DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Mining Programs

DOCUMENT NUMBER:	563-2112-115
TITLE:	Developing National Pollutant Discharge Elimination System (NPDES) Permits for Mining Activities
EFFECTIVE DATE:	Upon publication of notice as final in the *Pennsylvania Bulletin.*
AUTHORITY:	Surface Mining Conservation and Reclamation Act, Coal Refuse Disposal Control Act, Non-Coal Surface Mining Conservation and Reclamation Act, and The Clean Streams Law.
POLICY:	DEP will implement the requirements of the Laws and Regulations for issuing NPDES permits associated with mining activities.
PURPOSE:	The purpose of this guidance is to provide direction establishing effluent limits for NPDES permits associated with mining activities to ensure timely and compliant point source permitting.
APPLICABILITY:	This guidance applies to NPDES permits associated with mining activities.
DISCLAIMER:	The policies and procedures outlined in this guidance are intended to supplement existing requirements. Nothing in the policies or procedures shall affect regulatory requirements. The policies and procedures herein are not an adjudication or a regulation. There is no intent on the part of DEP to give the rules in these policies that weight or deference. This document establishes the framework within which DEP will exercise its administrative discretion in the future. DEP reserves the discretion to deviate from this policy statement if circumstances warrant.
PAGE LENGTH:	23 pages

Procedures for Developing NPDES
Requirements for Mining Activities

REGULATORY FRAMEWORK

NPDES permitting for mine sites is done in the context of the following regulations:

Chapter 77	Noncoal Mining
Chapter 86	Surface and Underground Coal Mining: General
Chapter 87	Surface Mining of Coal
Chapter 88	Anthracite Coal
Chapter 89	Underground Mining of Coal and Coal Preparation Facilities
Chapter 90	Coal Refuse Disposal
Chapter 92a	*NPDES Permitting, Monitoring and Compliance
Chapter 93	Water Quality Standards
Chapter 95	Wastewater Treatment Requirements
Chapter 96	Water Quality Standards Implementation

*Chapter 92a incorporates significant sections of the federal regulations at 40 Code of Federal Regulations (CFR). Cross-references to federal regulation citations are included to provide a complete regulatory roadmap.

NPDES permitting for mining under Chapter 92a is coordinated with the permitting of the mining activity under Chapters 77, 86, 87, 88, 89 and 90. The NPDES permit and the mining activity permit are interdependent and are reviewed and processed together.

BACKGROUND

NPDES permits must ensure compliance with all applicable water quality standards which include existing and designated surface water uses, narrative and numeric water quality criteria, and the antidegradation program (see TGD 391-0300-002).

Water Quality Criteria

NPDES permits are to be issued to comply with both numeric and narrative water quality criteria, designed to protect receiving stream uses and quality. Effluent limits established to comply with water quality criteria are referred to as water quality based effluent limits (WQBELs).

Narrative Criteria

The general narrative water quality criterion is stated in the regulations at Chapter 93, § 93.6(a), "*Water may not contain substances attributable to point or nonpoint source discharges in concentration or amounts sufficient to be inimical or harmful to the water uses to be protected or to human, animal, plant or aquatic life.*" This criterion is applicable to designated and existing uses.

In addition, the water quality criteria at Chapter 93, § 93.6(b) address "floating materials, oil, grease, scum and substances which produce color, tastes odors, turbidity or settle to form deposits."

Mining permit applications must be reviewed with respect to the narrative criteria to protect the water quality, particularly for two specific uses, as a public water supply (PWS) and for aquatic life. With respect to sulfate, total dissolved solids (TDS) and specific conductance (SC), the PWS use protection is implemented at the point of intake from a stream for the PWS, with a numeric limit at the intake point of 500 mg/l TDS (and 250 mg/l Sulfate). (Table 3 in § 93.7 includes numeric water quality criteria.) The aquatic life narrative criterion is implemented by Osmotic Pressure (OP) (the numeric in-stream limit is expressed as a maximum of 50 mOsm/kg) and evaluation for other toxic substances. The OP criterion is intended to protect aquatic life with respect to the effects of TDS/Sulfate/SC. Use of this water quality criterion is the most effective way to assure protection of aquatic life since there are currently no numeric water quality criteria promulgated for TDS or sulfate relating to aquatic life.

Numeric Criteria

Numeric water quality criteria are expressed in a variety of ways. For example, the criteria for the metals of primary concern for coal mining (iron, manganese and aluminum) each are expressed differently. The criterion for manganese is expressed as a maximum (1.0 mg/l, PWS). The criterion for iron is expressed as a 30-day average (1.5 mg/l-total, fisheries) and maximum (0.3 mg/l-dissolved, PWS). The criterion for aluminum is expressed as a Criteria Maximum Concentration (CMC) (750 ug/l). As a result, translating the criteria to limits is different for each metal.

The PWS criteria for sulfate, TDS and chloride must be met at the point of existing or planned surface water supply withdrawals. (Chapter 96, § 96.3(d))

Where limits are required for the 30-day average, daily maximum and instantaneous maximum, the ratio of the limits is 1:2:2.5, where the daily maximum is two times the 30-day average and the instantaneous maximum is 2.5 times the 30-day average.

Technology-Based Effluent Requirements

Appendix C of this guidance summarizes the technology based effluent requirements for mining.

Table C-1 lists the effluent limit guidelines from 40 CFR 436 for noncoal mining. Pennsylvania's regulations at Chapter 77, § 77.522 list limitations for pH and "other parameters the Department may require."

Table C-2 in Appendix C describes the technology-based effluent requirements for coal mining activities. These limits are categorized by the source of the water (i.e. pit water or runoff) and the precipitation conditions. These limits are based on the framework in 40 CFR 434.

DEP incorporates the more stringent of these limitations or any limits required to implement the state water quality criteria in the NPDES permits.

APPLICATION AND REVIEW PROCESS

The steps for the review of NPDES applications for mine sites include:

1. Application Received - notice in *Pennsylvania Bulletin*
2. Review Effluent Characterization information
3. Conduct Reasonable Potential Analysis

4. Calculate effluent limits
5. Prepare Draft Permit and Fact Sheet
6. Publish notice of Draft Permit in *Pennsylvania Bulletin*
7. Send required information to the U.S. Environmental Protection Agency (EPA) for review and comment/objection for NPDES permits related to a total maximizer daily load (TMDL) and in the Monongahela watershed
8. Review comments/objections
9. Public hearing (if requested and there is significant public interest)
10. Prepare final permit documents (and written findings)
11. Issue/Deny Permit
12. Notice of action in *Pennsylvania Bulletin*
13. Effluent Characterization Results submitted by applicant within two years of discharge
14. DEP evaluates Effluent Characterization data to determine if permit modifications are needed

Effluent Characterization

The regulations at Chapter 92a, § 92a.21 which incorporates 40 CFR 122.21 (wastewater) and Chapter 92a, § 92a.32 which incorporates 40 CFR 122.26 (stormwater) require that an applicant submit an effluent characterization (i.e. identifying what pollutants are expected to be discharged) as part of the permit application. The Application for Individual NPDES Permit Associated with Mining Activities (5600-PM-BMP0032) includes effluent characterization requirements in section D. The goal of effluent characterization is to assure that the nature and quantity of pollutants in the effluent, as well as their effect on the receiving waters, is fully evaluated during the application review and permit development process.

Resources are available to assist an applicant determine if a pollutant should be expected to be present in the effluent and to assist DEP in reviewing this information. These resources include the Development Document for Effluent Limitations Guidelines and Standards for the Coal Mining Point Source Category (US EPA, 1982), data from adjacent or similar sites, datasets collected by the U.S. Geological Survey (USGS) as part of a survey of coal mine discharge characteristics in Pennsylvania, data collected and presented by the PA Coal Association and the PA Aggregates and Concrete Association.

The pollutants for which sampling may be required are listed in various categories in Appendix D of 40 CFR 122. They are organized in tables:

Table II	Organic Toxic Pollutants
Table III	Other Toxic Pollutants (Metals and Cyanide) and Phenols
Table IV	Conventional and Nonconventional Pollutants
Table V	Toxic Pollutants and Hazardous Substances

In addition, there are effluent characterization requirements that are cited elsewhere in the regulations (i.e. not in tables).

The effluent characterization requirements are summarized in Appendix A.

The regulations at 40 CFR 122.21(g)(7)(ii) state that "an applicant is expected to 'know or have reason to believe' that a pollutant is present in an effluent based on an evaluation of the expected use, production, or storage of the pollutant, or on any previous analyses for the pollutant."

On sites with multiple outfalls, with substantially identical effluents, DEP may allow the applicant to test only one outfall for effluent characterization purposes and report that outfall as representative of the substantially identical outfall. (40 CFR 122.21(g)(7)(i))

Under Section 402(k) of the Clean Water Act, 42 U.S.C § 1342(k), an NPDES permit provides authorization and a shield for the discharge of the following pollutants resulting from facility processes, waste streams and operations that have been clearly identified in the permit application process when discharged from specified outfalls: (1) pollutants specifically limited in the permit or pollutants which the permit, fact sheet or administrative record explicitly identify as controlled through indicator parameters; (2) pollutants for which the permit authority has not established limits or other permit conditions, but which are specifically identified in writing as present in facility discharges during the permit application process and contained in the administrative record which is available to the public; and pollutants not identified as present but for which constituents or waste streams, operations or processes were clearly identified in writing during the permit application process and contained in the administrative record which is available to the public.

Generally, an applicant must provide a narrative description that includes the significant materials used or stored on-site in the previous three years and the manner and frequency that pesticides, herbicides, soil conditioners and fertilizers are applied. Significant materials is a defined term that includes raw materials, fuels, solvents, detergents, hazardous substances, fertilizers, pesticides and waste products (e.g. ash, slag or sludge). (40 CFR 122.26(b)(12)) Those significant materials that were treated, stored or disposed of in a manner that would allow exposure to stormwater and therefore have the potential to be released in a stormwater discharge must be reported. (40 CFR 122.26(c)(i)(B)) For mine sites where coal ash is beneficially used for reclamation, the required coal ash water monitoring data may be used to supplement the effluent characterization data.

Two-year Sampling Requirement: Within the first two years of the initial discharge from an outfall, some effluent characterization analysis is required in order to confirm the presence and concentration of those parameters designated as believed to be present. 40 CFR 122.21(k)(5)(vi) requires sampling within two years of the initiation of a treatment pond discharge. 40 CFR 122.26(c)(1)(i)(G) requires new stormwater sources to provide data within two years after the commencement of discharge. These requirements are summarized in Appendix A. A form is available to report the required effluent characterization data. DEP evaluates the data for presence or absence of the pollutants. For those parameters present, follow up sampling may be required. The follow-up sample results are then evaluated based on the criterion maximum concentration water quality criteria in Table 5 of Section 93.8. The Table 5 limits for toxic metals are expressed as dissolved metals and many of the toxicity levels are related to hardness, so follow-up samples for metals need to be filtered and include hardness. Discharges exceeding the Table 5 limits are evaluated for effluent limits for any parameter which exceeds or has the potential to exceed water quality criteria.

Stormwater Requirements: Stormwater includes the discharge of surface runoff, snow melt runoff and drainage from any conveyance used for collecting and conveying the runoff water that is directly related to manufacturing, processing or raw material storage areas, including the overburden and mineral being mined. (40 CFR 122.26(b)(14)) An applicant for a new NPDES permit for stormwater related to a mine needs to include a description of the significant materials used at the site within the past three years and the herbicides, pesticides and fertilizers used at the site. An applicant for a new mine discharge needs to provide estimates (and the source of the estimates) for the stormwater facilities for total suspended solids, pH, acidity/alkalinity, Oil and Grease, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), phosphorus, Kjeldahl nitrogen, Nitrite/Nitrate nitrogen, flow and any other items they

would expect from Table IV (e.g. sulfate, aluminum and magnesium for coal mines). Coal mines must also report iron and manganese since these pollutants are limited by effluent limit guidelines. (40 CFR 122.26(c)(i)(E))

The review of the effluent characterization data results in a reasonable potential analysis for pollutants that are present in concentrations at or above the water quality criterion for that pollutant.

Reasonable Potential Analysis

A reasonable potential analysis is used to determine if a discharge could lead to a violation of the water quality standards. The regulations at Chapter 92a, § 92a.44 incorporate 40 CFR 122.44. The context of reasonable potential analysis is established in the following sections:

- Limitations must control all pollutants or pollutant parameters which may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality. (40 CFR 122.44(d)(1)(i))

- When determining whether a discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion above a narrative or numeric criteria within a State water quality standard, the permitting authority shall use procedures which account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant or pollutant parameter in the effluent, the sensitivity of the species to toxicity testing (when evaluating whole effluent toxicity), and where appropriate, the dilution of the effluent in the receiving water. (40 CFR 122.44(d)(1)(ii))

- When the permitting authority determines, using the procedures in paragraph (d)(1)(ii) of this section, that a discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion above the allowable ambient concentration of a State numeric criteria within a State water quality standard for an individual pollutant, the permit must contain effluent limits for that pollutant. (40 CFR 122.44(d)(1)(iii))

- When the permitting authority determines, using the procedures in paragraph (d)(1)(ii) of this section, that a discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion above the numeric criteria for whole effluent toxicity, the permit must contain effluent limits for whole effluent toxicity. (40 CFR 122.44(d)(1)(iv))

Reasonable potential analysis is completed for pollutants of concern. Pollutants of concern include parameters which have regulatory effluent limitations, those that are identified through effluent characterization and those for which there is a listed or actual impairment in the receiving stream.

TMDL Streams: Where there is a final TMDL, reasonable potential analysis includes the review of the TMDL report. WQBELs are developed based on the TMDL report. TMDL reports may be revised to accommodate a new permit or to adjust a waste load allocation for an existing facility that may not have been addressed in the report. When reviewing TMDL requirements, consideration may be required of downstream TMDLs. Where TMDLs are written for a larger water body, a WQBEL may be needed for the immediate receiving stream.

Limits established to comply with the TMDL are WQBELs. The most stringent limits from all the evaluations are to be applied to protect all uses. The review of an NPDES application includes the evaluation of water quality criteria for all pollutants that are expected to be present. If a facility is in a watershed with a TMDL but does not have waste load allocation (WLA) for the pollutants of concern, there may or may not be reasonable potential to cause or contribute to an excursion above applicable water quality criteria. A reasonable potential analysis for those facilities should be conducted. Based on the types of activities and minimal flow of the discharges, some permits may be considered negligible discharge facilities (in that they typically discharge with pollutant levels below water quality criteria), and the permit reviewer might determine that the pollutant contributions of metals from these permitted sources are negligible. Under these conditions, these minor discharges are authorized to operate under their current levels. For TMDL streams, it may be determined that some facilities have the reasonable potential to cause or contribute to an impairment but those facilities do not have a WLA in a TMDL. In that case, setting effluent limits at the numeric criteria prevents the discharge from causing or contributing to a violation of the criteria. TMDLs have not typically been done for TDS related pollutants in Pennsylvania. The future growth section of the TMDL report typically lists the options for approving new outfalls.

Many of the acid mine drainage (AMD) TMDLs developed by Pennsylvania and approved by EPA do not specifically account for the discharges from stormwater controls in mining permits. This is because the effects from sedimentation ponds are considered negligible since the potential discharges from the ponds are based on infrequent events and the ponds should rarely discharge if reclamation and revegetation is concurrent. All stormwater ponds are designed in accordance with 25 Pa. Code 87.108(h) to contain, at a minimum, runoff from a 10-year, 24-hour precipitation event. If a waterbody was identified as impaired for sediment the TMDL may include sediment WLAs. Stormwater discharges are specifically considered in those TMDLs and sediment WQBELs should be included based upon the sediment WLAs.

For the Kiski-Conemaugh TMDL, a dynamic model was used and stormwater facilities are specifically accounted for within it. Any parameter for which there is a TMDL is not eligible for alternate precipitation provisions of 25 Pa. Code §§ 87.102, 88.92, 88.187, 88.292, 89.52 and 90.102. For example, if a limit for manganese is based on a WLA, the limit associated with the WLA (this could be best available technology (BAT)) applies at all times. Because of the relationship between iron and TSS, in the Kiski-Conemaugh TMDL iron WLAs are also provided for facilities with stormwater discharges that are regulated under NPDES permits that contain iron or total suspended solids (TSS) limitations.

If there is no assimilative capacity in the receiving stream (i.e. the $Q_{7\text{-}10}$ flow is zero or the ambient stream water quality exceeds a numeric criterion), then there may be a reasonable potential for a discharge to cause or contribute to a violation of a water quality criterion. Setting effluent limits at the numeric water quality criterion or using non-discharge alternatives in cases where there is no assimilative capacity prevents the discharge from causing or contributing to a violation of the criteria.

Background Data Review for Assessing Reasonable Potential: There are various ways to determine if there is a reasonable potential for a discharge to cause or contribute to a violation of the in-stream limits. If any of these approaches conclude that there is a reasonable potential, the permit is to include appropriate water quality based effluent limits. Data from statewide sampling over the last several years indicates, generally, that surface mining in Pennsylvania does not have a reasonable potential to produce high TDS waters that would have an impact on aquatic life. However, this needs to be documented on a site-specific basis for each permit application.

Mass balance calculations for sulfate and TDS should be completed for the closest downstream PWS intake using $Q_{7\text{-}10}$ flow and ambient quality (or the numeric criterion) for the intake and average expected discharge flow and concentration. If the calculated change is not measurable at the intake or there is assimilative capacity, then there is no reasonable potential for the discharge to cause or contribute to a violation of the PWS water quality standard. For the purposes of this PWS evaluation when the in-stream values are near the water quality criterion, laboratory analysis variability is used to determine if the difference will be measurable. Chapter 5 of the guidance document for NPDES permitting (362-0400-001) includes a table (5-1a) which lists the variability of results for various analytical methods. This should be used as a reference for determining if a projected change will be measurable. For example, the variability for the most sensitive analytical method for sulfate is 1.6 mg/l. Therefore, in evaluating the PWS standard, if the mass balance calculations result in a difference less than 1.6 mg/l sulfate, there is no reasonable potential for the discharge to cause or contribute to a violation of the in-stream criteria. Table 5-1a indicates that the variability for TDS is 5.2 mg/l and 1.54 mg/l for chloride.

Overburden Analysis: For a site where the overburden analysis shows overburden with high sulfur and high neutralization potential, there is the potential to produce TDS. For a site where the overburden analysis shows overburden with high sulfur and low neutralization potential (and alkaline addition is proposed), then there is a reasonable potential to produce high TDS water. Setting an instantaneous maximum limit for these cases for OP at the in-stream water quality criterion (50 mOsm/kg) complies with 40 CFR 122.44(d)(1)(iii). Note that the regulations at Chapter 95, § 95.10 exclude pre-existing discharges, pit water discharges from surface mines with a pit area less than 450,000 square feet, and surface mine erosion and sedimentation control facilities from the treatment requirements under Chapter 95. However, this exclusion is limited to determining the applicability of Chapter 95.

If a review of data from adjacent mine sites shows that the mining could produce pit water with TDS greater than 1,500 mg/l, then there may be a reasonable potential to cause an in-stream excursion above the aquatic life narrative criterion. Also, under Chapter 95, an effluent limit for TDS may be required if a pit size variance (i.e. the approved area exceeds 450,000 square feet) is approved. In order to protect the receiving waters with respect to the PWS standard, sulfate and TDS data need to be evaluated to assure the prevention of a violation at the nearest downstream intake.

As an example, for a surface mine, a reasonable potential analysis would consist of:

- Overburden analysis (if applicable)

- Water Quality Spreadsheet (WQSS) evaluation

  DEP has developed a mass balance based spreadsheet for evaluating the numeric criteria for metals and acidity for mine sites. This spreadsheet is described in detail in Appendix B. If the WQSS analysis results in WQBELs which are more stringent than BAT limits, then there is a reasonable potential. The imposition of the WQBELs based on water quality criteria meets the requirements of 40 CFR 122.44(d)(1)(iii).

- TMDL evaluation

SETTING EFFLUENT LIMITS

If it is determined that there is a reasonable potential for a violation of water quality standards, then:

- WQBELs (when more stringent than BAT) are to be applied
- For TDS, an OP limit needs to be imposed as the aquatic life criterion
- For the PWS standard, TDS and/or Sulfate limits (depending on assimilative capacity) need to be imposed

Osmotic Pressure Limits: OP represents the effect of dissolved constituents in the water on aquatic life. Generally, the higher the concentration of TDS, the higher the OP. If the conclusion of the reasonable potential analysis is that there is a reasonable potential to exceed the aquatic life criteria relating to TDS, then an instantaneous maximum limit of 50 mOsm/kg is the default effluent limit for OP. Because 50 mOsm/kg is the in-stream criterion for OP and the OP limit was established to protect aquatic life from the effects of pollutants, this is a conservative approach to protect aquatic life (i.e. it requires that the effluent at no time exceed the criterion).

An applicant can request a higher limit. In order for a higher limit to be applied, it needs to be shown that there is existing assimilative capacity in the receiving stream to accommodate higher concentrations of dissolved pollutants. The demonstration ought to show that the alternative limit will be protective of the aquatic life use. This demonstration can be accomplished through a mass balance calculation. It is not appropriate to do a mass balance calculation with OP data since the units are mOsm/kg, rather than mg/l, therefore an applicant should provide the data necessary to evaluate a higher OP limit, which includes OP and TDS background data for the receiving stream below the proposed discharge location(s).

While laboratory determinations will be needed to calculate an alternative OP effluent limit, estimating OP levels may be useful in some cases, such as when conducting a reasonable potential analysis using existing data. The following method may be used to estimate OP. While the estimates described below are helpful, additional data (TDS and/or OP) should be obtained in cases where the estimates are insufficient to rely upon (i.e., where the values are near the 50 mOsm/kg criterion).

Site-specific or other relevant data for OP should be used when it is available. However, for the purpose of estimating OP when data is not available, the following estimation may be used:

$$\text{OP (mOsm/kg)} \sim \text{TDS (mg/l)}/34$$

Similarly, site-specific or other relevant TDS data should be used when it is available. If TDS data is not available and conductivity data is, the following estimate for TDS may be used:

$$SC*0.83 \sim TDS$$

In order to conduct the reasonable potential analysis, the expected quality of the discharges and the receiving stream quality needs to be evaluated. If the discharge is expected to be high in any pollutant (including TDS), then limits (including OP, if TDS is the pollutant at issue with respect to the aquatic life narrative standard) are to be imposed. If the analysis concludes that there is no reasonable potential for the discharges to cause or contribute to a violation of the water quality (WQ) standards, then the reason for this needs to be documented in the fact sheet and written findings.

When specific constituent data is available, it may be useful to estimate OP based on the data. For estimating OP the following conversions may be used:

Constituent	Osmolality (mOsm/kg per mg/l)
Sulfate	0.0104
Chloride	0.0282
Sodium	0.0434
Magnesium	0.0412
Calcium	0.0249
Potassium	0.0256
Bicarbonate	0.0164

For example, for a waste stream that has concentrations of 1,000 mg/l chloride and 1,000 mg/l sulfate, the OP resulting from these constituents would be 1,000(0.0282) + 1,000(0.0104) = 38.6 mOsm/kg.

Aluminum Limits: Aluminum is evaluated using the water quality spreadsheet. Since aluminum is not subject to an effluent limit guideline, the limits imposed in a permit are WQBELs. The values generated by the water quality spreadsheet will be used as permit limits. However, when the result of the spreadsheet is an instantaneous maximum limit greater than 10 mg/l, a monitor only requirement, rather than a limit should be included in the permit. This is based on data collected from mine drainage treatment facilities in Pennsylvania. This data shows that the treated effluents do not exceed 2.5 mg/l. Stated another way, there is no reasonable potential for a mine drainage treatment facility to cause or contribute to a violation of the aluminum water quality criteria, if the calculation from the spreadsheet results in a value of 10 mg/l or greater.

General Procedures

The District Mining Office (DMO) will develop and issue NPDES permits for coal mining activities in a manner consistent with state and federal regulations pertaining to technology-based and water quality-based effluent requirements and other applicable requirements as outlined below.

Effluent limits are expressed as monthly average, daily maximum and/or instantaneous maximum. 40 CFR 122.45(d) requires that limits be stated as maximum daily and average monthly for continuous discharges. Continuous discharges occur without interruption throughout the operating hours of a facility. (40 CFR 122.2) In the mining context continuous discharges include, post-mining discharges and pumped deep mine discharges. Stormwater induced discharges are not continuous discharges. For mining discharges that are not continuous, effluent limits should be expressed as an instantaneous maximum unless there is an applicable effluent limit guideline that is expressed as a monthly average or daily maximum. Daily maximum and monthly average limits will be imposed as necessary to comply with the effluent limitations at 25 Pa. Code §§ 87.102, 88.92, 88.187, 88.292, 89.52 and 90.102.

In the absence of another method to calculate limits, a useful reference is EPA's "Technical Support Document for Water Quality-Based Toxics Control." This method is useful when the water quality criteria are expressed as a Criterion Maximum Concentration (CMC) or Criterion Chronic Concentration (CCC) in 25 Pa. Code Chapter 16, Water Quality Toxics Management Strategy.

This method includes the following steps:

1. Translate both the CCC and CMC to a long term average (LTA) to determine which is controlling, using Table 5.1. Default to 0.6 coefficient of variation and use the 99th percentile.

2. Calculate the average monthly limit using Table 5.2. Default to 0.6 coefficient of variation, use the 99th percentile and use a minimum n of 4.

3. Use the proportions (1:2:2.5) to determine the daily maximum and instantaneous maximum limits.

Noncoal Mining and Mineral Processing Activities: The predominant types of non-coal mining/mineral processing activities, and their associated NPDES technology-based effluent requirements, are shown in Table C-1 in Appendix C. Also included in this table are additional technology-based requirements which should be included in permits issued to such facilities.

The District Mine Office (DMO) will develop and issue NPDES permits based upon Table C-1. When permitting non-coal mining where acid mine drainage problems may exist, metals parameters need to be evaluated.

Underground Coal Mines, Coal Preparation Plants (Wet Processing), and Coal Refuse Disposal Sites: Mine drainage and leachate discharges from these operations are generally fixed in terms of location, quantity, quality and frequency of occurrence. As such, they can be considered similar to many other types of industrial activity discharges. They also may occur at locations where they interact with other industrial waste or sewage discharges. In order to calculate WQBELs for these mine drainage treatment facilities the DMO will typically use the PentoxSD model or other mass balance tools and any applicable TMDL report.

For bituminous deep mines, coal refuse disposal sites and preparation plants, the reasonable potential analysis may include:

- Use of PENTOXSD to calculate limits for treatment facilities
- TDS/OP review for the aquatic life impact
- TMDL review
- TDS Review for PWS use (mass balance at the PWS intake)
- Review for other pertinent parameters (e.g. chlorides, sulfates, toxics)
- Water quality spreadsheet for stormwater controls

If the conclusion of the review is that there is no reasonable potential, then BAT limits apply.

If there is a reasonable potential, then WQBELs need to be applied.

Surface Coal Mining (including coal refuse reprocessing and stormwater related to underground mines): Discharges from these activities are primarily precipitation-related and are less predictable in terms of actual quantity, quality and frequency of occurrence. They are also relatively temporary when compared with discharges from underground mines, prep plants and refuse disposal sites. DEP will typically evaluate if WQBELs are needed for such activities using the WQSS described in Appendix B.

The procedure uses the watershed area (A_W)/disturbed area (A_D) ratio.

Use of the WQSS enables DEP to make the following types of evaluations and decisions:

- Restricting the amount of acreage to be disturbed by a surface mining activity (i.e. as permit condition)

- Restricting the extent of surface mining within a watershed area

- Establishment of stream monitoring networks within watersheds

- Evaluating/predicting in-stream impacts from multiple mining operations in a watershed

Special Protection Watersheds

DMO will implement DEP's policies and regulations for protection of special protection (HQ and EV) waters when evaluating permits for mining activities. The process is described in the Anti-Degradation Supplement for Mining Permits form (5600-PM-MR0007).

Post-Mining Discharges

For post-mining discharges, the review the water monitoring data of the receiving stream should inform the decision as to whether WQBELs are needed. WQBELs for post-mining discharges should be evaluated at the $Q_{7\text{-}10}$ stream flow and the 95th percentile low flow. If the dataset for the 95th percentile low flow is zero, then the lowest recorded flow should be used. The PENTOXSD model or a water quality spreadsheet should be used to calculate the WQBELs. The WQBEL evaluation is particularly important for manganese since the applicable effluent limit guidelines do not include manganese.

$Q_{7\text{-}10}$ flow can be determined using methods described in USGS Water Resources Investigative Report 99-4068 or the StreamStats tool.

Fact Sheet

A fact sheet is required for all draft NPDES permits. (Chapter 92a, § 92a.53) The effluent limits and the methodology in determining the limits plus any specific permit conditions need to be documented on the fact sheet.

Non-Discharge Alternatives

From a planning perspective, where more stringent effluent limits are required, non-discharge alternatives should be considered. It may be more environmentally sound and cost-effective to implement non-discharge techniques than to provide treatment that meets the required lower limits. This is particularly true for cases where TDS and sulfate limits may be necessary due to a potential PWS impact or where there is no available waste load allocation under a TMDL.

Stormwater General Permit for Mining

DEP has an NPDES General Permit (GP-104) for Stormwater for mine sites. This general permit applies to earth disturbance activity of one acre or greater associated with mining.

This general permit is issued in conjunction with a separate mining permit where the only potential discharge to surface waters of the Commonwealth will be composed entirely of stormwater, in which the main potential pollutant is sediment. Mining permit types to which the GP-104 is applicable include coal and noncoal mining permits, small noncoal (and bluestone) permits, noncoal mining general permits and exploration activities (in which case there is no mining permit).

The GP-104 cannot be used for sites that have an individual NPDES permit or another NPDES general permit.

The general permit does not apply to those activities where one or more of the conditions listed in 25 Pa. Code § 92a.54(e)(1)-(9) exist. For those situations or when otherwise notified by DEP, the operator should file an application for an individual NPDES permit. An individual NPDES permit for a point source discharge is necessary if the mining activity will or has the potential to discharge to High Quality or Exceptional Value waters, including EV wetlands, or to streams listed as "impaired waters" for sediment.

Compliance Schedules

In cases where the evaluation of effluent characterization data or permit review for a renewal or modification requires the imposition of effluent limits for toxic pollutants or more stringent limits than are already in the permit, a compliance schedule is appropriate to allow the applicant sufficient time to meet the new limits. The regulations relating to NPDES permit compliance schedules are found at 25 Pa. Code § 92.5a.51.

A compliance schedule is appropriate when it is clear that it is not possible for the permittee to meet the newly imposed limit(s) immediately. Compliance schedules need to establish the shortest reasonable period of time to meet the new limits. For compliance schedules that exceed one year, annual milestones are typically required. In many cases, time must be built into the schedule in order to identify the appropriate treatment technology to be employed.

A compliance schedule should cover the following points:

1. A compliance schedule term, which could extend up to the full five-year term of the NPDES permit. A longer term may be given under appropriate circumstances, however, a term longer than five years may only be provided through entry of a consent decree by a court of competent jurisdiction. The permittee should have the right to request approval of a modification of the compliance schedule or any milestones therein conditioned upon the occurrence of events beyond the control of the permittee.

2. Provisions for the permittee to develop and submit a report to DEP evaluating the treatment technologies and identifying the preferred technology which will meet the effluent limitations in the NPDES permit. The report may include specifications of the treatment equipment, proposed schedule for construction and start-up, and demonstration that construction and start-up are to be performed as soon as possible.

3. Provisions for the permittee to submit all necessary permits for the selected treatment equipment after DEP approval of the treatment plan.

4. Milestone dates (i) to begin and end construction of the treatment technology, (ii) to start-up the "equipment," and (iii) to demonstrate attainment with the applicable permit limits. These milestone dates should consider DEP's issuance of any necessary construction permits.

5. Submission of periodic progress reports to DEP.

Appendix A

Mining Effluent Characterization Table

	Table II Organic Toxics	Table III Other Toxics	Table IV Conventional and Nonconventional	Table V Toxic and Hazardous	Other Items
Treatment Facility Application Requirements-New Permits	Report those expected to be present-include daily max, ave and source 122.21(k)(5)(iii)(B) **SBE Applies**	Report estimates of those expected to be present 122.21(k)(5)(iii)(A)	Report estimates of those expected to be present and those limited by an ELG 122.21(k)(5)(ii)	Report those that are expected to be present. Data is not needed unless it is available 122.21(k)(5)(v)	Provide data for BOD, COD, TOC, TSS, Ammonia N, Temp (winter & summer) and pH and source of data. [These may be waived] 122.21(k)(5)(i) Report that TCDD may be discharged if 2,4,5-T, 2,4,5-TP, Erbon, TCH or HCP are used or made 122.21(k)(5)(iv)
Treatment Facility Application Requirements-Renewals	Indicate if it knows or has reason to believe these will be present-data is required if it is expected that the concentration will be greater than 10 ppb 122.21(g)(7)(vi)(B) **SBE applies** 122.21(g)(8)	*Coal* - Report data. 122.21(g)(7)(v)(B) *Noncoal* - Report quantitative data for expected pollutants 122.21(g)(7)(vi)(B)	Provide data for ELG limited and data or reason for others 122.21(g)(7(vi)(A)	Indicate which ones are expected to be present and report any <u>available</u> data 122.21(g)(7)(vii)	Provide data for BOD, COD, TOC, TSS, Ammonia N, Temp (winter & summer) and pH. [These may be waived] 122.21(g)(7)(iii) Report that TCDD may be discharged if 2,4,5-T, 2,4,5-TP, Erbon, TCH or HCP are used or made 122.21(g)(7)(viii)
Treatment Facility Two-year Sampling Requirement	Provide data for those expected to be present 122.21(k)(5)(vi) **SBE Applies**	*Coal* - Submit data *Noncoal* - Submit data for those expected to be present 122.21(k)(5)(vi), Form 2C	Report results for those expected to be present 122.21(k)(5)(vi), Form 2C	Analysis not required **SBE Applies** Form 2C	Not Applicable since the data is collected with the application
Stormwater-New Permits Application Requirements	Not Required 122.26(c)(1)(i)(G)	Provide estimates for those that are known or believed to be present 122.26(c)(1)(i)(G)	Provide estimates for those that are known or believed present 122.26(c)(1)(i)(G)	Analysis not required Form 2F	Provide estimates for Fe, Mn; Oil & Grease, pH, BOD5, COD, TSS, P, Kjeldahl N, Nitrate-nitrite N, Flow. Also provide flow estimates. 122.26(c)(1)(i)(G)
Stormwater-Renewal Application Requirements	Indicate if it knows/has reason to believe these will be present and provide data for those expected 122.21(g)(7)(vi)(B) **SBE Applies** Form 2F	Provide data for those that are known or believed to be present 122.26(c)(1)(i)(E)	Provide data for those that are known or believed to be present 122.26(c)(1)(i)(E)	Analysis not required Form 2F	Provide data for Fe, Mn, and other pollutants with limits in the permit; Oil & Grease, pH, BOD5, COD, TSS, P, Kjeldahl N, Nitrate-nitrite N, Flow. Also provide date/duration of event sampled. 122.26(c)(1)(i)(E)

	Table II Organic Toxics	Table III Other Toxics	Table IV Conventional and Nonconventional	Table V Toxic and Hazardous	Other Items
Stormwater Two-year Sampling	Provide data for those that are known or expected to be present 122.26(c)(1)(i)(G) **SBE Applies** Form 2F	Provide data for those that are known or believed to be present 122.26(c)(1)(i)(G)	Data for those known or believed present 122.26(c)(1)(i)(G)	Analysis not required Form 2F	Provide data for Fe, Mn, and other pollutants with limits in the permit; Oil & Grease, pH, BOD5, COD, TSS, P, Kjeldahl N, Nitrate-nitrite N, Flow. Also provide date/duration of event sampled. 122.26(c)(1)(i)(E)

Appendix B

Water Quality-Based Effluent Limit Calculations For Coal Surface Mining Activities

Background

Development of WQ based effluent limit using conventional mass-balance WQ modeling techniques requires fairly precise knowledge of wastewater discharge rate and low-flow rate of the receiving stream along with several other variables described below:

Q_S = Flow rate of the receiving stream
C_S = Upstream background concentration
Q_D = Wastewater discharge rate
C_D = Concentration of pollutant in the wastewater discharge
Q_T = Resulting downstream flow rate ($Q_S + Q_D$)
C_T = Resulting downstream pollutant concentration

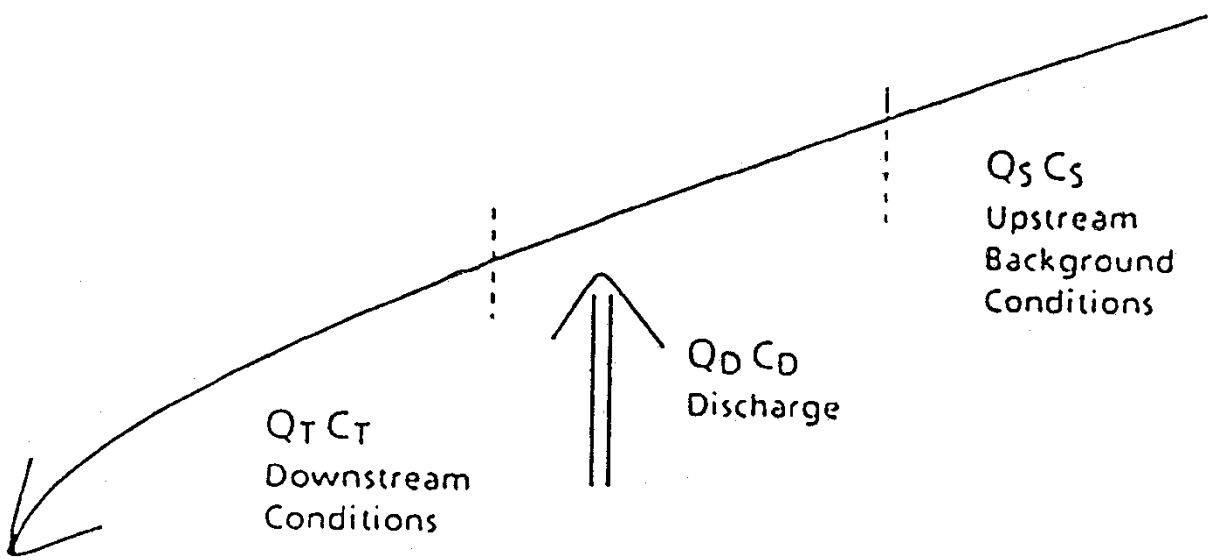
The mass-balance equation is then established as follows:

$$Q_T C_T = Q_S C_S + Q_D C_D \quad (1)$$

and

$$C_D = [Q_T C_T - Q_S C_S] / Q_D \quad (1.a)$$

where C_D becomes the effluent limit required.



In contrast to other types of mining activities, discharges from surface mining operations are less predictable in terms of quantity, quality, frequency and pattern of occurrence. Such discharges are primarily precipitation-related and generally exhibit some correlation with nearby stream flows (i.e. discharge rates are higher when stream flows are higher and vice-versa).

Since $Q_T = Q_S + Q_D$, equation (1) can be rewritten as:

$$(Q_S + Q_D)\, C_T = Q_S\, C_S + Q_D\, C_D$$

$$Q_S\, C_T + Q_D\, C_T = Q_S\, C_S + Q_D\, C_D$$

$$Q_S\, (C_T - C_S) = Q_D\, (C_D - C_T)$$

and

$$Q_D / Q_S = (C_T - C_S) / (C_D - C_T) \qquad (2)$$

For a watershed impacted by surface mining and for a given precipitation pattern, it can generally be assumed that:

Q_S is proportional to the watershed area (A_W) for the stream segment impacted by mining
Q_D is proportional to the disturbed area associated with mining (A_D)

Equation (2) can then be rewritten as:

$$A_D / A_W = (C_T - C_S) / (C_D - C_T) \qquad (3)$$

Equation (3) can be used to determine the ratio of A_D/A_W which is necessary to protect downstream water quality for a pollutant of concern by further assuming that:

C_D = the BAT effluent level for the pollutant (average monthly)
C_T = instream Ch. 93 WQ criterion value for the pollutant
C_S = upstream background level of the pollutant

Alternatively, Equation (3) can be further modified to determine the allowable WQ based discharge concentration (C_D) for a given drainage ratio A_D/A_w, as follows:

$$C_D = [(C_T - C_S) / (A_D / A_W)] + C_T \qquad (4)$$

Spreadsheet for WQ-Based Effluent Limit Calculations

DEP has developed a water quality Excel spreadsheet (WQSS), which incorporates the principles described in Equations (3) and (4).

Figure 1 shows a generic surface mine permit area within a watershed drainage area, with a receiving stream. During the life of the surface mine there will be several discharges from sediment control ponds and from a mine drainage treatment pond. The exact location of these discharges may change as mining proceeds. The focus of the WQSS analysis is to determine if effluent limits stricter than the Group A limits in Table C-2 should be assigned to the mine drainage discharge to protect in-stream water quality. A conservative approach, described below, is followed when determining the ratio of watershed drainage area (A_w) "disturbed area" to (A_D).

The value of A_D is developed by first determining the maximum area disturbed (i.e. not revegetated to Stage II Bond Release Standards) during the life of the mine site. The maximum area of open pit plus unregraded spoil piles is multiplied by a factor of at least 2.0. This pit/spoil multiplier can be increased, however, to reflect additional drainage due to groundwater entering the pit (see Table 1).

The value of A_w is developed by first determining the watershed area above the point of evaluation (Point A in Figure 1) and then it is adjusted by subtracting the maximum area disturbed (including pit/spoil area).

The "available dilution" is then calculated using the formula:

$$\textit{Available Dilution } A_w/A_D = \frac{\textit{Adjusted Upstream Watershed Area}}{\textit{(Pit + Spoil acres) (Multiplier) + (Remaining max. affected acres)}}$$

For "high quality" streams, the WQSS incorporates a minimum A_w/A_D ratio of 6:1.

Figure 1. - Hypothetical Watershed and Surface Mine Permit (SMP) Configuration

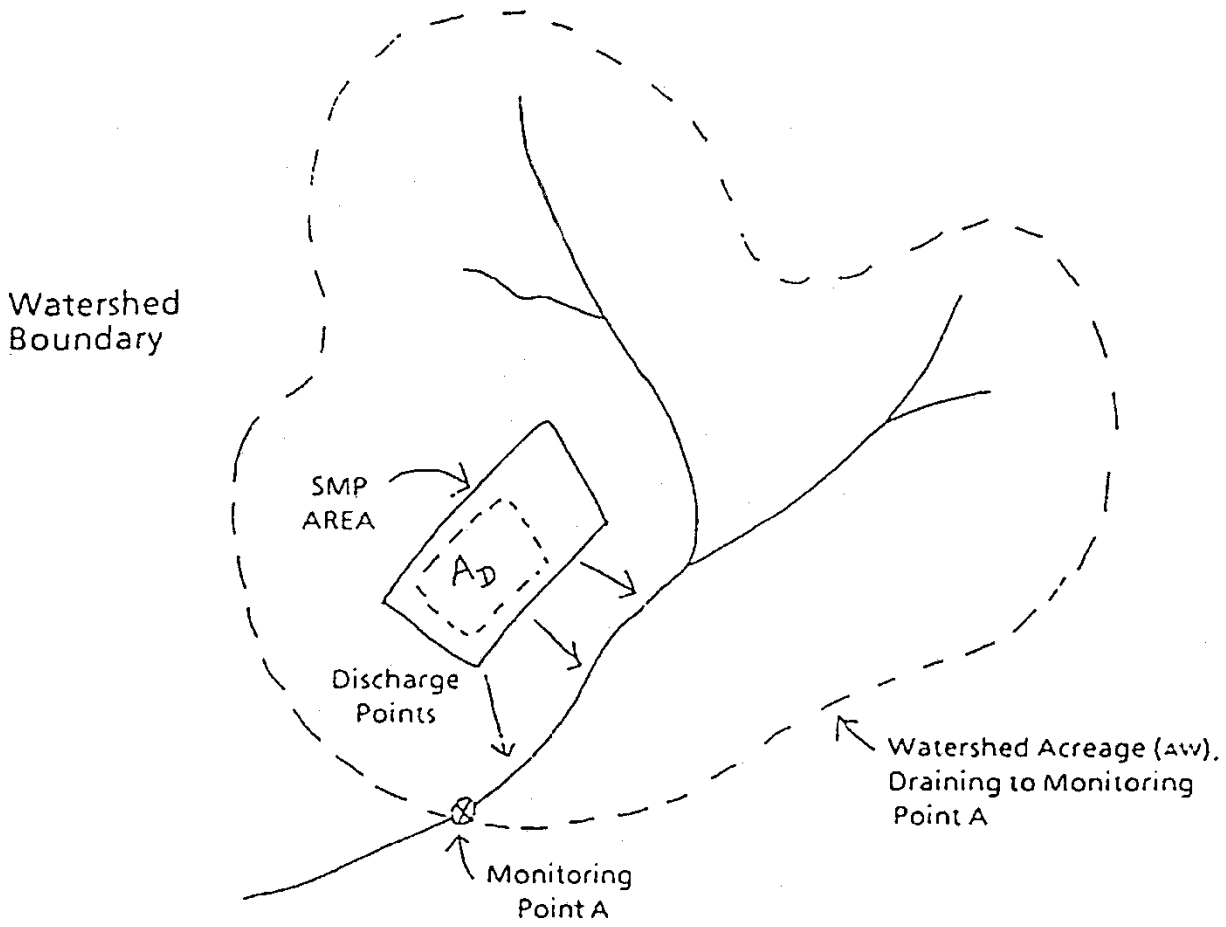


Table 1. - Discharge Multiplier Values for Pit and Unregraded Spoil Area

Discharge Multiplier	Site Conditions
2	Mine site located on hilltop, above regional water table. Few or no springs or seeps located in area to be mined. Little groundwater flow into expected.
4	Mine site probably below regional or significant perched water table. Some groundwater flow into pit expected. Springs or seeps present within stratigraphic interval to be mined.
6 or greater depending on conditions	Mine site located below regional water table in a significant groundwater discharge zone, i.e. pit below major stream level or abundant indications of groundwater discharge present.

The spreadsheet uses equations (3) and (4) to calculate the required minimum dilution ratio to meet in-stream criteria and, alternately, the required wastewater effluent limit to meet in-stream criteria (using the available dilution without any flow controls). Where it is difficult to control the discharge rate, or where flow measurements of the receiving stream and discharges are impractical, the permit contains WQ-based effluent limits rather than BAT limits with a WQ-based dilution ratio requirement.

Appendix C

Table C-1. Summary of EPA's Technology-Based NPDES Effluent Requirements For Non-Coal Mineral Mining and Processing (40 CFR 436)

Type of Non-Coal Mining Activity	40 CFR 436 Subpart	Technology-Based Requirements			Additional PA Requirements (See Note 1)
			30 Day Avg	1-Day Max	
Crushed Stone (Limestone quarries and crushing/sizing operations)	B	pH*	6-9 at all times	6-9 at all times	TSS 35/70 mg/l Use of std. E&SC practices and BMP controls
Construction Sand and Gravel (aggregate for general construction purposes, or materials to be used as fill)	C	pH*	6-9 at all times	6-9 at all times	TSS 35/70 mg/l Use of std. E&SC practices and BMP controls.
Industrial Sand (Non-construction uses such as refractories, abrasives, glass making)	D	TSS* pH*	25 mg/l	45 mg/l 6-9 at all times	Use of std. E&SC practices and BMP controls

[1] Additional effluent limits, E&SC practices, and BMP controls to be evaluated on a case-by-case basis, considering the type(s) of discharges present and additional WQ protection needs.

- Limit does not apply for discharges resulting from >, 10-yr., 24-hr. precipitation event.

Table C-2. Summary of Technology-Based Effluent Requirements For Coal Mining Activities*

Part 1 - Discharge Limitation Groupings

Group A	30-day Average	Daily maximum	Instantaneous maximum
Iron (total)	3.0 mg/l	6.0 mg/l	7.0 mg/l
Manganese (total)	2.0 mg/l	4.0 mg/l	5.0 mg/l
Suspended Solids	35 mg/l	70 mg/l	90 mg/l
pH	6-9 at all times		
Alkalinity	>acidity at all times		

Group B	30-day Average	Daily maximum	Instantaneous maximum
Iron (total)			7.0 mg/l
Settleable Solids			0.5 ml/l
pH	6-9 at all times		
Alkalinity	>acidity at all times		

Group C	30-day Average	Daily maximum	Instantaneous maximum
pH	6-9 at all times		
Alkalinity	>acidity at all times		

Part 2 - Discharge Situations and Applicable Discharge Limitation Groupings

Type Discharge	Weather Conditions/Precipitation Events	Effluent Limitations
Pit Water from Surface Mines	all	Group A
Drainage from Underground Mine Workings	all	Group A
Drainage from coal refuse disposal piles	dry weather, and less than or equal to 1 yr-24 hr greater than 1 yr-24 hr to less than or equal to 10 yr-24 hr greater than 10 yr-24 hr	Group A Group B Group C
Surface runoff from active mining area and from area where Stage II reclamation standards achieved	dry weather less than or equal to 10 yr-24 hr greater than 10 yr-24 hr	Group A Group B Group C
All other discharges	dry weather less than or equal to 10 yr-24 hr Greater than 10 yr-24 hr	Group A Group B Group C

*Pursuant to regulations 25 Pa. Code §§ 87.102, 88.92, 88.187, 88.292, 89.52 and 90.102.