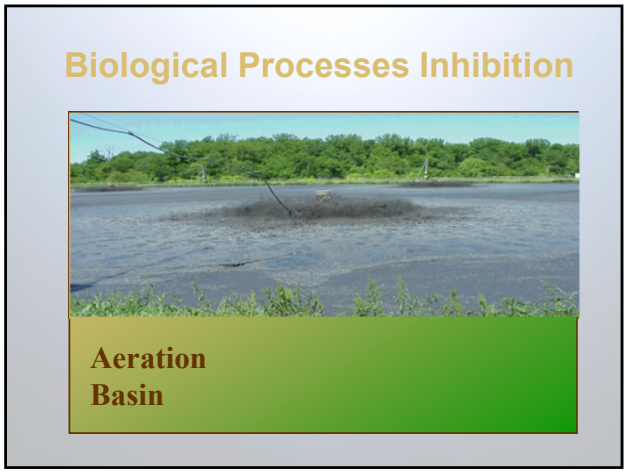
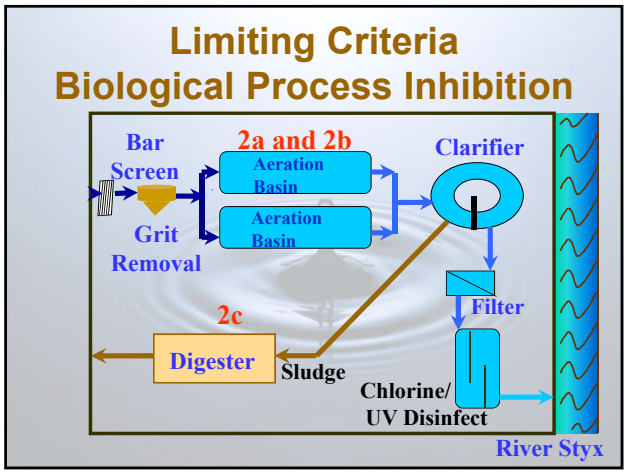

Effects of Removal Rate on
Pass Through MAHL
30,000
25,000
20,000
15,000
10,000
5,000
0
MAHL (lbs/day)
@ RR = 98%, MAHL = 27,597 lbs/day
@ RR = 94%, MAHL = 9,199 lbs/day
60%
65%
70%
75%
80%
85%
90%
95%
100%
WWTF Removal Rate
49


Biological Processes Inhibition
Aeration
Basin


Limiting Criteria
Biological Process Inhibition
Bar
Screen
Grit
Removal
2a and 2b
Aeration
Basin
Aeration
Basin
Clarifier
Filter
2c
Digester
Sludge
Chlorine/
UV Disinfect
River Styx

What Do I Need To Calculate Biological Inhibition Load?

- Basic understanding of WWTP microorganisms
- Wastewater Biological Treatment Units
  - Activated Sludge, Aeration Basin, etc.
  - Trickling Filter
  - Carbonaceous vs. Nitrogenous/Nitrification
- Sludge Biological Treatment Units
  - Only if have Anaerobic Digester
- Inhibition Formula
- Literature Inhibition Criteria
- LTMP/STMP data from basins (+anaerobic digesters)

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AHL: Inhibition Criteria

Based on Activated Sludge/Nitrification

- **Allowable Headworks Loading (AHL) based on Secondary Treatment Inhibition =**

$$(8.34)\ \frac{\text{Secondary Inhibition Criteria, mg/l} \times \text{POTW Average Flow, mgd}}{(1 - \text{Primary RR, as decimal})}$$

No primary Clarifiers? - just use 0

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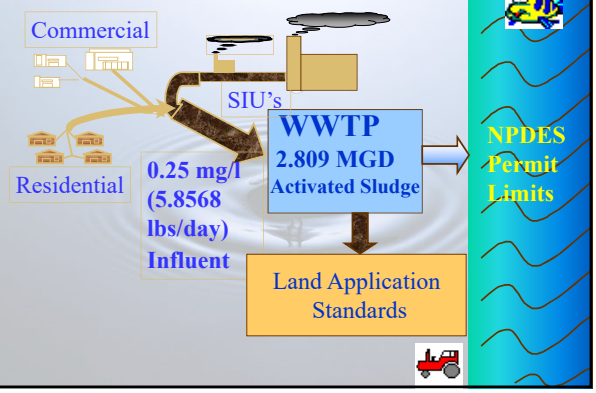
Inhibition Loading for Nickel based on Nitrification Inhibition



Which Inhibition Values Do I Use?

Activated Sludge Inhibition:

- All POTWs must evaluate for Activated Sludge Inhibition

Nitrification Inhibition:

- POTWs who have Ammonia limit and/or Nitrogenous bacteria

(We'll get to anaerobic digesters later…)

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Which Inhibition Values Do I Use?

Nitrification Inhibition:

- NPDES permit limit for ammonia
  - Tab 3-B, page 14
- Nitrogenous bacteria
  - Does LTMP data suggest WWTP nitrifies?
    - Tab 3-B, page 20
  - Ask the ORC - Does POTW nitrify?
- Must use lower of Activated Sludge or Nitrification Inhibition Criteria

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Review HWA Spreadsheet

- Tab 3-A, page 3
- Enter chosen inhibition criteria in column D
- Source in Column E
- If your POC is not on PERCS HWA Numbers sheet, contact PERCS

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No Literature Inhibition Criteria Load?

- If no literature Biological Inhibition criteria for a POC, do not have to develop site-specific inhibition criteria
  - L/STMP - Do not have to sample for these POCs at the biological process locations such as aeration basin or influent to anaerobic digester
    - or other inhibition related locations like primary clarifier effluent
- BOD, TSS, Mo, Se, some others

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Site Specific vs. Literature Inhibition Criteria

If LTMP data suggests POTW is acclimated to higher levels of site-specific concentration than traditional literature values, ask ORC:

Was POTW upset during basin sampling?

- Were there NPDES or Toxicity violations?
- Were any effluent parameters (usually BOD, TSS NH_3) elevated above normal for no other apparent reason?
- Was there foaming?
- Was there fluctuations in the DO?
- Did the bugs die?

If No, then the POTW may consider using basin data for site specific inhibition criteria.

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Review HWA Spreadsheet

- **Tab 3-A, page 3**
- **Replace chosen literature inhibition criteria in column D with chosen site-specific value.**
- **Source in Column E, and discuss in HWA Narrative**

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Get Credit for Primary Clarifier Removal?

- Quarterly LTMP/STMP sampling at primary clarifier effluent (PCE)
  - Sample before any return flows
  - Same detection levels as influent/effluent
  - Only required for parameters with literature inhibition criteria
- Use with WWTP influent data to calculate primary removal rates
  - BDL Data? – same as WWTP removal rates regarding use of literature removal rates
- No PCE sampling? No primary removal rates in HWA at all, even literature primary removal rate

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AHL: Based on Anaerobic Digester Inhibition

- **Conservative Pollutants**

AHL for Anaerobic Digester =

$$\frac{(8.34)(\text{An. Dig Inhib Crit, mg/l})(\text{Flow to Dig, MGD})}{\text{POTW Removal Rate, as Decimal}}$$

- **Non-conservative Pollutants**

AHL for Anaerobic Digester =

$$\frac{(\text{Influent NH3 in lbs/day}) * (\text{An. Dig Inhib Crit, mg/l})}{\text{(Avg. influent to sludge to An. Dig NH3, mg/l)}}$$

Review HWA Spreadsheet

- **[On Tab 3-A, page 2, enter sludge to Digester Flow in cell C14]**
- **Tab 3-A, page 3**
- **Literature inhibition criteria in column G**
- **Source in Column H**
- **Ammonia is Special…**
  - **Non-conservative – not all NH3 "removed" by WWTP ends up in digester…. is converted to NO2/NO3**
  - **Average influent NH3 in cell G49**
  - **Average Influent to Sludge to Digester NH3 in cell G50**

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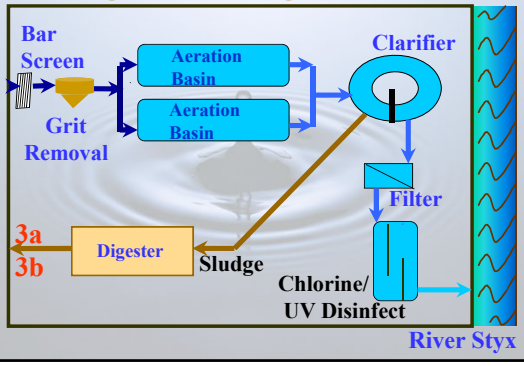
Sludge Criteria – 503 Regulations

HWA Limiting Criteria
Sludge 503 Regulations



What Do I Need To Calculate Sludge Load?

- Tab 3-C
- Copy of selected pages of current Sludge Permit
- Copy of selected pages of current Annual Sludge Report
- Site Life
- Sludge Formulas

Sludge use and disposal methods

- **Land Application/Compost:**
  Limits: Arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, zinc
- **Incineration:**
  Limits: Arsenic, beryllium, cadmium, chromium, lead, mercury, nickel
- **Municipal Solid Waste Landfill:**
  No pollutants limits. Requirements in 40 CFR 257, 258, and 261 apply.

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AHL: Based on Land App/Compost
Using Ceiling Concentration Limits

Allowable Headworks Loading (AHL) based on Sludge Ceiling Limits =

$$(8.34) \times \frac{\text{Sludge Ceiling Limit, mg/kg} \times \text{Percent Solids as decimal} \times \text{Sludge average mgd to disposal}}{\text{(POTW RR as decimal)}}$$

Tab 3-C, pages 31-40

- Sludge Specific Gravity assumed to be 1, same as water.
- Yours significantly different? Contact PERCS

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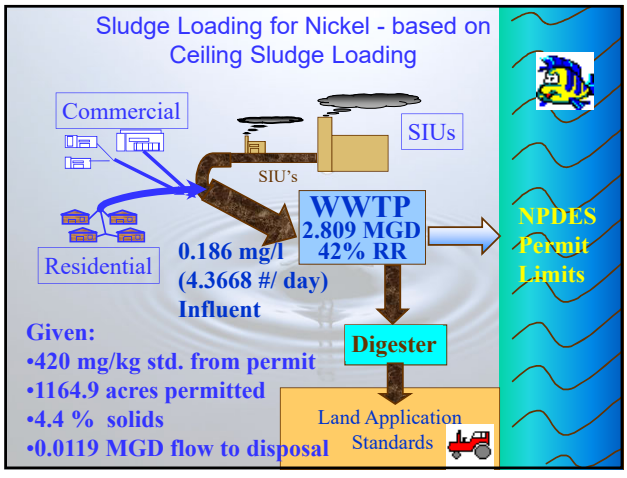

AHL: Based on Land Application Using Cumulative App Limit

Allowable Headworks Loading (AHL) based on Cumulative Sludge Limit =

$$\frac{\text{(CAR in lbs/acre)(SA in acres)}}{\text{(SL, years)(POTW RR as decimal)(365 days/year)}}$$

$$\frac{\text{(Cumulative Applic. Limit)(Total Permitted Acres)}}{\text{(Site Life)(Removal Rate)(365/year)}}$$

Tab 3-C, pages 31-40

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Review HWA Spreadsheet

- Column C – Tab 3-A, page 2 – Enter values for:
  - Sludge Permit Number
  - Class of Sludge Disposal
    - A for Compost; B for Land App
  - Sludge Flow and % Solids to Disposal
  - Sludge Site Acres and Site Life
- Tab 3-A, page 4
  - Spreadsheet automatically selected sludge standards based on A or B
  - Spreadsheet calculated sludge AHLs

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Review HWA Spreadsheet

- Site Life – Cell C18 – Tab 3-A, page 2
  - Can calculate by dividing annual load on most heavily loaded field by cumulative limit
    - Will likely get very large value - 100-500 years
    - If use this value in HWA, will likely get very small Cumulative Sludge AHL
- Most POTWs use 20 to 50 years

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Notice To Composters!

The previous example was for land applied sludge or “Class B”

If you compost your sludge, also called “Class A” or “Distribution and Marketing,” entering “A” in cell C13 will automatically adjust Tab 3-A page 4 of HWA worksheet to use the applicable standards

AHL: Based on Incineration

Contact PERCS to discuss requirements

Maximum Allowable Headworks Loading (MAHL)

Determines the Amount of Pollutant the POTW can Treat Based on the Most Restrictive Criteria

Review HWA Spreadsheet

- Tab 3-A, page 5
- Final AHLs for each criteria shown
  - Pass Through / Design
  - Inhibition
  - Sludge
- Smallest one is chosen as the –

Maximum Allowable Headworks Loading (MAHL)

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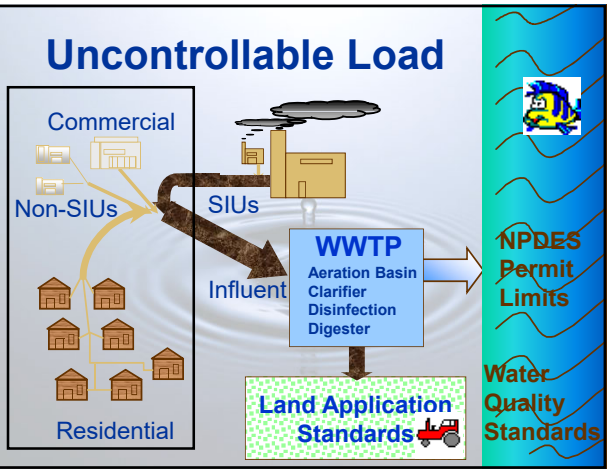
Uncontrollable Load



Determine Uncontrolled Load

- Everything that contributes to POTW not covered in SIU Permit
  - Residential
  - Non-Residential, but not SIU, for example:
    - Commercial
    - Hospitals, Funeral Homes
    - Doctors, Dentists
    - Car Repair/Wash Centers
    - Inflow/Infiltration
    - ALL Non-SIUs

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Uncontrolled load may be determined in two ways:

Mass Balance Method

- Sum of SIU Load for each POC
- Subtract total SIU Load from POTW Influent Load

Sampling Method

- Sample for uncontrolled pollutants per LTMP

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What Do I Need To Calculate Uncontrollable Load?

- **Average Influent values from Removal Rate Spreadsheet – Tab 3-B, pages 20-25**
- **Average SIU values from SIU Data summaries – Tab 3-D, pages 49-68**
- **Average Uncontrollable values from Uncontrollable data summary, if available [N/A for Typicalville]**
- **SIU Uncontrollable Mass Balance Spreadsheet – Tab 3-D, pages 45-48**

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Review Mass Balance Spreadsheet

- Tab 3-D, pages 45-48
- Enter Average SIU flow and mg/l values
  - Tab 3-D, pages 49-68
- Enter Average POTW flow and Average Influent mg/l values in row 21
  - Tab 3-B, pages 20-25
- Enter Uncontrollable mg/l values
  - If available
- Compare uncontrollable mass balance, sampling, and literature values
- Choose one to be used in HWA…

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Choosing Uncontrollable Value to be used in HWA

- …compare uncontrollable mass balance, sampling, and literature values…
- …and choose one for HWA?
- Which one is more…
  - Reasonable?
  - Representative?
  - Conservative?
    - Remember, for uncontrollable, "larger" is more conservative

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Uncontrolled Mass Balance Troubleshooting

- Inaccurate flow or pollutant data
  - In particular, SIU flow data
- Limited data set
- Widely variable detection levels
- Inflow and Infiltration
- Degradation of the pollutant in the collection system
- Conservative/non conservative pollutant

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Uncontrollable Sampling Troubleshooting

- Sample location not really "uncontrolled"
  - 1 house and 27 restaurants
  - new subdivision (low flow toilets, no sewer leaks)
  - No commercial and/or non-SIU
  - Inaccurate sample collection
- May need >1 sampling point or larger data set
- Flow may be too low
- BOD will degrade in the collection system

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Review Spreadsheets

- Chose uncontrollable values to be used in HWA
  - Tab 3-D, pages 45-48
- Enter Uncontrollable flow in cell C9
  - Tab 3-A, page 2 of HWA Spreadsheet
- Enter chosen uncontrollable values and sources to HWA Spreadsheet
  - Tab 3-A, page 6, columns E and F

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Uncontrollable As Zero

- If all of the influent data for a particular pollutant of concern is all less than the current best available detection level.

- If the program does sampling of the collection system and sample results less than the current best detection level can be averaged as zeros.

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Uncontrollable As Zero Cont.

Arsenic -2.0 µg/L
Cadmium – 0.50 ug/l
Chromium - 10 µg/L
Copper – 2.0 µg/L
Lead - 2.0 µg/L
Mercury – 1.0 ng/L (EPA Method 1631E)
Molybdenum - 10 µg/L
Silver – 1.0 µg/L
Selenium - 5.0 µg/L
Zinc - 10 µg/L

* Red Highlighted are lower than the current model LTMP/STMP

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Uncontrollable As Zero Cont.

- There may be other circumstances under which the uncontrollable concentration can be considered zero but they will be evaluated on a case-by-case basis.

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Maximum Allowable Industrial Loading (MAIL)

Determines the Amount of MAHL Available to your Industries

Maximum Allowable Industrial Loading (MAIL)

MAIL= MAHL – UNC Load - SF

- **MAIL = Maximum Allowable Industrial Loading, lbs/day**
- **MAHL = Maximum Allowable Headworks Loading, lbs/day**
- **SF = Safety Factor, if desired**

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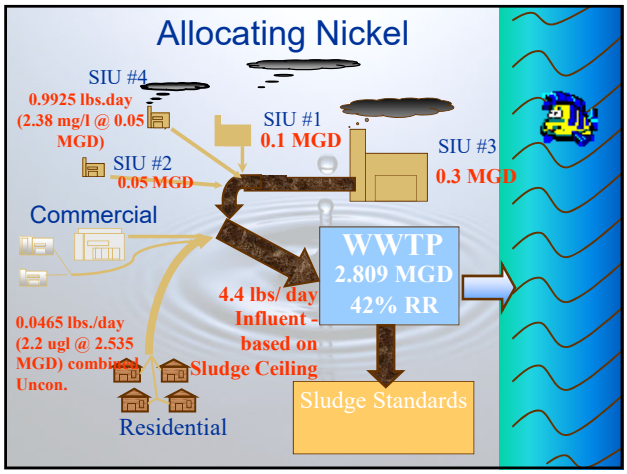
Review HWA Spreadsheet

- Tab 3-A, page 6
- MAILs calculated in column H
- Any negative numbers?
  - Typicalville - None so far….

Allocation Table

Allocating The MAIL To Your Industries

Allocating Nickel



Review Allocation Table

- Click on "AT" tab in lower left corner
  - AT Worksheet within HWA_AT workbook
  - Tab 3-A, pages 7-10
- MAHLs, Basis for MAHL, Uncontrollable Loads, and MAILs automatically filled in from HWA worksheet
- Enter SIU info + permit limits in Row 12
- Review MAIL left in Row 20
- Any negative numbers?

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Safety Factor / MAHL Reserve

- Tab 3-A, pages 7-10
- Row 29 - % MAIL still available
- Row 30 - % MAHL still available

- Buffer against SIU IUP violations
- Uncertainty in HWA calculations
- Reserve for future growth
  - Especially for POCs based on Design

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What Do I Do When I'm Over Allocated?

- Generally
  - Should you be over allocated?
    - For example, if MAHL based on NPDES limit, are you violating that limit?
  - Any typos, missing/changed formulas?
  - Review your choices for all values
    - Did you have other choices to make?
  - Can you lower SIU limits (pollutant or flow)?

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What Do I Do When I'm Over Allocated?

- Specifically
  - Is Inhibition Limiting?
    - If yes, can you use site-specific Inhibition criteria?
  - Is Sludge Limiting?
    - If yes, can you lower site life? Can you perform HASL Worksheet?

Typicalville Over Allocated for Silver

- Should Typicalville be over allocated?
  - Silver MAHL based on stream std
  - Are they violating that limit?
    - Tab 3B, page 26 (Calculator)
    - Tab 3B, page 24 (silver effluent data)
- Can/should they lower SIU limits (pollutant or flow)?

HASL

Headworks Addendum for Sludge Loading

HASL Worksheet

Re-evaluates AHL for Sludge Criteria by taking into consideration:

1. **Historical WWTP Performance Data,**
2. **Historical Sludge Report Data, and**
3. **Applicable Sludge Criteria**

Only applicable for pollutants over allocated based on sludge criteria!

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What Do I Need For A HASL?

- Copy of current Sludge Permit
- Copy of current Annual Sludge Report
- POTW Influent Data from Removal Rate Calculations
- HASL Worksheet and Calculations

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HASL – Step 1 - Arsenic

Cumulative Criteria

Check POC to assure that the available land does not exceed 80% of the Cumulative Loading Rate.

$$\frac{\text{Actual Cumulative Load From Most Heavily Loaded Field}}{\text{Cumulative Sludge Loading Limit}} * (100) <= 80\%$$

For the Pretreatment World, the "most heavily loaded field" is the field with the highest cumulative lbs/acre for that pollutant.

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HASL – Step 1

- From current Annual Sludge Report, locate Land Application Field Summary Reports.
- Review “Cumulative lbs/acre” values for HASL POC for each field.
- Identify field with highest cumulative lbs/acre for HASL POC – Pretreatment’s “most heavily Loaded field”
- Enter value in column C of HASL worksheet in HWA_AT workbook (spreadsheet)
- Any flags? Contact PERCS

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HASL – Step 2 - Arsenic

Ceiling Criteria

Check POC to assure that sludge does not exceed 80% of the Sludge Ceiling Limit

$$\frac{\text{Maximum mg/kg from Sludge Report}}{\text{Sludge Ceiling mg/kg Limit}} * (100) <= 80\%$$

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HASL – Step 2

- From current Annual Sludge Report, locate Annual Residual Sampling Summary Forms
- Review “mg/kg dry weight” values values for HASL POC for each sample.
- Identify highest “mg/kg dry weight”
- Enter value in column H of HASL worksheet in HWA_AT workbook (spreadsheet)
- Any flags? Contact PERCS

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HASL – Step 3 - Arsenic
Recalculate Sludge HASL AHL

A new Sludge AHL is calculated using historical POTW influent and % of Ceiling Concentration

AHL based on Sludge/HASL =

$$\frac{\text{Average Influent Loads, lbs/day}}{\text{\% of ceiling mg/kg Limit based on highest sludge sample}}$$

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HASL – Step 3

- Locate HWA Removal Rate Calculations
- Identify Average Influent value for HASL POC
- Enter value in column M of HASL worksheet in HWA_AT workbook (spreadsheet)
- HASL Spreadsheet will calculate HASL sludge AHL

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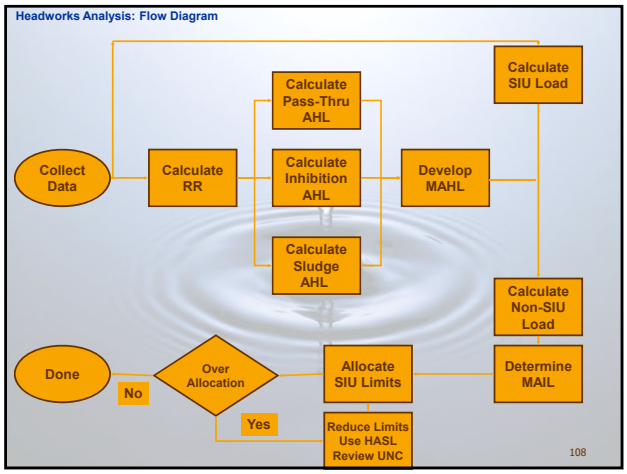

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Documents Needed to Submit HWA

- Transmittal Letter
- Organized Data Summaries
  - DMR/LTMP/STMP, SIU, Uncontrolled
  - Related LTMP sampling
- Removal Rates Calculation spreadsheet
- HWA.AT.HASL spreadsheet

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Documents Needed to Submit HWA

- Mass Balance spreadsheet
- Plant Design Documentation
- Copy of applicable pages from Land Application or Composting permit
- Copy of applicable parts of sludge report
- Explanation/Discussion of Choices, Assumptions, etc.

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Division Pretreatment Contacts

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http://deq.nc.gov/about/divisions/water-resources/water-resources-permits/percs/pretreatment-permits

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