



John R. Kasich, Governor  
Mary Taylor, Lt. Governor  
Scott J. Nally, Director

March 18, 2013

Mr. Gary Vest, Mayor  
Village of Gratis  
P.O. Box 574  
Gratis, Ohio 45330

**RE: Preble County, Gratis WWTP, Compliance Evaluation Inspection**

Dear Mayor Vest:

On March 11, 2013, I conducted a Compliance Evaluation Inspection at the Gratis WWTP (NPDES Permit No. OH0047571; OEPA Permit No. 1PB00041\*GD). The inspection was also conducted as part of renewing the NPDES Permit. Representing this facility was Gary Wagner and Tim Hoffman. A copy of my inspection report is enclosed.

The inspection report contains two unsatisfactory areas. The Effluent/Receiving Waters section was rated unsatisfactory as a result of the NPDES Permit violations. The Permit section was rated unsatisfactory as a result of the sanitary sewer overflows.

The areas noted in the report summary will require a written response by April 5, 2013. The response should include a description of the actions proposed to correct the violations and the dates anticipated for completion of these actions.

If you have any questions, please call me at (937) 285-6096.

Sincerely,

Martyn Burt  
Compliance and Enforcement Supervisor  
Division of Surface Water

MB/kb

Enclosure



State of Ohio Environmental Protection Agency  
Southwest District Office

NPDES Compliance Inspection Report

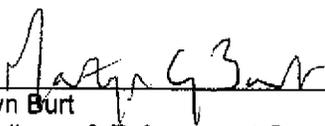
Section A: National Data System Coding					
Permit #	NPDES#	Month/Day/Year	Inspection Type	Inspector	Facility Type
1PB00041*GD	OH0047571	3/11/2013	C	S	1

Section B: Facility Data		
Name and Location of Facility Inspected	Entry Time	Permit Effective Date
Gratis WWTP 7128 Enterprise Road Gratis, Ohio 45330	9:30 A.M.	9/1/2008
	Exit Time	Permit Expiration Date
	12:15 P.M.	8/31/2013
Name(s) and Title(s) of On-Site Representatives		Phone Number(s)
Gary Wagner, Operator of Record Tim Hoffman, WWTP Superintendent		(937) 533 - 0082 (937) 313 - 4500
Name, Address and Title of Responsible Official		Phone Number
Gary Vest, Mayor P.O. Box 574 Gratis, Ohio 45330		(937) 304 - 4411

Section C: Areas Evaluated During Inspection					
(S = Satisfactory, M = Marginal, U = Unsatisfactory, N = Not Evaluated)					
U	Permit	S	Flow Measurement	N	Pretreatment
S	Records/Reports	S	Laboratory	S	Compliance Schedule
S	Operations & Maintenance	U	Effluent/Receiving Waters	S	Self-Monitoring Program
S	Facility Site Review	S	Sludge Storage/Disposal	N	Other
S	Collection System				

**Section D: Summary of Findings (Attach additional sheets if necessary)**

See Attached Summary of Findings / Comments.

Inspector	Reviewer
 Ned Sarle Division of Surface Water Southwest District Office	 Martyn Burt Compliance & Enforcement Supervisor Division of Surface Water Southwest District Office
3/18/13 Date	3/18/13 Date

Permit #: 1PB00041\*GD  
NPDES #: OH0047571

Sections E thru K: Complete on all inspections as appropriate  
Y – Yes, N – No, N/A – Not Applicable, N/E – Not Evaluated

**Section E: Permit Verification**

Inspection observations verify the permit

- |  |     |
|--|-----|
| (a) Correct name and mailing address of permittee .....                        | Y   |
| (b) Flows and loadings conform with NPDES permit.....                          | Y   |
| (c) Treatment processes are as described in permit application...              | Y   |
| (d) All discharges are permitted.....  | N   |
| (e) Number and location of discharge points are as described<br>in permit..... | Y   |
| (f) Storm water discharges properly permitted.....                             | N/A |

Comments/Status:

See Attached Summary of Findings / Comments.

**Section F: Compliance**

- |   |     |
|---|-----|
| (a) Any violations since the last inspection.....                       | Y   |
| (b) Appropriate Non-compliance notification of violations.....          | Y   |
| (c) Permittee is taking actions to resolve violations.....              | Y   |
| (d) Permittee has a compliance schedule.....                            | N   |
| (e) Compliance schedule contained in...N/A                              |     |
| (f) Permittee is in compliance with schedule.....                       | N/A |
| (g) Has biomonitoring shown toxicity in discharge since last inspection | N/A |

Comments/Status:

See Attached Summary of Findings / Comments.

**Section G: Operation & Maintenance**

**Treatment Works:**

Treatment facility properly operated and maintained

(a) Standby power available.....generator  or dual feed ..... Y

i. What does the back-up power source operate.....

The influent pump station has a backup generator. The wastewater flows through the WWTP by gravity. No backup power for blowers or disinfection system.

ii. How often is the generator tested under load.....

Monthly.

(b) Which components have an alarm system available for power or equipment failures.....

Influent pump station.

(c) All treatment units in service other than backup units..... Y

(d) What method is used for scheduling routine & preventative maintenance (calendar, software, etc.).....

O&M manual and logsheets / spreadsheets.

(e) Any major equipment breakdown since last inspection..... N

(f) Operation and maintenance manual provided and maintained..... Y

(g) Any plant bypasses since last inspection..... N

(h) Any plant upsets since last inspection..... N

**Comments/Status:**

None.

**Section G: Operation & Maintenance con't**

**Record Keeping/Operator of Record:**

- (a) Wastewater Treatment Works classification (OAC 3745-7)..... I
- (b) Operator of Record holds unexpired license of class required by Permit..... Y
- (c) Copy of certificate of Operator of Record displayed on-site..... Y
- (d) Has the Operator of Record submitted an ORC Notification form. Y
- (e) Minimum operator staffing requirements fulfilled (OAC 3745-7).... N/A
- (f) If a Staffing Reduction plan has been approved, are the stipulations of the plan being met..... N/A
- (g) Operator of Record log book provided..... Y
- (h) Format of log book (e.g. computer log, hard bound book)
 

Hard bound book.
- (i) Log book kept onsite (in an area protected from weather)..... Y
- (j) Log book contains the following:
  - I. Identification of treatment works..... Y
  - II. Date/times of arrival/departure for Operator of Record and any other operator required by OAC 3745-7..... Y
  - iii. Daily record of operator and maintenance activities (including preventative maintenance, repairs and request for repairs, process control test results, etc.)..... Y
  - iv. Laboratory results (unless documented on bench sheets)... Y
  - v. Identification of person making entries..... Y
- (k) Has the Operator of Record submitted written notifications to the permittee, Ohio EPA and, if applicable, any local environmental agencies when a collection system overflow, treatment plant bypass or effluent limit violation has occurred..... Y

**Comments/Status:**

Gary Wagner is a Class IV wastewater operator. Tim Hoffman has taken Class I wastewater operator course. This fall he is hoping to take the Class I wastewater test.

**Section G: Operation & Maintenance con't**

**Collection System:**

- (a) Are there pump stations in the collection system..... Y
  - i. How many publicly-owned pump stations equipped with permanent standby power or equivalent.....1
  - ii. How many pump stations have telemetered alarms.....2
  - iii. How many pump stations have operable alarms.....2
  
- (b) Any chronic collection system overflows since last inspection..... Y
- (c) Regulatory agency notified of all overflows..... Y
- (d) Are there CSOs in the collection system..... N/A  
if so, what is the LTCP status.....
- (e) How are CSOs monitored (chalk, block, level sensor, etc.).....
- (f) Portable pumps available for collection system maintenance..... Y
- (g) RDII Program established and active..... Y
- (h) Any WIB complaint received since last inspection..... N
- (i) Is there a WIB response plan..... Y
- (j) Is any portion of the collection system at or near dry weather capacity..... N

**Comments/Status:**

See Attached Summary of Findings / Comments.

**Section H: Sludge Management**

(a) Method of Sludge Disposal...

- Land Application
- Haul to Another NPDES Permittee
- Haul to a Mixed Solid Waste Landfill

\*if one of the selected methods is land application, complete applicable charts.

**Class A - Exception Quality Sewage Sludge (monitoring station 584)**

Pathogen Reduction Alternative	84370 Vector Attraction Reduction Options							
	Option 1 -38% Volatile Solids Reduction	Option 2 -Anaerobic Bench Scale Analysis	Option 3 - Aerobic Bench Scale Analysis	Option 4 - Specific Oxygen Uptake Rate	Option 5 - Aerobic Time and Temperature	Option 6 - Alkali Addition	Option 7 - >75% Percent Solids without Unstabilized Solids	Option 8 - >75% Percent Solids with Unstabilized Solids
Alternative 1 - Time and Temperature Regime (84369)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternative 2 - High pH and High Temperature (84369)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternative 3 - Other Processes (84369)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternative 4 - Unknown Processes (84369)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternative 5 - Composting (84397)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternative 5 - Heat Drying (84397)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternative 5 - Heat Treatment (84397)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternative 5 - Thermophilic Aerobic Digestion (84397)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternative 5 - Beta Ray Irradiation (84397)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternative 5 - Gamma ray Irradiation (84397)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternative 5 - Pasteurization (84397)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternative 6 - Approved Equivalent Process	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Class B Sewage Sludge (monitoring station 581)**

Pathogen Reduction Alternative	84370 Vector Attraction Reduction Options									
	Option 1 -38% Volatile Solids Reduction	Option 2 -Anaerobic Bench Scale Analysis	Option 3 - Aerobic Bench Scale Analysis	Option 4 - Specific Oxygen Uptake Rate	Option 5 - Aerobic Time and Temperature	Option 6 - Alkali Addition	Option 7 - >75% Percent Solids without Unstabilized	Option 8 - >75% Percent Solids with Unstabilized	Option 9 - Land Injection	Option 10 - Immediate Incorporation
Alternative 1 - Geometric Mean of Seven Fecal Samples (84369)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternative 2 - Aerobic Digestion (46396)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternative 2 - Air Drying (46396)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternative 2 - Anaerobic Digestion (46396)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternative 2 - Composting (46396)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternative 2 - Lime Treatment (46396)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternative 3 - Approved Equivalent Process	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- (b) Has amount of sludge generated changed significantly since the last inspection..... N
- (c) How much sludge storage is provided at the plant.....
- (d) Records kept in accordance with State and Federal law (5 years according to OAC 3745-40-06)..... Y
- (e) Any complaints received in last year regarding sludge..... N
- (f) 5/8" screen at headworks for facilities that land apply sludge..... Y
- (g) Are sludge application sites inspected to verify compliance with NPDES permit..... N/A
- (h) Is a contractor used for sludge disposal..... N/A  
 If so, what is the name of the contractor.....

**Comments/Status:**

Lagoons typically need to be cleaned out once every 20 years. See Attached Summary of Findings / Comments.

**Section I: Self-Monitoring Program**

**Flow Measurement:**

- (a) Primary/Secondary flow measuring devices (e.g. weir with ultrasonic level sensor):  

Ultrasonic meter and weir.
- (b) Flow meter calibrated annually ..... Y  
(Date of last calibration: 8/12/2012)
- (c) 24-hour recording instruments operated and maintained..... Y
- (d) Flow measurement equipment adequate to handle full range of flows..... Y
- (e) All discharged flow is measured..... Y

**Comments/Status:**

None.

**Section I: Self-Monitoring Program (con't)**

**Sampling:**

- (a) Sampling location(s) are as specified by permit..... Y
- (b) Parameters and sampling frequency agree with permit..... Y
- (c) Permittee uses required sampling method..... Y  
(see GLC page)
- (d) Monitoring records (i.e., flow, pH, DO) maintained for a minimum of three years including all original strip chart recordings (i.e, continuous monitoring instrumentation, calibration and maintenance records)..... Y

**Comments/Status:**

None.

**Section I: Self-Monitoring Program (con't)**

**Laboratory:**

*General*

- (a) Does the Quality Assurance Manual contain written Standard Operating Procedures (SOP's) for all analysis performed onsite..... Y
- (b) Do SOP's include the following if applicable..... Y
  - Title
  - Scope and Application
  - Summary
  - Sample Handling and Preservation
  - Interferences
  - Apparatus and Materials
  - Reagents
  - Procedure
  - Calculations
  - Quality Control
  - Maintenance
  - Corrective Action
  - Reference (Parent Method)

*Note: Standard Methods 1020A establishes that "Quality assurance (QA) is the definitive program for laboratory operation that specifies the measure required to produce defensible data of known precision and accuracy. Standard operating procedures are to be used in the laboratory in sufficient detail that a competent analyst unfamiliar with the method can conduct a reliable review and/or obtain acceptable results." SOPs should be developed for each analytical procedure.*

- (c) EPA approved analytical testing procedures used (40 CFR 136.3).. Y
- (d) If alternate analytical procedures are used, proper approval has been obtained..... N/A
- (e) Analyses being performed more frequently than required by permit. Y
- (f) If (e) is yes, are results in permittee's self-monitoring report..... Y
- (g) Satisfactory calibration and maintenance of instruments/equipment. Y (see score from GLC page)
- (h) Commercial laboratory used..... Y  
Parameters analyzed by commercial lab: Oil & Grease, ammonia, phosphorus, metals, Cn, Hg, and fecal coliform.

Lab name: Belmont and Eaton WWTP (fecal coliform).

*Discharge Monitoring Report Quality Assurance (DMRQA)*

- (a) Participation in latest USEPA quality assurance performance sampling..... N  
Date:
- (b) Were any parameters "Unsatisfactory"..... N/A
- (c) Reasons for "Unsatisfactory" parameters.....

**Comments/Status:**

See Attached Summary of Findings / Comments.

**Section J: Effluent/Receiving Water Observations**

Outfall # 1PB00041001

Outfall Description: WWTP discharge

Receiving Stream: Twin Creek

Receiving Stream Description: No adverse conditions were noted in WWTP discharge.

**Comments/Status:**

Outfall sign posted as required.

**Section K: Multimedia Observations**

- (a) Are there indications of sloppy housekeeping or poor maintenance in work and storage areas or laboratories..... N
- (b) Do you notice staining or discoloration of soils, pavement or floors.. N
- (c) Do you notice distressed (unhealthy, discolored, dead) vegetation.. N
- (d) Do you see unidentified dark smoke or dust clouds coming from sources other than smokestacks..... N
- (e) Do you notice any unusual odors or strong chemical smells..... N
- (f) Do you see any open or unmarked drums, unsecured liquids, or damaged containment facilities..... N

If any of the above are observed, ask the following questions:

- (1) What is the cause of the condition?
- (2) Is the observed condition or source a waste product?
- (3) Where is the suspected contaminant normally disposed?
- (4) Is this disposal permitted?
- (5) How long has the condition existed and when did it begin?

**Comments/Status:**

None.

**See Attached Summary of Findings / Comments**

Areas Requiring a Response

Numerous sewage collection system overflows were reported for November 2010 through February 2013. These overflows were reported on the DMRs and are as follows:

Parameter	Frequency	Date	Total
Overflow Occurrence	No./Month	3/6/2011	1
Overflow Occurrence	No./Month	4/19/2011	4
Overflow Occurrence	No./Month	4/20/2011	1
Overflow Occurrence	No./Month	4/25/2011	1
Overflow Occurrence	No./Month	4/27/2011	1
Overflow Occurrence	No./Month	12/5/2011	2
Overflow Occurrence	No./Month	12/21/2011	1
Overflow Occurrence	No./Month	1/26/2012	1
Overflow Occurrence	No./Month	5/5/2012	1
Overflow Occurrence	No./Month	6/29/2012	1

All of these overflows were associated with the influent pump station. These overflows have been the result of high flows, equipment failures and alarm failures. The alarms were replaced in August 2012. The village feels the new alarms will address some of these past overflows. However, the village also indicated that at times both influent pumps must run to handle the peak influent flows. Pump stations should be designed so that the peak flows are handled with one pump while the backup pump is available for emergency events. The Ohio EPA is concerned that the current pump station is not adequate. The village must look at means of either reducing these peak influent flows or upgrading the influent pump station. Please indicate how the village is proposing to address these concerns.

Areas Not Requiring a Response

A review of the Discharge Monitoring Reports (DMRs) for November 2010 through February 2013 indicated numerous effluent limit violations. These violations are addressed on Attachment I. The Village should continue their efforts to prevent these violations. Future violations must continue to be reported in accordance to the NPDES Permit as detailed in Part III.12 titled "Noncompliance Notification".

The WWTP consists of an influent pump station with a comminutor, four aerated lagoons operated in series, four surface sand filters, a chlorine contact tank, a dechlorination tank and cascade aeration.

Sludge was last removed from the aerated lagoons in 2001. The lagoons are 10 feet deep. When they were cleaned the last time, the first two lagoons had 4 feet of sludge

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in them. This amount of sludge would reduce the treatment efficiencies of these aerated lagoons and may have contributed to some recent effluent violations. The village does not routinely monitor these sludge levels. We recommend monitoring the sludge levels at least yearly to determine if the sludge should be removed.

The WWTP discharge flow rate is monitored using an ultrasonic meter. The WWTP is designed for an average daily flow rate of 0.119 MGD and a peak daily flow rate of 0.355 MGD. A review of the DMRs indicated that the average and peak flow rate for this period was reported as 0.100 MGD and 0.548 MGD.

The village has approximately 10 miles of sanitary sewers that consist of 8, 10 and 12 inch pipes. The village does not have any equipment for cleaning or visually inspecting the sanitary sewer. For 2010, 2011 and 2012, the village did not have any "Water in the Basement" events.

The village is encouraged to install a rain gauge and monitor the daily rainfall total. This information would be helpful in evaluating overflows from the collection system and high flows at the WWTP. Also enclosed is a rainfall frequency chart that shows different rain events and the return frequencies of these events.

The lab was inspected and my findings are detailed on the Attached General Lab Criteria checklist. No issues were noted in this report.

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Attachment I

Gratis WWTP

Effluent Limit Violations for November 2010 through February 2013

Reporting Period	Parameter	Limit Type	Units	Permit Limit	Reported Value
January 2011	CBOD5	Monthly	mg/l	10	13
February 2011	CBOD5	Monthly	mg/l	10	13
February 2011	CBOD5	Monthly	kg/day	4.5	7.2
February 2011	CBOD5	Weekly	kg/day	6.8	7.3
February 2011	CBOD5	Weekly	mg/l	15	16
February 2011	CBOD5	Weekly	kg/day	6.8	9.7
April 2011	CBOD5	Monthly	kg/day	4.5	5.1
April 2011	CBOD5	Weekly	kg/day	6.8	8.6
June 2011	Chlorine	Daily	mg/l	0.038	0.25
October 2011	Fecal Coliform	Weekly	#/100 ml	2000	3942
January 2012	CBOD5	Monthly	kg/day	4.5	5.1
January 2012	CBOD5	Weekly	kg/day	6.8	10
October 2012	Ammonia	Monthly	mg/l	1.5	1.6
October 2012	Ammonia	Weekly	mg/l	2.3	2.8

# General Lab Criteria – Gratis WWTP, March 11, 2013

Criteria	Standard Methods Requirement	Acceptable?		Rating
<b>Balance</b>				<b>A</b>
• Standard Weights	• Either NIST Class s or ASTM/ANSI Class 1 weights <sup>1,2</sup>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
• Calibration Frequency / Documentation	• Calibration verification required at least once each day the balance is used. <sup>3</sup>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
• Cleanliness, air movement, vibration	• Cleanliness of balance is a must and air movement and vibration needs to be kept to a minimum <sup>1</sup>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
• Other	• Service and recalibrate annually (manufacturer representative or comparable) <sup>1</sup>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Must be able to measure to 0.1 grams <sup>4</sup>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Instrument manual available	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Log book maintained <sup>2</sup>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
Comments: : None.				

Criteria	Standard Methods Requirement	Acceptable?		Rating
<b>Drying Oven (Suspended Solids)</b>				<b>A</b>
• Temperature Recordkeeping	• Temperature recorded with each use <sup>4</sup>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Log book maintained <sup>2</sup>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
• Calibration Frequency / Documentation	• Thermometer calibrated annually with NIST traceable thermometer <sup>1,2</sup> . Correction factor posted on thermometer / equipment <sup>1</sup>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
• Other	• Thermometer temperature accurate to 0.5° Celsius <sup>5</sup>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Acceptable temperature range is 103° – 105° C <sup>4</sup>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Instrument manual available	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
Comments: : None.				

# General Lab Criteria – Gratis WWTP, March 11, 2013

Criteria	Standard Methods Requirement	Acceptable?		Rating	
<b>pH Meter</b>					
<ul style="list-style-type: none"> <li>• Calibration Frequency / Documentation</li> </ul>	<ul style="list-style-type: none"> <li>• Calibration verification required for testing over long period of time (e.g. 12 hrs.), or after a large number of samples (every 10 samples)<sup>3</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
	<ul style="list-style-type: none"> <li>• Logbook maintained<sup>2</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
<ul style="list-style-type: none"> <li>• Minimum of 2 point calibration</li> </ul>	<ul style="list-style-type: none"> <li>• Calibration per manufacturer specification and calibration buffers must bracket anticipated result<sup>7</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
<ul style="list-style-type: none"> <li>• Slope Documentation / Acceptability</li> </ul>	<ul style="list-style-type: none"> <li>• Slope acceptable range indicated on benchsheet<sup>2</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
<ul style="list-style-type: none"> <li>• Buffer Expiration Date</li> </ul>	<ul style="list-style-type: none"> <li>• Buffers must not be expired</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
<ul style="list-style-type: none"> <li>• Other</li> </ul>	<ul style="list-style-type: none"> <li>• Instrument manual available</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
	<ul style="list-style-type: none"> <li>• Teflon covered magnetic stirrer or equivalent for mixing<sup>8</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Comments: :          					
Criteria	Standard Methods Requirement	Acceptable?		Rating	
<b>Dissolved Oxygen Meter</b>					
<ul style="list-style-type: none"> <li>• Calibration Method</li> </ul>	<ul style="list-style-type: none"> <li>• Air or known DO calibration method<sup>10</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
	<ul style="list-style-type: none"> <li>• Calibration per manufacturer specification<sup>10</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
<ul style="list-style-type: none"> <li>• Calibration Frequency / Documentation</li> </ul>	<ul style="list-style-type: none"> <li>• Logbook maintained<sup>2</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
	<ul style="list-style-type: none"> <li>• Calibration verification required at least once each day the meter is used.<sup>3</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
<ul style="list-style-type: none"> <li>• Other</li> </ul>	<ul style="list-style-type: none"> <li>• Small to no bubble present under membrane (must be smaller than the lead in number 2 pencil)<sup>11</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
	<ul style="list-style-type: none"> <li>• Instrument manual available</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Comments: :          					

# General Lab Criteria – Gratis WWTP, March 11, 2013

Criteria	Standard Methods Requirement	Acceptable?		Rating
<b>Incubator (CBOD/ E-Coli)</b>				
<ul style="list-style-type: none"> <li>• Temperature Recordkeeping</li> </ul>	<ul style="list-style-type: none"> <li>• Temperature checked / recorded twice daily for each shelf in use<sup>1</sup>(E-Coli)</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	<ul style="list-style-type: none"> <li>• Temperature checked / recorded daily<sup>2</sup> (CBOD)</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	<ul style="list-style-type: none"> <li>• Acceptable temperature range (CBOD) is 20° C ±1.0<sup>o12</sup></li> </ul>	<input type="checkbox"/> Yes.	<input type="checkbox"/> No	
	<ul style="list-style-type: none"> <li>• Acceptable temperature range (E-Coli) is 35° C ±0.5<sup>o22</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	<ul style="list-style-type: none"> <li>• Logbook maintained<sup>2</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
<ul style="list-style-type: none"> <li>• Temperature Calibration / Documentation</li> </ul>	<ul style="list-style-type: none"> <li>• Thermometer calibrated annually with NIST traceable thermometer<sup>1,2</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	<ul style="list-style-type: none"> <li>• Temperature correction information posted on incubator<sup>1</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
<ul style="list-style-type: none"> <li>• E-Coli can use multiple tubes (five 20 ml or ten 10 ml), or mfg's multi-well tray</li> </ul>	<ul style="list-style-type: none"> <li>• E-coli Ultraviolet lamp (365 nm wave length, 6 W bulb)<sup>23</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
<ul style="list-style-type: none"> <li>• Other</li> </ul>	<ul style="list-style-type: none"> <li>• Instrument manual available</li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	<ul style="list-style-type: none"> <li>• Temperature Log (thermometer accurate to 0.5 Celsius).<sup>1</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Comments: : <div style="border: 1px solid black; height: 150px; margin-top: 5px;"></div>				
Criteria	Standard Methods Requirement	Acceptable?		Rating
<b>Refrigerator</b>				
<ul style="list-style-type: none"> <li>• Temperature Recordkeeping</li> </ul>	<ul style="list-style-type: none"> <li>• Temperature Log (thermometer accurate to 0.5 Celsius).<sup>5</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
<ul style="list-style-type: none"> <li>• Temperature Calibration / Documentation</li> </ul>	<ul style="list-style-type: none"> <li>• Thermometer calibrated annually with NIST traceable thermometer<sup>1,2</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
<ul style="list-style-type: none"> <li>• Other</li> </ul>	<ul style="list-style-type: none"> <li>• Thermometer held in water bath.<sup>1</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	<ul style="list-style-type: none"> <li>• Refrigerator temperature ≤6° Celsius.<sup>13</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	<ul style="list-style-type: none"> <li>• Do not store volatile solvents, food, or beverages.<sup>14</sup></li> </ul>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Comments: <div style="border: 1px solid black; height: 150px; margin-top: 5px;"></div>				

# General Lab Criteria – Gratis WWTP, March 11, 2013

Criteria	Standard Methods Requirement	Acceptable?		Rating
<b>Chlorine Meter</b>				
• Calibration Frequency / Documentation	• pH / millivolt meter read to 0.1 mV <sup>15</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Calibration verification required for testing over long period of time (e.g. 12 hrs.), or after a large number of samples (every 10 samples) <sup>3</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
• Calibration Method	• Calibration using three iodate solutions 0.2, 1.0, 5.0 milliliters or calibration per manufacturer specification <sup>16</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Standards used for calibration not expired	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
• Slope Documentation / Acceptability	• Calibration curve (acceptable slope)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
• Other	• Electrode free of deposits and foreign material	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Log book being maintained. <sup>2</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Instrument manual available	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Comments: :				

Criteria	Standard Methods Requirement	Acceptable?		Rating
<b>Ammonia Meter</b>				
• Calibration Frequency / Documentation	• Calibration verification required for testing over long period of time (e.g. 12 hrs.), or after a large number of samples (every 10 samples) <sup>3</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Log book being maintained <sup>2</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
• Slope acceptability	• Verify calibration slope is acceptable (per mfg. spec.).	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
• Calibration Method	• Standards used for calibration (3 ammonia solutions of 10 mg/l, 1 mg/l, and 0.1 mg/l) or per mfg. spec. <sup>17</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Standards used for calibration not expired	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
• Other	• Electrode free of deposits and foreign material	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Teflon covered magnetic stirrer or equivalent for mixing <sup>18</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Instrument manual available	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Comments: :				

# General Lab Criteria – Gratis WWTP, March 11, 2013

Criteria	Standard Methods Requirement	Acceptable?		Rating
<b>Sample Collection/Handling</b>				
• Sample Labeling	• Samples container labeled (description, date, time, preservative added, initialed). <sup>19</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
• Chain of Custody	• Chain of custody (description, date, time, signature). <sup>19</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
• Other	• Composite samples refrigerated during sample collection <sup>14</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Equipment blanks utilized <sup>14</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	• SOP for cleaning of sampling equipment	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Logbook being maintained <sup>2</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Comments:				

Criteria	Standard Methods Requirement	Acceptable?		Rating
<b>Desiccator</b>				
• General criteria	• Properly working seals.	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<b>A</b>
	• Desiccant fresh (blue color)	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
• Documentation	• Log book being maintained <sup>2</sup>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
Comments: None.				

Criteria	Standard Methods Requirement	Acceptable?		Rating
<b>Bench sheets</b>				
• General criteria	• Date(s) <sup>2</sup>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<b>A</b>
	• Analyst initials <sup>2</sup>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Blue or black ink pen <sup>2</sup>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Calibration information <sup>2</sup>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Equations, calculations, units for all measurements, notations, and results present <sup>2</sup>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Corrections, single line through, initialed and dated <sup>2</sup>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
Comments: None.				

# General Lab Criteria – Gratis WWTP, March 11, 2013

Criteria	Standard Methods Requirement		Rating
<b>Hot Water Bath (Fecal Coliform/E. Coli)</b>		Acceptable?	
• Temperature Recordkeeping	• Temperature Log (thermometer accurate to 0.2° C) <sup>21</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	• Incubator temperature 44.5° C ± 0.2° <sup>21/24</sup>		
• Temperature Calibration / Documentation	• Thermometer calibrated annually with NIST traceable thermometer <sup>1,2</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	• Log book being maintained <sup>2</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
• Water Level	• Thermometer total immersion or partial (line on thermometer to ID immersion depth) <sup>1,5</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No

Comments:

Criteria	Standard Methods Requirement		Rating
<b>Autoclaves/Steam Sterilizers</b>		Acceptable?	
• All apparatus utilized is adequately sterilized before use	• Sterilizing temperature 121° C <sup>25</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	• 10 to 30 minutes time based on material being sterilized <sup>26</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
• Documentation	• Verify the autoclave temperature weekly by using a maximum registering thermometer (MRT) to confirm that 121°C has been reached as measured in the exhaust. <sup>1</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	• Date, contents, sterilization time and temperature, total time in autoclave, and analyst's initials should be recorded each time the autoclave is used <sup>1</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
• Temperature Calibration / Documentation	• Thermometer calibrated annually with NIST traceable thermometer <sup>1,2</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	• Log book being maintained <sup>2</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
• Performance Checks	• Test monthly for efficacy using a biological such as commercially available <i>Geobacillus stearothermophilus</i> in spore strips, suspensions, or capsules <sup>1</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No

Comments:

# General Lab Criteria – Gratis WWTP, March 11, 2013

Criteria	Standard Methods Requirement	Acceptable?		Rating
<b>Final Effluent Temperature Monitoring</b>				
• General Criteria	• Thermometer calibrated annually with NIST traceable thermometer <sup>1,2</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Thermometer accurate to 0.1° Celsius <sup>5</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	• Log book being maintained <sup>2</sup>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Comments:				
<b>Number of Criteria Rated:</b>				4
				4
				4
<p><b>Acceptable Ratings</b> – No action required (recommend SOP's written or updated, perform DMRQA's for all onsite analysis, recommend voluntary lab analyst certification, written response not required).</p>				
<p><b>Marginal Ratings</b> – Improvements required, written response required (recommend SOP's be written or updated, recommend they perform DMRQA's for all onsite analysis, recommend voluntary lab analyst certification, require deficiencies to be addressed in written response).</p>				
<p><b>Unsatisfactory Rating</b> - Improvements required, written response required, NOV issued (recommend SOP's be written or updated, recommend they perform DMRQA's for all onsite analysis, recommend voluntary lab analyst certification, require deficiencies to be addressed in written response to NOV).</p>				
Consider recommending PAI Audit from DES when:		>60% of ratings are Marginal >45% of ratings are a combination of Marginal or Unacceptable >30% of ratings are Unacceptable		

### Notation of Referenced Method

- |                            |                              |
|----------------------------|------------------------------|
| 1 Method 9020-B, Item 3    | 14 Method 1060A, Item 1      |
| 2 Method 1020-A, Item 1    | 15 Method 4500-CI I, Item 2  |
| 3 Method 1020-B, Item 10   | 16 Method 4500-CI I, Item 4  |
| 4 Method 2540-B, Item 2    | 17 Method 4500-NH3 D, Item 4 |
| 5 Method 2550-B, Item 1    | 18 Method 4500-NH3 D, Item 2 |
| 6 Method 1020-A, Item 1    | 19 Method 1060-B, Item 2     |
| 7 Method 4500-H B, Item 4  | 20 Method 1060-B, Item 1     |
| 8 Method 4500-H B, Item 2  | 21 Method 9222D, Item 1      |
| 9 Method 1020-B, Item 2    | 22 Method 9223 B, Item 2     |
| 10 Method 4500-O B, Item 3 | 23 Method 9223 B, Item 3     |
| 11 Method 4500-O G, Item 3 | 24 Method 1603, Item 2       |
| 12 Method 5210-B, Item 5   | 25 Method 9030-B, Item 3     |
| 13 CFR 136.3, Table II     | 26 Method 9020 B, Table IV   |

# General Lab Criteria – Gratis WWTP, March 11, 2013

**Equipment Logbook Content** - all maintenance performed on a piece of equipment should be documented in the logbook. This should include parts replacement and routine maintenance activities. Entries should include date, maintenance performed and initials of person making entry.

<b>Preservation and Holding Times</b>						
Parameter	Container	Min. Sample Size (mL)	Sample Type	Preservation	Maximum Storage Time	
					Recommended	Regulatory
BOD / CBOD	P, G	1000	G, C	Refrigerate $\leq 6^{\circ}\text{C}$	6h	48h
TSS	P, G	200	G, C	Refrigerate $\leq 6^{\circ}\text{C}$	7 d	7 d
pH	P, G	50	G	Analyze immediately	0.25h	0.25 h
NH3-N	P, G	500	G, C	Analyze as soon as possible or add $\text{H}_2\text{SO}_4$ to pH <2, Refrigerate $\leq 6^{\circ}\text{C}$	7 d	28 d
TRC	P, G	500	G	Analyze immediately	0.25h	0.25 h
DO (electrode)	G, BOD Bottle	300	G	Analyze immediately	0.25h	0.25 h
Temperature	P, G	--	G	Analyze immediately	0.25h	0.25 h
Metals, general	P, G	1000	G, C	For dissolved filter immediately and add $\text{HNO}_3$ to pH <2	6 months	6 months
Purgeables by purge and trap	G (PTFE lined lid)	40 (X2)	G	HCl to pH<2, Refrigerate $\leq 6^{\circ}\text{C}$	7 d	14 d
Base/Neutrals and acids	G (solvent rinsed or baked)	1000	C, G	Refrigerate $\leq 6^{\circ}\text{C}$	7 d	7 days until extraction 40 days after extraction
Pesticides	G (PTFE lined lid)	1000	C	Refrigerate $\leq 6^{\circ}\text{C}$	7 d	7 days until extraction 40 days after extraction
Fecal Coliform / E-Coli	G, P (Sterilized)	100	G	Refrigerate $\leq 10^{\circ}\text{C}$ if chlorine present, add sodium thiosulfate tablet	6 hrs transport Start analysis within 2 hrs of receipt in lab.	
Oil and Grease	G	1000	G	HCl or $\text{H}_2\text{SO}_4$ to pH <2, Refrigerate $\leq 6^{\circ}\text{C}$	28 d	28 d

<b>Approved Standard Methods</b>	
CBOD / BOD 5 Day	Std Methods 5210-B
Ammonia, Selective Electrode Method	Std Methods 4500-NH3 D
Total Residual Chlorine, DPD Colorimetric Method	Std Methods 4500-Cl G
Total Suspended Solids, Dried at 103-105 °C	Std Methods 2540-D
Dissolved Oxygen, Membrane Electrode Method	Std Method 4500-O G
pH, Electrometric Method	Std Methods 4500-H+ B
Fecal Coliform, Membrane Filter Procedure	Std Methods 9222D
Escherichia Coli, Enzyme Substrate Test	Std Method 9223B
Escherichia Coli Membrane Filtration Procedure	EPA Method 1603
Oil and Grease	USEPA 1664A or Std Methods 5520B
Metals, general	USEPA 200, Std Methods 3111B or C, or 3120B
Volatiles (Purgeables by purge and trap)	USEPA 6210, Std Methods 624
Semi-Volatiles (Base/Neutrals and acids)	USEPA 6410, Std Methods 625
Pesticides	USEPA 6410 and 6630, Std Methods 608



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  - Temporal Distr.
  - Time Series Data
  - PFDS Perform.
- PF Documents

- Probable Maximum Precipitation (PMP)
- PMP Documents

- Miscellaneous Publications
- AEP Storm Analysis Record
- Precipitation

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**NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: OH**

**DATA DESCRIPTION**

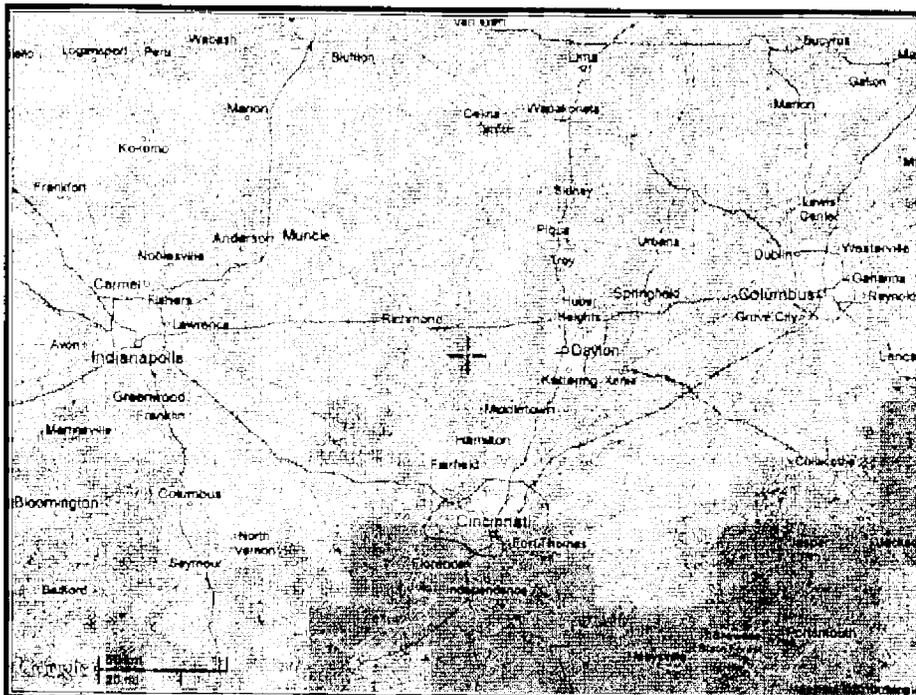
Data type:  precipitation depth Units:  english Time series type:  partial duration

**SELECT LOCATION**

**1. Manually:**

- a) Enter location (decimal degrees, use "-" for S and W): latitude:  longitude:
- b) Select station (click here for a list of stations used in frequency analysis for OH):

**2. Use map:**



- a) Select location (move crosshair or double click)
- b) Click on station icon  show stations on map

**LOCATION INFORMATION:**

Name: Eaton, Ohio, US\*  
 Station Name: EATON  
 Site ID: 33-2485  
 Latitude: 39.7347  
 Longitude: -84.6336  
 Elevation: 1002ft

\* source: Google Maps

**POINT PRECIPITATION FREQUENCY (PF) ESTIMATES**  
 WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION  
 NOAA Atlas 14, Volume 2, Version 3

PF tabular PF graphical Supplementary information



Duration	PDS-based precipitation frequency estimates with 90% confidence intervals (in inches) <sup>1</sup>									
	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.368 (0.336-0.404)	0.435 (0.397-0.478)	0.512 (0.467-0.562)	0.571 (0.519-0.626)	0.642 (0.583-0.703)	0.696 (0.629-0.760)	0.744 (0.670-0.810)	0.792 (0.711-0.884)	0.853 (0.760-0.931)	0.884 (0.764-0.975)
10-min	0.571 (0.522-0.628)	0.680 (0.620-0.747)	0.796 (0.726-0.873)	0.881 (0.801-0.966)	0.983 (0.892-1.08)	1.05 (0.954-1.15)	1.12 (1.01-1.22)	1.18 (1.06-1.29)	1.25 (1.12-1.37)	1.30 (1.16-1.42)
15-min	0.700 (0.639-0.770)	0.831 (0.758-0.913)	0.978 (0.892-1.07)	1.08 (0.986-1.19)	1.21 (1.10-1.33)	1.31 (1.18-1.43)	1.39 (1.25-1.52)	1.47 (1.32-1.60)	1.57 (1.40-1.71)	1.63 (1.44-1.77)
30-min	0.926 (0.846-1.02)	1.11 (1.01-1.22)	1.34 (1.22-1.47)	1.51 (1.37-1.65)	1.71 (1.56-1.87)	1.87 (1.69-2.04)	2.01 (1.81-2.19)	2.15 (1.93-2.34)	2.32 (2.07-2.53)	2.44 (2.17-2.68)
60-min	1.13 (1.03-1.24)	1.37 (1.24-1.50)	1.68 (1.53-1.84)	1.92 (1.74-2.10)	2.22 (2.02-2.43)	2.46 (2.22-2.68)	2.69 (2.42-2.92)	2.91 (2.61-3.18)	3.21 (2.86-3.50)	3.43 (3.04-3.74)
2-hr	1.33 (1.22-1.45)	1.61 (1.47-1.74)	1.98 (1.81-2.15)	2.26 (2.09-2.45)	2.63 (2.39-2.86)	2.82 (2.64-3.05)	3.20 (2.88-3.45)	3.48 (3.12-3.70)	3.86 (3.44-4.17)	4.14 (3.66-4.47)
3-hr	1.42 (1.30-1.56)	1.71 (1.56-1.88)	2.11 (1.92-2.31)	2.41 (2.19-2.63)	2.83 (2.59-3.08)	3.15 (2.84-3.43)	3.47 (3.12-3.78)	3.80 (3.39-4.13)	4.25 (3.76-4.61)	4.69 (4.03-4.98)
6-hr	1.69 (1.65-1.86)	2.03 (1.87-2.23)	2.50 (2.29-2.73)	2.86 (2.61-3.12)	3.34 (3.05-3.64)	3.73 (3.38-4.06)	4.12 (3.71-4.47)	4.51 (4.06-4.90)	5.04 (4.48-5.47)	5.46 (4.82-6.02)
12-hr	1.89 (1.83-2.18)	2.39 (2.19-2.62)	2.91 (2.67-3.18)	3.32 (3.04-3.63)	3.87 (3.53-4.21)	4.29 (3.90-4.67)	4.72 (4.27-5.12)	5.15 (4.64-5.60)	5.73 (5.11-6.22)	6.17 (5.47-6.70)

24-hr	2.32 (2.20-2.46)	2.78 (2.64-2.95)	3.39 (3.21-3.60)	3.87 (3.66-4.09)	4.49 (4.24-4.78)	4.99 (4.70-5.28)	5.48 (5.15-5.80)	5.99 (5.61-6.33)	6.65 (6.19-7.03)	7.16 (6.65-7.59)
2-day	2.72 (2.58-2.88)	3.25 (3.07-3.45)	3.94 (3.73-4.18)	4.48 (4.22-4.74)	5.19 (4.88-5.49)	5.74 (5.36-6.08)	6.29 (5.86-6.65)	6.85 (6.38-7.25)	7.56 (7.04-8.04)	8.14 (7.54-8.64)
3-day	2.92 (2.76-3.08)	3.48 (3.26-3.69)	4.21 (3.98-4.46)	4.77 (4.50-5.05)	5.52 (5.20-5.84)	6.10 (5.73-6.46)	6.69 (6.27-7.07)	7.27 (6.79-7.69)	8.05 (7.49-8.53)	8.65 (8.01-9.17)
4-day	3.12 (2.98-3.31)	3.72 (3.52-3.94)	4.47 (4.24-4.74)	5.07 (4.79-5.36)	5.85 (5.52-6.19)	6.47 (6.08-6.84)	7.08 (6.65-7.48)	7.70 (7.20-8.14)	8.52 (7.93-9.01)	9.16 (8.48-9.69)
7-day	3.69 (3.50-3.90)	4.38 (4.15-4.63)	5.26 (4.98-5.58)	5.95 (5.63-6.29)	6.89 (6.50-7.28)	7.83 (7.19-8.06)	8.38 (7.67-8.84)	9.15 (8.56-9.65)	10.2 (9.47-10.7)	11.0 (10.2-11.8)
10-day	4.19 (3.97-4.43)	4.97 (4.71-5.27)	5.85 (5.64-6.30)	6.72 (6.36-7.11)	7.75 (7.33-8.21)	8.58 (8.09-9.08)	9.40 (8.84-9.95)	10.2 (9.60-10.8)	11.4 (10.6-12.0)	12.2 (11.4-13.0)
20-day	5.74 (5.46-6.05)	6.78 (6.45-7.15)	8.00 (7.60-8.42)	8.94 (8.49-9.41)	10.2 (9.66-10.7)	11.2 (10.6-11.7)	12.1 (11.4-12.8)	13.1 (12.3-13.8)	14.3 (13.4-15.1)	15.2 (14.2-16.1)
30-day	7.12 (6.79-7.47)	8.38 (7.99-8.79)	9.76 (9.29-10.2)	10.8 (10.3-11.3)	12.2 (11.6-12.8)	13.2 (12.6-13.9)	14.3 (13.5-15.0)	15.3 (14.4-16.0)	16.6 (15.6-17.4)	17.5 (16.4-18.4)
45-day	9.02 (8.61-9.44)	10.6 (10.1-11.1)	12.2 (11.6-12.8)	13.4 (12.8-14.1)	15.0 (14.3-15.7)	16.2 (15.4-17.0)	17.4 (16.5-18.2)	18.5 (17.5-19.4)	19.9 (18.8-20.8)	20.9 (19.7-21.9)
60-day	10.7 (10.3-11.2)	12.6 (12.0-13.2)	14.4 (13.8-15.1)	15.8 (15.1-16.6)	17.7 (16.8-18.5)	19.0 (18.1-19.9)	20.3 (19.3-21.2)	21.6 (20.5-22.6)	23.1 (21.9-24.3)	24.3 (22.9-25.5)

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parentheses are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.  
Please refer to NOAA Atlas 14 document for more information.

Estimates from the table in csv format:

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