

DEPARTMENT OF ENVIRONMENTAL
PROTECTION

BUREAU OF WASTE MANAGEMENT
DIVISION OF MUNICIPAL and RESIDUAL WASTE

GENERAL PERMIT WMGR099

BENEFICIAL USE OF WASTEWATER TREATMENT
RESIDUAL

Issued: May 5, 2016

Expires: May 5, 2026

**SPECIAL CONDITIONS
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A. Authorization:

This general permit authorizes the processing of combined domestic sewage and industrial wastewater treatment residual, hereinafter referred to as "wastewater treatment residual", generated at a pre-treatment facility for beneficial use as a soil additive or effective fertilizer for utilization by (i) land application upon agricultural, agronomic, horticultural, and silvicultural lands and (ii) land application on disturbed lands to facilitate re-vegetation for land reclamation purposes.

B. Determination of Applicability Requirements:

A person or municipality that proposes to operate under the terms and conditions of this general permit after the date of permit issuance must obtain a Determination of Applicability (DOA) from the appropriate Department Regional Office (see attached list) prior to commencing authorized activities under this general permit. A completed (i) General Information Form (Authorization Application for a Residual or Municipal Waste General Permit Application), (ii) Form B (Professional Certification), (iii) Form 20 (Application For A Municipal or Residual Waste General Permit), (iv) Form 27R (Acceptance of General Permit Conditions), (v) DOA application fee in the amount identified in Section A (General Information) of the Form 20, and (vi) as a minimum, an operation and sampling plan contains the information indicated below must be submitted to the appropriate Department Regional Office. Checks shall be made payable to the "Commonwealth of Pennsylvania". No activities shall commence unless approved, in writing, by the Department.

1. A description of the facility's operation to stabilize the wastewater treatment residual.
2. Select and describe in details one of the treatments, as specified in §271.932(a) or §271.932(b)(1) through §271.932(b)(4), to be provided to wastewater treatment residual to meet the pathogen reduction requirements.
3. Select and describe in details one of the treatments, as specified in §271.933(b)(1) through §271.933(b)(10), to be provided to wastewater treatment residual to meet the vector attraction reduction (VAR) requirements.
4. An inventory list of major industrial waste generators whose waste is received and treated at the facility during the previous 12 calendar months.
5. Analytical results and name of the laboratory performing the analyses.
6. A description of the storage of wastewater treatment residual at the land application site if applicable.
7. Will the wastewater treatment residual be dewatered before it is land applied?
8. A description of how the representative sample(s) of the wastewater treatment residual will be collected.

C. Operating Conditions:

1. Prior to its land application for beneficial use as (i) a soil additive upon agricultural, agronomic, horticultural, and silvicultural lands or (ii) to facilitate re-vegetation on disturbed lands, the quality of wastewater treatment residual produced shall meet the quality criteria requirements in sub-sections (a), (b) and (c) of this Condition below.

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- a. Pollutants Limits - The concentration of any pollutant in the treated wastewater treatment residual produced shall not exceed the chemical concentration limit for the pollutant as specified in Table 1 below:

Table 1

Pollutant	Limit (Dry Weight Basis)
Arsenic	75 mg/kg
Cadmium	85 mg/kg
Copper	4,300 mg/kg
Lead	840 mg/kg
Mercury	57 mg/kg
Molybdenum	75 mg/kg
Nickel	420 mg/kg
Polychlorinated Biphenyls (PCBs)	8.6 mg/kg
Selenium	100 mg/kg
Zinc	7,500 mg/kg

- b. The wastewater treatment residual shall meet regulatory requirements for the selected pathogen reduction treatment as described in the sampling plan that was requested in Condition B of this general permit.
- c. The wastewater treatment residual shall meet regulatory requirements for the selected vector attraction reduction treatment as described in the sampling plan that was requested in Condition B of this general permit.
2. The wastewater treatment residual that does not meet one or more of the quality criteria requirements, as specified in Condition C(1) of this general permit, is not authorized to be land applied as a soil additive or effective fertilizer under this general permit.
 3. The wastewater treatment residual authorized under this general permit is prohibited from being sold to wholesale outlets, given away or distributed, in a bag or other container, for land application to a lawn or home garden.
 4. The wastewater treatment residual shall not be land applied if it is likely to adversely affect a Federal or Pennsylvania threatened or endangered species, or its designated critical habitat, listed under or pursuant to Section 4 of the Endangered Species Act (16 U.S.C.A. §1533), 30 Pa.C.S. §2305 (Relating to threatened and endangered species) or 34 Pa.C.S. (Relating to game and wildlife code).
 5. The wastewater treatment residual shall not be land applied at a rate that is greater than the agronomic rate, unless a greater application rate is approved by the Department. The agronomic rate required in this Condition may be estimated by using Worksheet 2 provided in this general permit, or an equivalent tabulated table that contains the information as indicated in the Worksheet 2.
 6. The permittee shall obtain a written consent of the landowner, using the Department-provided Form E-GP (Contractual Consent of Landowner for a General Permit), for the land, site, farm or field, acquired after the issuance date of this general permit, upon which the wastewater treatment residual will be land applied, prior to the actual land application of the wastewater

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treatment residual. This Form E-GP is not required to be recorded in the recorder of deeds office in the county where the land application activity will be conducted.

The Bureau of Water Standards and Facility Regulation's Form (3800-FM-WSFR0342), for an existing land, site, farm, or field acquired prior to the issuance date of this general permit, is sufficient consent for the land application of wastewater treatment residual activities authorized under this general permit.

7. The beneficial use of wastewater treatment residual to facilitate re-vegetation on disturbed lands for land reclamation purposes, under the authorization granted in this general permit, at an active or abandoned mine site must be approved by the Department. A greater application rate may be approved by the Department to facilitate re-vegetation on disturbed lands for land reclamation purposes.
8. Prior to the first land application of wastewater treatment residual at each new location, site or field, the permittee shall obtain, at a minimum, one representative soil chemical analysis for each field on which the wastewater treatment residual is to be land applied, for pH, Arsenic, Cadmium, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, PCBs, and Zinc. The results of these analyses shall be maintained by the permittee as required in Condition E(6) of the general permit and shall be made available to the Department upon request.
9. The wastewater treatment residual authorized under this general permit shall be stored and transported in accordance with 25 Pa. Code Chapter 299 (relating to storage and transportation) and the Waste Transportation Safety Act, 27 Pa. C.S. §§6201-6209. In addition, the facility shall be in compliance with federal and state statutes, rules and regulations relating to transportation.
10. If one of the pathogen reduction treatments as specified in §271.932(b) was selected to be provided to the wastewater treatment residual, the permittee shall provide the farmer and/or occupant(s) of the land on which land application of wastewater treatment residual is proposed the information below:
 - a. Site restrictions as specified in §271.932(b)(5), and
 - b. Management practices as specified in §271.915.

Site restrictions and management practices shall be met at the farm on which the wastewater treatment residual is applied.
11. This general permit does not authorize and shall not be construed as an approval to discharge any industrial wastes, wastewater, or leachate from the processing facility and/or land application site to the waters of the Commonwealth.
12. The wastewater treatment residual that is beneficially used under this general permit shall not be mixed or blended with other types of waste materials, including hazardous waste, municipal waste, special handling waste, or other residual waste, unless otherwise approved by the Department in writing.
13. The permittee shall comply with the terms and conditions of this general permit and with the environmental protection acts to the same extent as if activities were covered by an individual permit. The Department may:

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- a. Modify, suspend, revoke, or reissue the authorization granted in this general permit if the permittee cannot comply with the conditions of this general permit or if the authorized processing and beneficial use activities cannot be adequately regulated under the conditions of this general permit.
 - b. Require an individual permit be obtained if it is deemed necessary to prevent harm or the threat of harm to public health and the environment.
14. Nothing in this general permit shall be construed to supersede, amend, or authorize a violation of any of the provisions of any valid state or federal law or regulation.
 15. As a condition of this permit and of the permittee's authority to conduct the activities authorized by this permit, the permittee hereby authorizes and consents to allow authorized employees or agents of the Department, without advance notice or search warrant, upon presentation of appropriate credentials and without delay, to have access to and to inspect all areas on which solid waste management activities required of the permittee are being, will be, or have been conducted. This authorization and consent shall include consent to collect samples of waste, soils, water, or gases; take photographs; to perform measurements, surveys, and other tests; inspect any monitoring equipment; to inspect the methods of operation; and to inspect and/or copy documents, books, and papers required by the Department to be maintained. This permit condition is referenced in accordance with §§608 and 610(7) of the Solid Waste Management Act, 35 P.S. §§6018.608 and 6018.610(7). This condition in no way limits any other powers granted to the Department under the Solid Waste Management Act.
 16. The beneficial use of wastewater treatment residual by land application is contingent upon compliance with conditions of this general permit and, if sold, the Pennsylvania Fertilizer, Soil Conditioner and Plant Growth Substance Law of the Pennsylvania Department of Agriculture.
 17. For mine reclamation sites, re-vegetation shall provide for an effective and permanent vegetative cover of the same seasonal variety as vegetation native to the site and capable of self-regeneration and plant succession. Introduced species may be used when desirable and necessary to achieve the approved post closure land use. Vegetative cover shall be considered of the same seasonal variety when it consists of a mixture of species that is equal or superior utility to native vegetation during each season of the year.
 18. All activities conducted under the authorization granted in this general permit shall be performed in accordance with the permittee's application, except to the extent that there is a conflict with the regulations or governing statutes.
 19. The wastewater treatment residual and any waste generated from the beneficial use activity authorized by this general permit shall be managed in accordance with the Solid Waste Management Act, 35 P.S. §§6018.101 - 6018.1003 and the regulations promulgated thereunder.
 20. Upon cessation of operations, by completion of beneficial use activities or by the expiration date of this permit, unless extended by the Department, the permittee shall remove any remaining wastewater treatment residual and manage the wastewater treatment residual in accordance with the Solid Waste Management Act, the environmental protection acts and the regulations promulgated thereunder.
 21. Any independent contractors or agents retained by the permittee in the completion of processing and/or land application activities authorized under this general permit shall be

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subject to compliance history review by the Department prior to performance as specified by the Solid Waste Management Act of 1980, as amended.

22. At a minimum, at least one person working for the permittee with responsibility for the land application of wastewater treatment residual is required to satisfactorily complete a biosolids training course, provided by the Department. This training requirement should be satisfied within six months of this general permit issuance.
23. A surface water and erosion and sedimentation (E&S) controls plan in accordance with 25 Pa. Code, Chapter 102 (relating to erosion and sediment control) shall be implemented at the field/site in which the wastewater treatment residual is land applied for beneficial use purposes.
24. Except at designated storage areas, as specified in Condition C(25), wastewater treatment residual may be staged, for a maximum of 7 days, on the farm where land application is to take place. The total amount of wastewater treatment residual that may be staged shall not exceed the agronomic loading rate in dry tons per acre per year loading rate multiplied by the number of acres on which wastewater treatment residual is to be applied. If staging or storing wastewater treatment residual in a pile, under no circumstances may free liquids be present in the wastewater treatment residual, as determined by Method 9095 (Paint Filter Test) "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (EPA SW846).
25. Wastewater treatment residual stored at designated storage areas shall be recorded using the Bureau of Water Standards and Facility Regulation's Form (3800-FM-WSFR0068) or equivalent. Requirements for a designated storage area are as follows:
 - a. A map showing the location of the designated storage area, a diagram showing its design and a description of its operations shall be provided to the appropriate Department Regional Office with jurisdiction over the site. Written approval from the Department shall be obtained prior to installation of the designated storage area.
 - b. Routine inspections of the designated storage area shall be conducted for any signs of failure of the integrity of the area, spills, run-on, run-off, odors or other problems. Corrections or repairs shall be made promptly. Inspections shall be made as soon as possible after any severe weather event.
 - c. Wastewater treatment residual containing free liquid shall not be stored at the designated storage area.
 - d. At no time may all the designated storage areas on a site contain more wastewater treatment residual than can be applied and will be applied at an agronomic rate (or otherwise approved rate) for the proposed crop for a 365-day period on that site.
 - e. The designated storage area shall be designed, constructed and operated in a manner to minimize run-on, run-off, odors and the harboring, breeding or attraction of vectors. Designated storage areas may not be located on slopes exceeding three (3) percent unless otherwise approved in writing by the Department.
 - f. Best Management Practices (BMPs) as part of 25 Pa. Code, Chapter 102 (relating to erosion control) shall be implemented at the storage areas to divert storm water run-on away from the storage area(s). Proper drainage (i.e., diversions, drains, dikes, etc.) shall be constructed and maintained to prevent storm water from coming into contact with the stored wastewater treatment residual. Storm water runoff shall be managed in accordance with The Clean Streams Law and regulations promulgated thereunder.

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- g. If a storm water permit is required for construction of the storage area, the permittee must obtain necessary permit prior to storage of wastewater treatment residual at the facility, the permittee must obtain all the necessary storm water management permits.
- h. The permittee shall not cause or allow a point or non-point source discharge of the combined storm water run-off, wastewater treatment residual, and leachate, if generated, from the storage area to the surface waters of this Commonwealth.

D. Sampling, Analysis and Frequency of Monitoring.

1. The permittee shall collect representative samples of the wastewater treatment residual generated and determine its quality for land application in accordance with this permit. Samples must be representative of the final product to be land applied. Representative samples will be collected and analyzed in accordance with the sampling plan provided to the Department.

Should knowledge of the production or quality of the wastewater treatment residual produced, visual observations, or analytical results indicate variability in the quality of the wastewater treatment residual produced, more frequent testing shall be conducted.

2. The chemical analysis required in Conditions C(1) and D (1) of this general permit shall be performed by a laboratory accredited or registered for accreditation under the Environmental Laboratory Accreditation Act, 27 Pa.C.S.A. §§ 4101-4113.
3. The sampling and analytical methodologies used to meet the requirements as specified in Conditions C (1) and D (1) of this general permit shall be those in the most recent edition of the EPA's "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (EPA SW-846), "Methods for Chemical Analysis of Water and Wastes" (EPA 600/4-79-020), "Standard Methods for Examination of Water and Wastewater" (prepared and published jointly by the American Public Health Association, American Waterworks Association, and Water Pollution Control Federation), methods listed in §271.906, the Department's Biosolids Sampling Manual (3800-MN-DEP4081), or a comparable method subsequently approved by the Department.
4. The frequency of monitoring for the pollutants, pathogen reduction, and vector attraction reduction contained in the wastewater treatment residual as required in Condition C(1) of this general permit shall be as follows:

TABLE 2

Compliance Monitoring

Amount of Wastewater Treatment Residual Land Applied (Dry Tons per 365 Day Period)	Frequency of Monitoring
Greater than 0 but less than 290	Once per year
Equal to or greater than 290 but less than 1,500	Once per 90 days

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TABLE 2 (Continued)

Compliance Monitoring

Amount of Wastewater Treatment Residual Land Applied (Dry Tons per 365 Day Period)	Frequency of Monitoring
Equal to or greater than 1,500 but less than 15,000	Once per 60 days
Equal to or greater than 15,000	Once per month

The Department may reduce the frequency of monitoring required in this Condition, but may not be less than once per year, after the wastewater treatment residual has been monitored for two years and the permittee has submitted a written request to the Department asking for a lesser frequency of monitoring.

E. Recordkeeping.

1. The permittee shall maintain records of all samples collected and analyzed for the parameters (i.e., enteric viruses, viable Helminth ova, percentage of solids, temperature, pH, volatile solids, etc.) that are used at the facility, to meet the pollutant, pathogen and vector attraction reduction requirements. The records shall include the dates of sampling and testing, name of person collecting the sample, each parameter tested, the analytical results, the laboratory measurements, the name of laboratory used, and the analytical methodologies.
2.
 - a. The permittee shall maintain records to demonstrate that the wastewater treatment residual meets the quality criteria requirements as specified in Condition C(1) of this general permit.
 - b. The permittee shall maintain records of all analytical evaluations conducted on the wastewater treatment residual. This analytical information shall include the following on each sample: the dates of sampling and testing, sampling procedures, person collecting the sample, each parameter tested, the analytical results, the laboratory measurements, the laboratory used, and the analytical methodologies.
 - c. The permittee shall maintain records of all background soil analytical evaluations conducted on the land application site(s). The records shall include the following: the field names and site name, dates of sampling and testing, person collecting the sample, each parameter tested, the analytical results, the laboratory measurements, the laboratory used, and the analytical methodologies.
 - d. The permittee shall maintain a copy of the certification demonstrating satisfactory completion of the training course as specified in Condition C(22) of this general permit.
3. Cumulative pollutant loading rates (CPLRs) shall be tracked using "Worksheet 1" provided in this general permit or an equivalent form that contains the information requested in the Worksheet.

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4. The annual agronomic rate and annual plant available nitrogen applied shall be estimated using "Worksheets 2 and 3" provided in this general permit or equivalent forms that contain the information requested in the Worksheets.
5. Nitrogen from the manure that was applied to the fields which received the wastewater treatment residual shall be calculated using "Worksheet 4" provided in this general permit or an equivalent form that contains the information requested in the Worksheet.
6. The records required in Condition E of this general permit shall be retained at the facility for a minimum of five (5) years and made available to the Department upon request.

F. Reporting Requirements

1. The permittee shall submit to the appropriate Department Regional Office (see attached list), an annual report by March 1, which contains the following information:
 - a. For sites where the wastewater treatment residual was applied during the past calendar year (January – December):
 - i. A summary of agronomic rates applied to the site (e.g. Worksheet 5).
 - ii. A summary of cumulative pollutant loading rate (CPLRs) for the site using Worksheet 6 provided in this general permit
 - b. For the wastewater treatment residual processing facility:
 - i. Laboratory pollutant analysis as required in Condition C(1) of this general permit.
 - ii. Summary of the pathogen reduction analytical, specific or operational parameter(s) as specified in §271.932 for the selected treatment requested in Condition B(2) of this general permit.
 - iii. Summary of the vector attraction reduction analytical, specific or operational parameter(s) as specified in §271.933 for the selected treatment requested in Condition B(3) of this general permit.
 - iv. Records of wastewater treatment residual that was unacceptable for beneficial use and disposed of because it did not meet quality criteria as specified in Condition C(1) of this general permit.
 - v. An inventory list of the type of industry whose wastewater was received for treatment at the facility during the past calendar year (January – December).
 - c. Total amount of wastewater treatment residual produced, stored and land applied for beneficial use.
2. The permittee shall immediately notify the appropriate Department Regional Office (and District Mining Office, if applicable), in writing, of any changes: in the company name, address, owners, operators, and/or responsible officials; the quality (chemical and/or physical characteristics) of the wastewater treatment residual specified in Condition C(1); pathogen reduction and vector attraction reduction treatment provided to the wastewater treatment residual; when 90% or more of any of the cumulative pollutant loading rates (CPLRs) listed in

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worksheet 1 of this general permit is reached; in the status of any permit issued by the Department or federal government under the environmental protection acts.

3. The permittee shall immediately notify the appropriate Department Regional Office (and District Mining Office, if applicable), in writing or speech, the date and location at which land application of the wastewater treatment residual will occur when requested by the Department, for the purpose of inspection or investigation of compliance or non-compliance with the terms and conditions of the general permit and with applicable statutes, rules and regulations.
4. In case of emergency or if change(s) must be made to the selected wastewater treatment process(es) or method showing compliance with pathogen reduction and VAR requirements originally proposed in the approved general permit application, the permittee shall notify the appropriate Department Regional Office as follows:
 - a. Verbally notify of the changes;
 - b. Describe the changes including a sampling plan, in writing, and submit supporting documentation for the new process, VAR option and/or pathogen reduction alternative, within 14 days of the verbal notice;
 - c. Indicate the duration these emergency treatment process(es) or methods will be utilized; and
 - d. Indicate whether the permittee will utilize the previous treatment process(es) originally proposed in the approved general permit application.
5. Any person or municipality operating under the provisions of this general permit may utilize new application sites by providing the Department, in writing, the information below.
 - a. At least 30-days prior to the first land application of the wastewater treatment residual at a new location, field, farm, or site, the permittee shall send or otherwise provide a notification to the adjacent landowner(s), municipality, County Conservation District, and the Department as follows:
 - i. The notification shall include a brief description of the operation, including designated storage area(s) at the site, any site restrictions, the name of the person land applying the wastewater treatment residual, and the applicable permit number.
 - ii. The notification shall be sent by personal delivery or first class mail and, for an adjacent landowner, shall also be given by posting at the property line in a matter sufficient to notify the adjacent landowner of the information required in this Condition.
 - iii. The notification to the municipality, Department and County Conservation District shall include the location of the field, farm or site where the wastewater treatment residual will be applied.
 - b. The information required in this Condition E(5) must be submitted, no less than thirty (30) days prior to commencing land application activities at the new application site. The permittee may land apply the wastewater treatment residual at the new site in accordance with the conditions of this general permit after the aforementioned thirty-day period, unless otherwise instructed by the Department.

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6. The permittee shall immediately notify the Department's Emergency Hotline by telephone at 800-541-2050 and the appropriate DEP regional office waste management program in the event of any spill of the water treatment residual in a quantity capable of reaching surface water, and shall take appropriate immediate action to protect the health and safety of the public and the environment.

G. Permit Renewal.

A person or municipality that plans to continue the operations authorized under this general permit, after the expiration date indicated on the approval for coverage page, shall file a complete application for permit renewal at least 180 days before the expiration date of this general permit unless permission has been granted by the Department for submission at a later date. The renewal application shall be made using the "Form 20 (Application For a Municipal or Residual Waste General Permit)". In the event that a timely and complete application for renewal has been submitted and the Department is unable, through no fault of the permittee, to reissue the general permit or approval for coverage before its current coverage expiration date, the terms and conditions of the approved coverage will

automatically continue and will remain fully effective and enforceable pending the issuance or denial of the renewal for permit coverage, provided the permittee is, and has been, operating in compliance with the terms and conditions of the general permit.

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WORKSHEET 1

**CUMULATIVE POLLUTANT LOADING RATES (CPLRs)
ON LAND APPLICATION SITES**

1. Site Name: _____ 2. Application Rate (dry ton/acre): _____ 3. Year of Application: _____
 Field: _____

 _____ (From Worksheet 2)

Pollutant	CPLRs (lb/acre)		Calculation for Determining Cumulative Loading								
	100%	90%*	Analytical Values (mg/kg)	x	Application Rate (dry ton/acre)	x	0.002 (lb/ton)	+	Pollutant Previously Applied (lb/acre)	=	Amount To Date (lb/acre)
Arsenic	36	32.4	_____	x	_____	x	0.002	+	_____	=	_____
Cadmium	34	30.6	_____	x	_____	x	0.002	+	_____	=	_____
Copper	1320	1188	_____	x	_____	x	0.002	+	_____	=	_____
Lead	264	237.6	_____	x	_____	x	0.002	+	_____	=	_____
Mercury	15	13.5	_____	x	_____	x	0.002	+	_____	=	_____
Nickel	370	333	_____	x	_____	x	0.002	+	_____	=	_____
Selenium	88	79.2	_____	x	_____	x	0.002	+	_____	=	_____
Zinc	2464	2217.6	_____	x	_____	x	0.002	+	_____	=	_____

Conversion from gallons or wet tons per acre to dry tons per acre (based on actual application rate used on field):

$$\begin{array}{l} \text{Gallons Applied} \quad \times \quad 8.5 \quad \div \quad 2,000 \quad = \quad \text{Wet Tons Applied} \\ \text{_____} \quad \times \quad 8.5 \quad \div \quad 2,000 \quad = \quad \text{_____} \end{array}$$

$$\begin{array}{l} \text{Wet Tons Applied} \quad \times \quad \text{Percent Solids (in decimal)} \quad = \quad \text{Application Rate (Dry Tons/Acre)} \\ \text{_____} \quad \times \quad \text{_____} \quad = \quad \text{_____} \end{array}$$

* When 90% of the CPLR is reached, the appropriate Department Regional Office must be notified.

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WORKSHEET 2

WASTEWATER TREATMENT RESIDUAL ANNUAL AGRONOMIC RATE

Field _____ Site _____
 Growing Season Year _____

Crop _____
 Yield Goal _____

1. Total available Nitrogen from residual waste (based on wastewater treatment residual analysis):

a. **NH₄-N**

$$\frac{\text{NH}_4\text{-N}}{\text{NH}_4 \text{ lb/ton}} \times \frac{\% \text{NH}_4}{100} \times 2000 \text{ lb/ton} = \text{_____ lb/ton NH}_4\text{-N}$$

$$\text{_____ NH}_4 \text{ lb/ton} \times \text{_____ } K_{\text{vel}} \text{ (Vol. Rate Table)} = \text{_____ lb/ton available NH}_4$$

b. **Org-N**

$$\frac{\text{Org-N}}{\text{Org lb/ton}} \times \frac{\% \text{NH}_4}{100} \times 2000 \text{ lb/ton} = \text{_____ lb/ton Org-N}$$

$$\text{_____ Org lb/ton} \times \text{_____ } K_{\text{min}} \text{ (Min. Rate Table)} = \text{_____ lb/ton available Org-N}$$

Total Plant Available Nitrogen (PAN) from residual waste (1.a. + 1.b.): 1 _____ lb/ton plant available N

2. P₂O₅ and K₂O fertilizer equivalent in wastewater treatment residual (based on wastewater treatment residual analysis):

a. _____ % P in residual x 2.29 = _____ % P₂O₅ in wastewater treatment residual

_____ % P₂O₅ x 2000 lb/ton = 2.a. _____ lb/ton P₂O₅

b. _____ % K in residual x 1.2 = _____ % K₂O in wastewater treatment residual

_____ % K₂O x 2000 lb/ton = 2.b. _____ lb/ton K₂O

3. Total crop nitrogen requirement:

(From soil analysis, historical data, or Penn State Agronomy Guide) 3 _____ lb/acre

4. Nitrogen provided from other N sources either added to or mineralized in the soil:

a. Nitrogen contributions from previous years' applications.

- 1. N from previous legume crop (Penn State Agronomy Guide) _____ lb/acre
- 2. Estimate of mineralized organic N from **previous** residual waste (Worksheet 2, Part 4 from previous 2 years applications) _____ lb/acre applications
- 3. Estimate of available N from **historical** manure application (Worksheet 3) _____ lb/acre (Worksheet 3)

Sum of (4.a.1 + 4.a.2 + 4.a.3.) 4a _____ lb/acre

b. Nitrogen contributions from current years' applications.

- 1. Estimate of available N from **current** manure application (Worksheet 3) _____ lb/acre
- 2. N from chemical fertilizers _____ lb/acre
- 3. N from other sources (ex: food processing waste) _____ lb/acre

Sum of (4.b.1 + 4.b.2. + 4.b.3.) 4b _____ lb/acre

Total available Nitrogen from other sources (4.a. + 4.b.) 4 _____ lb/acre

5. Adjusted crop Nitrogen requirement (**Subtract 4 from 3**): 5 _____ lb/acre

6. Calculate the agronomic rate for wastewater treatment residual (**Divide 5 by 1**): 6 _____ dry ton/acre

7. Calculate amount of wastewater treatment residual to be applied: 7 _____
 wet tons/acre or gallons/acre

_____ dry tons/acre + % Solids (In Decimal) _____ = _____ Wet tons/acre

_____ wet tons/acre x 2,000 lb/ton _____ = _____ gallons/acre

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WORKSHEET 3

**PLANT AVAILABLE NITROGEN MINERALIZED FROM RESIDUAL ORGANIC-N
APPLIED IN CURRENT YEAR**

Field: _____
 Growing Season Year: _____
 Site: _____

Crop: _____
 Yield Goal: _____

Step 1. Column 1.A. - The year of residual waste application and insert appropriate year in Columns 2.A. and 3.A.

Step 2. Block 1.B. - Obtain by the following equations:

% Organic N in residual waste (from analysis) x (2000 lb/ton ÷ 100) = lb/ton Org-N in residual waste:

_____ % Org-N¹ x (2000 lb/ton ÷ 100) = _____ lb/ton Org-N

lb/ton Org-N x actual application rate (in dry ton/acre) = Org-N applied (in lb/acre)

¹ Value from residual waste analysis

Step 3. Column C - The mineralization rate for the specific residual waste treatment for the respective year (i.e., 1, 2, or 3). See K_{min} Table provided of this Appendix.

Step 4. Column D = Column B x Column C

Step 5. Column E = Column B - Column D

Step 6. Block 2.B. = Value in Block 1.E. and follow Steps 4 and 5

Step 7. Block 3.B. = Value in Block 2.E. and follow Steps 4 and 5

	A	B	C	D	E
Year	Year of growing season _____ (Year of application)	Organic N (lb/acre)	Mineralization Rate (K _{min}) (Min. Rate Table)	Mineralized Organic N In lb/acre (PAN)	Organic N Remaining (lb/acre)
1	Growing Season 0 – 1 Year _____				
2	Growing Season 1 – 2 Year _____	(from 1.E)			
3	Growing Season 2 – 3 Year _____	(from 2.E)			

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WORKSHEET 3 (Continued)

Volatilization Factors (K_{vol})

If Residual waste is:	Factor K_{vol} is:
Liquid and surface applied	0.50
Liquid and injected into the soil	1.0
Dewatered and applied in any matter	0.50

Mineralization Rates¹ (K_{min})

Time After Residual Waste Application (Year)	% ² of Org-N Mineralized from Unstabilized Primary & Waste Activated Residual Waste	% ² of Org-N Mineralized from Aerobic or Lime Stabilized Digested Residual Waste	% ² of Org-N Mineralized from Anaerobically Digested Residual Waste	% ² of Org-N Mineralized from Composted Residual Waste
0 – 1	0.4	0.3	0.2	0.1
1 – 2	0.2	0.15	0.10	0.05
2 – 3	0.10	0.08	0.05	0.03

¹ Percentage of Org-N present mineralized during the time interval shown.

² Expressed as a decimal.

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WORKSHEET 4

MANURE

Field: _____

Crop: _____

Growing Season Year: _____

Yield Goal: _____

Site: _____

Manure Residual Nitrogen (Historical)

Manure Rate (ton/acre)	x	Manure N (lb/ton) (Penn State Agronomy Guide)	x	N Availability Factor (Penn State Agronomy Guide)	=	Available Residual Nitrogen (lb/acre)

Manure Nitrogen (Current Year)¹

Expected Manure Application Rate (ton/acre)	x	Manure N (lb/ton) (Penn State Agronomy Guide)	x	N Availability Factor (Penn State Agronomy Guide)	=	Available Residual Nitrogen (lb/acre)

¹ Includes previous fall application

For nitrogen available factors, see Agronomy Guide, Table 2-13.

For total manure nutrient content, see Agronomy Guide, Table 2-12 or manure analysis provided by farmer

Historical Available Residue Nitrogen from Manure = _____ lb/acre
 Current Available Nitrogen from Manure = _____ lb/acre
 Total Available Nitrogen from Manure = _____ lb/acre

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WORKSHEET 5

Summary of Agronomic Rates Applied

Site Name: _____
 Land Owner Name: _____

Year of Application: _____
 Estimated Date of Land Application Activity Completed: _____

Date	Field ID	Field Size (Acres)	Crop Planned	Actual Acres Land Applied	Application Method	Total Crop N Required (Lb/Acre)	P ₂ O ₅ Applied (Lb/Acre)	K ₂ O Applied (Lb/Acre)	Manure N Applied (Lb/Acre)	Calculated Appl. Rate (Dry ton or Gal. per acre)	Actual Appl. Rate (Dry ton or Gal. per acre)
Total	-		-		-						

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WORKSHEET 6

Summary of Cumulative Pollutant Loading Rates (CPLRs)

Site Name: _____

Year of Application: _____

Reporting Level (Lb/Acre)		32.4	30.6	1188	237.6	13.5	333	79.2	2217.6	
Field ID	Total Acres	Application Rate (DT/Acre)	Arsenic (Lb/Acre)	Cadmium (Lb/Acre)	Copper (Lb/Acre)	Lead (Lb/Acre)	Mercury (Lb/Acre)	Nickel (Lb/Acre)	Selenium (Lb/Acre)	Zinc (Lb/Acre)

**Department of Environmental Protection
Regional Offices
(and Counties Served)**

- I. Bucks, Chester, Delaware, Montgomery, Philadelphia.

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- II. Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, Pike, Schuylkill, Susquehanna, Wayne, Wyoming.

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- III. Adams, Bedford, Berks, Blair, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, Lancaster, Lebanon, Mifflin, Perry, York.

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- V. Allegheny, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington, Westmoreland.

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- VI. Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango, Warren.

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