WEST VIRGINIA
SECRETARY OF STATE
JOE MANCHIN, III
ADMINISTRATIVE LAW DIVISION

Form #3

Do Not Mark In This Box

FILED

2004 SEP 29 P 1:20

OFFICE WEST VIRGINIA
SECRETARY OF STATE

NOTICE OF AGENCY APPROVAL OF A PROPOSED RULE
AND
FILING WITH THE LEGISLATIVE RULE-MAKING REVIEW COMMITTEE

AGENCY: WV Environmental Quality Board TITLE NUMBER: 46

CITE AUTHORITY: 22B-3-4

AMENDMENT TO AN EXISTING RULE: YES X NO ___

IF YES, SERIES NUMBER OF RULE BEING AMENDED: ONE

TITLE OF RULE BEING AMENDED: Requirements Governing Water Quality Standards

IF NO, SERIES NUMBER OF RULE BEING PROPOSED: ___

TITLE OF RULE BEING PROPOSED: ___

THE ABOVE PROPOSED LEGISLATIVE RULE HAVING GONE TO A PUBLIC HEARING OR A PUBLIC COMMENT PERIOD IS HEREBY APPROVED BY THE PROMULGATING AGENCY FOR FILING WITH THE SECRETARY OF STATE AND THE LEGISLATIVE RULE-MAKING REVIEW COMMITTEE FOR THEIR REVIEW.

Stephanie R. Timmermeyer
Authorized Signature

QUESTIONNAIRE

(Please include a copy of this form with each filing of your rule: Notice of Public Hearing or Comment Period; Proposed Rule, and if needed, Emergency and Modified Rule.)

DATE: Septemer 29, 2004

TO: LEGISLATIVE RULE-MAKING REVIEW COMMITTEE

FROM:(*Agency Name, Address & Phone No.*) WV Environmental Quality Board
1615 Washington Street, E.
Suite 301
Charleston, WV 25311-2126
(304) 558-4002

LEGISLATIVE RULE TITLE: Requirements Governing Water Quality Standards

1. Authorizing statute(s) citation WV Code 22B-3-4

2. a. Date filed in State Register with Notice of Hearing or Public Comment Period:

   August 11, 2004

   b. What other notice, including advertising, did you give of the hearing?

   Published in the Charleston Gazette on September 2, 2004

   Published in the Charleston Daily Mail on September 8, 2004

   Posted on the Board's Website

   Distributed the Notice to the Board's internal e-mail list of approximately 175 people

   c. Date of Public Hearing(s) ***or*** Public Comment Period ended:

   Public Hearing - September 15, 2004. Written Comments - September 24, 2004

   d. Attach list of persons who appeared at hearing, comments received, amendments, reasons for amendments.

   Attached X No comments received ______

e. Date you filed in State Register the agency approved proposed Legislative Rule following public hearing: (be exact)

September 29, 2004

f. **Name, title, address and phone/fax/e-mail numbers** of agency person(s) to receive all *written correspondence* regarding this rule: (Please type)

Elzabeth Chatfield, Technical Advisor
1615 Washington Street, E.
Suite 301
~~Charleston, WV 25311-2126~~
558-4002
558-4116 (Fax)
lchatfield@wvaqbeqb.org

g. **IF DIFFERENT FROM ITEM 'f'**, please give **Name, title, address and phone number(s)** of agency person(s) who wrote and/or has responsibility for the contents of this rule: (Please type)

Same

3. If the statute under which you promulgated the submitted rules requires certain findings and determinations to be made as a condition precedent to their promulgation:

   a. Give the date upon which you filed in the State Register a notice of the time and place of a hearing for the taking of evidence and a general description of the issues to be decided.

   N/A

b. Date of hearing or comment period:

____

c. On what date did you file in the State Register the findings and determinations required together with the reasons therefor?

____

d. Attach findings and determinations and reasons:

Attached ______________________________________

46 CSR 1
Requirements Governing Water Quality Standards
(September 29, 2004)

Summary of Proposed Changes

Appendix E, Table 1, section 8.1

Section 8.1 in Table 1 will be revised by adding a footnote [(e)] in three places: once, after the words "Not to exceed" in the text of section 8.1 under the "PARAMETER" column and once after each of the values "87xCF[5]" which occur in section 8.1 in both of the columns labeled "CHRON" under the headings "B1, B4" and "B2" which are under the "AQUATIC LIFE" Use Designation columns. The text of the footnote, which will be placed at the end list of footnotes at the end of Table 1, will read:

> "e Until July 4, 2007, the aluminum criteria will be implemented as follows: the chronic aluminum criterion shall be 87 ug/l for trout waters (as defined in section 2.20 of this rule) and shall be 750 ug/l for all other waters of the state. The implementation of the interim criteria provides time for a study to develop aluminum criteria for waters of the state which are based upon sound science and are protective of aquatic life."

46 CSR 1
Requirements Governing Water Quality Standards
September 29, 2004

Statement of Circumstances Requiring Proposed Amendments

During its 2004 session, the West Virginia Legislature passed H.B. 4193, which mandates that the Environmental Quality Board (the "Board") shall, with the cooperation of the Department of Environmental Protection ("DEP") and the regulated community, propose an emergency and legislative rule to revise the aluminum criteria in the West Virginia Water Quality Standards, 46 CSR §1.

In response to this directive, the Board began consideration of the aquatic life aluminum criteria at its April 2004 meeting. The Board circulated a *Request for Information on Aluminum Water Quality Standard* asking for "information from all interested parties regarding appropriate aquatic life protection limits for aluminum." The Board received written comments from ten individuals and organizations, and heard oral comments from five speakers.

Based on the information presented, the Board agreed to propose a modification of the aluminum criteria by adding the following footnote to the current aluminum criteria:

> The current chronic aluminum standard of 87 ug/l will be suspended in all but trout waters until July 4, 2007. During the period of the suspension, the acute and chronic aquatic life values for aluminum are 750 ug/l.

The Board conducted a public comment period on the proposed modification. A public hearing on the proposed rule was conducted on September 15, 2004, and written comments were received until September 24, 2004.

Based on the comments received by the Board both in 2004 and in past triennial reviews, the Board believes that a modification of the aluminum criteria is appropriate in light of the questions regarding the scientific validity of the 87 ug/l chronic criterion proposed by US

Environmental Protection Agency ("EPA"), the stream data presented by DEP, and the disparity between the current chronic criterion and the aluminum criteria adopted by other states, in particular those states surrounding West Virginia. This information is set forth in greater detail in the Board's Rationale Document. In consideration of public comments, the language of the footnote has been rewritten in the emergency rule and the proposed Legislative rule as follows:

> Until July 4, 2007, the aluminum criteria will be implemented as follows: the chronic aluminum criterion shall be 87 ug/l for trout waters (as defined in section 2.20 of this rule) and shall be 750 ug/l for all other waters of the State. The implementation of the interim criteria provides time for a study to develop aluminum criteria for waters of the State which are based upon sound science and are protective of aquatic life.

The aluminum criteria remain as dissolved concentrations. In 1999, the Board established that studies conducted in both the laboratory and in the field clearly demonstrate that the dissolved aluminum fraction is the toxic portion and that the particulate associated forms of aluminum are regarded as nontoxic. Thus, the most scientifically defensible alternative is to regulate only the dissolved (bioavailable) form of aluminum by establishing dissolved criteria.

Importantly, the current criteria do not address any of the water quality characteristics which exist in many West Virginia streams which mitigate aluminum toxicity. In addition, the EPA-approved method for dissolved aluminum measurements utilizes a 0.45 µm filter, which allows a considerable amount of particulate aluminum to pass through and therefore be included in the dissolved aluminum measurement. Most toxicity tests which measure a dissolved aluminum concentration utilize a 0.1 µm filter, which is a smaller portion of the total aluminum concentration.

A critical component of the Board's consideration is the study which has been planned to develop scientifically sound aluminum criteria for West Virginia. The modification to the aluminum criteria will allow all interested parties, including EPA, DEP, WV Division of Natural Resources, and all other interested parties, to develop and implement scientific studies to evaluate aquatic life effects of aluminum in state waters. However, the study must be completed in a timely manner. If no new criteria are promulgated on or before July 4, 2007, the chronic criterion of 87 ug/l will be reinstated for all waters of the State.

APPENDIX B

FISCAL NOTE FOR PROPOSED RULES

Rule Title: Requirements Governing Water Quality Standards

Type of Rule: X Legislative ______ Interpretive ______ Procedural

Agency: WV Environmental Quality Board

Address: 1615 Washginton St., E., Suite 301

Chalreston, WV 25311-2126

558-4002

1. Effect of Proposed rule:

	ANNUAL		FISCAL YEAR		
	INCREASE	DECREASE	CURRENT	NEXT	THEREAFTER
ESTIMATED TOTAL COST					
PERSONAL SERVICES					
CURRENT EXPENSE					
REPAIRS & ALTERATIONS					
EQUIPMENT					
OTHER					

2. Explanation of Above Estimates:

This type of information is not available for the revisions proposed.

3. Objectives of These Rules:
To establish an interim chronic aquatic life criterion for aluminum of 750 ug/l for warm water fishery streams. The chronic aquatic life aluminum criterion of 87 ug/liter will remain in effect for trout streams.

Rule Title: Requirements Governing Water Quality Standards

4. Explanation of Overall Economic Impact of Proposed Rule:

   A. Economic Impact on State Government:
   This revision is anticipated to have a positive impact for the WVDEP to the extent that revising the criterion will result in fewer streams being listed on the federally mandated "303(d)" list of impaired waters, which would eliminate the requirement to conduct Total Maximum Daily Loads (TMDLs) for those streams.

   B. Economic Impact on Political Subdivisions; Specific Industries; Specific Groups of Citizens: With the exception of those discharging into trout waters, entities regulated by NPDES permits with permt limits for aluminum would be expected to have less stringent and less costly discharge limits as a result of this revision.

   C. Economic Impact on Citizens/Public at Large.
   Impacts of using only the 750 ug/liter criterion for aluminum will remain uncertain until the results of the proposed studies are completed and analyzed. The potential impact to aquatic life of a less stringent criterion and the associated fiscal impacts are not known at this time.

Date: September 29 2004

Signature of Agency Head or Authorized Representative:

Edward M. Snyder EMC

TITLE 46
LEGISLATIVE RULES
ENVIRONMENTAL QUALITY BOARD
SERIES 1
REQUIREMENTS GOVERNING WATER
QUALITY STANDARDS

§46-1-1. General.

1.1. Scope. -- These rules establish requirements governing the discharge or deposit of sewage, industrial wastes and other wastes into the waters of the state and establish water quality standards for the waters of the State standing or flowing over the surface of the State. It is declared to be the public policy of the State of West Virginia to maintain reasonable standards of purity and quality of the water of the State consistent with (1) public health and public enjoyment thereof; (2) the propagation and protection of animal, bird, fish, and other aquatic and plant life; and (3) the expansion of employment opportunities, maintenance and expansion of agriculture and the provision of a permanent foundation for healthy industrial development. (See W. Va. Code §22-11-2.)

1.2. Authority. -- W. Va. Code §22B-3-4

1.3. Filing Date. – September 29, 2004

1.4. Effective Date. –

§46-1-2. Definitions.

The following definitions in addition to those set forth in W. Va. Code §22-11-3, shall apply to these rules unless otherwise specified herein, or unless the context in which used clearly requires a different meaning:

2.1. "Board" is the Environmental Quality Board.

2.2. "Chief" is the Chief of the Office of Water Resources of the West Virginia Division of Environmental Protection.

2.3. "Conventional treatment" is the treatment of water as approved by the West Virginia Bureau for Public Health to assure that the water is safe for human consumption.

2.4. "Cumulative" means a pollutant which increases in concentration in an organism by successive additions at different times or in different ways (bio-accumulation).

2.5. "Designated uses" are those uses specified in water quality standards for each water body or segment whether or not they are being attained. (See sections 6.2 - 6.6, herein)

2.6. "Director" is the Director of the West Virginia Division of Environmental Protection.

2.7. "Dissolved metal" is operationally defined as that portion of metal which passes through a 0.45 micron filter.

2.8. "Existing uses" are those uses actually attained in a water body on or after November 28, 1975, whether or not they are included in the water quality standards.

2.9. The "Federal Act" means the Clean Water Act (also known as the Federal Water Pollution Control Act) 33 U.S.C. § 1251 - 1387.

2.10. "High quality waters" are those waters whose quality is equal to or better than the minimum levels necessary to achieve the national water quality goal uses.

2.11. "Intermittent streams" are streams which have no flow during sustained periods of no precipitation and which do not support aquatic life whose life history requires residence in flowing waters for a continuous period of at least six (6) months.

2.12. "Outstanding national resource waters" are those waters whose unique character, ecological or recreational value or pristine nature constitutes a valuable national or State resource.

2.13. "Natural" or "naturally occurring" values or "natural temperature" shall mean for all of the waters of the state:

2.13.a. Those water quality values which exist unaffected by -- or unaffected as a consequence of -- any water use by any person; and

2.13.b. Those water quality values which exist unaffected by the discharge, or direct or indirect deposit of, any solid, liquid or gaseous substance from any point source or non-point source.

2.14. "Non-point source" shall mean any source other than a point source from which pollutants may reach the waters of the state.

2.15. "Persistent" shall mean a pollutant and its transformation products which under natural conditions degrade slowly in an aquatic environment.

2.16. "Point source" shall mean any discernible, confined and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural stormwater discharges and return flows from irrigated agriculture.

2.17. "Representative important species of aquatic life" shall mean those species of aquatic life whose protection and propagation will assure the sustained presence of a balanced aquatic community. Such species are representative in the sense that maintenance of water quality criteria will assure both the natural completion of the species' life cycles and the overall protection and sustained propagation of the balanced aquatic community.

2.18. The "State Act" or "State Law" shall mean the West Virginia Water Pollution Control Act, W. Va. Code §22-11-1.

2.19. "Total recoverable" refers to the digestion procedure for certain heavy metals as referenced in 40 CFR 136, as amended June 15, 1990, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act.

2.20. "Trout waters" are streams or stream segments which sustain year-round trout populations. Excluded are those streams or stream segments which receive annual stockings of trout but which do not support year-round trout populations.

2.21. "Water of special concern" are those waters occurring in the categories outlined in section 4.1.c. of the antidegradation policy. This designation provides an intermediate level of antidegradation protection between high quality waters and outstanding national resource waters.

2.22. "Water quality criteria" shall mean levels of parameters or stream conditions that are required to be maintained by these regulations. Criteria may be expressed as a constituent concentration, levels, or narrative statement, representing a quality of water that supports a designated use or uses.

2.23. "Water quality standards" means the combination of water uses to be protected and the water quality criteria to be maintained by these rules.

2.24. "Wetlands" are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.

2.25. "Wet weather streams" are streams that flow only in direct response to precipitation or whose channels are at all times above the water table.

§46-1-3. Conditions Not Allowable In State Waters.

3.1. Certain characteristics of sewage, industrial wastes and other wastes cause pollution and are objectionable in all waters of the state. Therefore, the Environmental Quality Board does hereby proclaim that the following general conditions are not to be allowed in any of the waters of the state.

3.2. No sewage, industrial wastes or other wastes present in any of the waters of the state shall cause therein or materially contribute to any of the following conditions thereof:

3.2.a. Distinctly visible floating or settleable solids, suspended solids, scum, foam or oily slicks;

3.2.b. Deposits or sludge banks on the bottom;

3.2.c. Odors in the vicinity of the waters;

3.2.d. Taste or odor that would adversely affect the designated uses of the affected waters;

3.2.e. Materials in concentrations which are harmful, hazardous or toxic to man, animal or aquatic life;

3.2.f. Distinctly visible color;

3.2.g. Concentrations of bacteria which may impair or interfere with the designated uses of the affected waters;

3.2.h. Requiring an unreasonable degree of treatment for the production of potable water by modern water treatment processes as commonly employed; and

3.2.i. Any other condition, including radiological exposure, which adversely alters the integrity of the waters of the State including wetlands; no significant adverse impact to the chemical, physical, hydrologic, or biological components of aquatic ecosystems shall be allowed.

§46-1-4. Antidegradation Policy.

4.1. It is the policy of the State of West Virginia that the waters of the state shall be maintained and protected as follows:

4.1.a. Tier 1 Protection. Existing water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected. Existing uses are those uses actually attained in the water body on or after November 28, 1975, whether or not they are included as designated uses within these water quality standards.

4.1.b. Tier 2 Protection. The existing high quality waters of the state must be maintained at their existing high quality unless it is determined after satisfaction of the intergovernmental coordination of the state's continuing planning process and opportunity for public comment and hearing that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. If limited degradation is allowed, it shall not result in injury or interference with existing stream water uses or in violation of state or federal water quality criteria that describe the base levels necessary to sustain the national water quality goal uses of protection and propagation of fish, shellfish and wildlife and recreating in and on the water.

In addition, the Board and the Director shall assure that all new and existing point sources shall achieve the highest established statutory and regulatory requirements applicable to them and shall assure the achievement of cost-effective and reasonable best management practices (BMPs) for non-point source control. If BMPs are demonstrated to be inadequate to reduce or minimize water quality impacts, the Director may require that more appropriate BMPs be developed and applied.

4.1.b.1. High quality waters are those waters meeting the definition at section 2.10 herein.

4.1.b.2. High quality waters may include but are not limited to the following:

4.1.b.2.A. Streams designated by the West Virginia Legislature under the West Virginia Natural Stream

Preservation Act, pursuant to W. Va. Code §22-13-5; and

4.1.b.2.B. Streams listed in West Virginia High Quality Streams, Fifth Edition, prepared by the Wildlife Resources Division, Department of Natural Resources (1986).

4.1.b.2.C. Streams or stream segments which receive annual stockings of trout but which do not support year-round trout populations.

4.1.c. Tier 2.5 Protection. Waters of special concern include all of those waters listed in 60 C.S.R. 5, Appendix A. Waters of special concern may include, but are not limited to naturally reproducing trout streams, federally designated rivers under the "Wild and Scenic Rivers Act," 16 U. S.C. §§ 1271 et seq., waters in state parks and forests, waters in National parks and forests, waters designated under the "National Parks and Recreation Act of 1978," and waters with unique or exceptional aesthetic, ecological, or recreational value. Waters may be nominated for inclusion in this category by any interested party or by the Board on its own initiative.

4.1.d. Tier 3 Protection. In all cases, waters which constitute an outstanding national resource shall be maintained and protected and improved where necessary. Outstanding national resource waters include, but are not limited to, all streams and rivers within the boundaries of Wilderness Areas designated by The Wilderness Act (16 U.S.C. §1131 et seq.) within the State.

Additional waters may be nominated for inclusion in that category by any interested party or by the Board on its own initiative. To designate a nominated water as an outstanding national resource water, the Board shall follow the public notice and hearing provisions as provided in 46 C.S.R. 6.

4.1.e. All applicable requirements of section 316(a) of the Federal Act shall apply to modifications of the temperature water quality criteria provided for in these rules.

§46-1-5. Mixing Zones.

5.1. In the permit review and planning process or upon the request of a permit applicant or permittee, the Chief may establish on a case-by-case basis an appropriate mixing zone.

5.2. The following guidelines and conditions are applicable to all mixing zones:

5.2.a. The Chief will assign, on a case-by-case basis, definable geometric limits for mixing zones for a discharge or a pollutant or pollutants within a discharge. Applicable limits shall include, but may not be limited to, the linear distances from the point of discharge, surface area involvement, volume of receiving water, and shall take into account other nearby mixing zones. Mixing zones shall take into account the mixing conditions in the receiving stream (i.e: whether complete or incomplete mixing conditions exist). Mixing zones will not be allowed until applicable limits are assigned by the Chief in accordance with this section.

5.2.b. Concentrations of pollutants which exceed the acute criteria for protection of aquatic life set forth in Appendix E, Table 1 shall not exist at any point within an assigned mixing zone or in the discharge itself unless a zone of initial dilution is assigned. A zone of initial dilution may be assigned on a case-by-case basis at the discretion of the Chief. The zone of initial dilution is the area within the mixing zone where initial dilution of the effluent with the receiving water occurs, and where the concentration of the effluent will be its greatest in the water column. Where a zone of initial dilution is assigned by the Chief, the size of the zone shall be determined using one of the four alternatives outlined in section 4.3.3 of US EPA's Technical Support Document for Water Quality-based Toxics Control (EPA/505/2-90-001 PB91-127415, March 1991). Concentrations of pollutants shall not exceed the acute criteria at the edge of the assigned zone of initial dilution. Chronic criteria for the protection of aquatic life may be exceeded within the mixing zone but shall be met at the edge of the assigned mixing zone.

5.2.c. Concentrations of pollutants which exceed the criteria for the protection of human health set forth in Appendix E, Table 1 shall not be allowed at any point unless a mixing zone has been assigned by the Chief after consultation with the Commissioner of the West Virginia Bureau for Public Health. Human health criteria may be exceeded within an assigned mixing zone, but shall be met at the edge of the assigned mixing zone. Mixing zones for human health criteria shall be sized to prevent significant human health risks and shall be developed using reasonable assumptions about exposure pathways. In assessing the potential human health risks of establishing a mixing zone upstream from a drinking water intake, the Chief shall consider the cumulative effects of multiple discharges and mixing zones on the drinking water intake. No mixing zone for human health criteria shall be established on a stream which has a seven (7) day, ten (10) year return frequency of 5 cfs or less.

5.2.d. Mixing zones, including zones of initial dilution, shall not interfere with fish spawning or nursery areas or fish migration routes; shall not overlap public water supply intakes or bathing areas; cause lethality to or preclude the free passage of fish or other aquatic life; nor harm any threatened or endangered species, as listed in the Federal Endangered Species Act, 15 U.S.C. §1531 et seq.

5.2.e. The mixing zone shall not exceed one-third (1/3) of the width of the receiving stream, and in no case shall the mixing zone exceed one-half (1/2) of the cross-sectional area of the receiving stream.

5.2.f. In lakes and other surface impoundments, the volume of a mixing zone shall not affect in excess of ten (10) percent of the volume of that portion of the receiving waters available for mixing.

5.2.g. A mixing zone shall be limited to an area or volume which will not adversely alter the existing or designated uses of the receiving water, nor be so large as to adversely affect the integrity of the water body.

5.2.h. Mixing zones shall not:

5.2.h.1. Be used for, or considered as, a substitute for technology-based requirements of the Act and other applicable state and federal laws.

5.2.h.2. Extend downstream at any time a distance more than five times the width of the receiving watercourse at the point of discharge.

5.2.h.3. Cause or contribute to any of the conditions prohibited in section 3, herein.

5.2.h.4. Be granted where instream waste concentration of a discharge is greater than 80%.

5.2.h.5. Overlap one another.

5.2.h.6. Overlap any 1/2 mile zone described in section 7.2.a.2 herein.

5.2.i. In the case of thermal discharges, a successful demonstration conducted under section 316(a) of the Act shall constitute compliance with all provisions of this section.

5.2.j. The Chief may waive the requirements of subsections 5.2.e and 5.2.h.2 above if a discharger provides an acceptable demonstration of:

5.2.j.1. Information defining the actual boundaries of the mixing zone in question; and

5.2.j.2. Information and data proving no violation of subsections 5.2.d and 5.2.g above by the mixing zone in question.

5.2.k. Upon implementation of a mixing zone in a permit, the permittee shall provide documentation that demonstrates to the satisfaction of the Chief that the mixing zone is in compliance with the provisions outlined in subsections 5.2.b, 5.2.c, 5.2.e, and 5.2.h.2, herein.

5.2.l. In order to facilitate a determination or assessment of a mixing zone pursuant to this section, the Chief may require a permit applicant or permittee to submit such information as deemed necessary.

§46-1-6. Water Use Categories.

6.1. These rules establish general Water Use Categories and Water Quality Standards for the waters of the State. Unless otherwise designated by these rules, at a minimum all waters of the State are designated for the Propagation and Maintenance of Fish and Other Aquatic Life (Category B) and for Water Contact Recreation (Category C) consistent with Federal Act goals. Incidental utilization for whatever purpose may or may not constitute a justification for assignment of a water use category to a particular stream segment.

6.1.a. Waste assimilation and transport are not recognized as designated uses. The classification of the waters must take into consideration the use and value of water for public water supplies, protection and propagation of fish, shellfish and wildlife, recreation in and on the water, agricultural, industrial and other purposes including navigation.

Subcategories of a use may be adopted and appropriate criteria set to reflect varying needs of such subcategories of uses, for example to differentiate between trout water and other waters.

6.1.b. At a minimum, uses are deemed attainable if they can be achieved by the imposition of effluent limits required under section 301(b) and section 306 of the Federal Act and use of cost-effective and reasonable best management practices for non-point source control. Seasonal uses may be adopted as an alternative to reclassifying a water body or segment thereof to uses requiring less stringent water quality criteria. If seasonal uses are adopted, water quality criteria will be adjusted to reflect the seasonal uses; however, such criteria shall not preclude the attainment and maintenance of a more protective use in another season. A designated use which is not an existing use may be removed, or subcategories of a use may be established if it can be demonstrated that attaining the designated use is not feasible because:

6.1.b.1. Application of effluent limitations for existing sources more stringent than those required pursuant to section 301 (b) and section 306 of the Federal Act in order to attain the existing designated use would result in substantial and widespread adverse economic and social impact; or

6.1.b.2. Naturally-occurring pollutant concentrations prevent the attainment of the use; or

6.1.b.3. Natural, ephemeral, intermittent or low flow conditions of water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges to enable uses to be met; or

6.1.b.4. Human-caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place; or

6.1.b.5. Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use; or

6.1.b.6. Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses.

6.1.c. The State shall take into consideration the quality of downstream waters and shall assure that its water quality standards provide for the attainment of the water quality standards of downstream waters.

6.1.d. In establishing a less restrictive use or uses, or subcategory of use or uses, and the water quality criteria based upon such uses, the Board shall follow the requirements for revision of water quality standards as required by W. Va. Code §22B-3-4 and section 303 of the Federal Act and the regulations thereunder. Any revision of water quality standards shall be made with the concurrence of EPA. The Board's administrative procedural regulations for applying for less restrictive uses or criteria shall be followed.

6.2. Category A -- Water Supply, Public. - - This category is used to describe waters which, after conventional treatment, are used for human consumption. This category includes streams on which the following are located:

6.2.a. All community domestic water supply systems;

6.2.b. All non-community domestic water supply systems, (i.e. hospitals, schools, etc.);

6.2.c. All private domestic water systems;

6.2.d. All other surface water intakes where the water is used for human consumption. (See Appendix B for partial listing of Category A waters; see section 7.2.a.2, herein for additional requirements for Category A waters.) The manganese human health criterion shall only apply within the five-mile zone immediately upstream above a known public or private water supply used for human consumption.

6.3. Category B -- Propagation and maintenance of fish and other aquatic life. --

This category includes:

6.3.a. Category B1 -- Warm water fishery streams. -- Streams or stream segments which contain populations composed of all warm water aquatic life.

6.3.b. Category B2 -- Trout Waters. -- As defined in section 2.20, herein (See Appendix A for a representative list.)

6.3.c. Category B4 -- Wetlands. -- As defined in section 2.24, herein; certain numeric stream criteria may not be appropriate for application to wetlands (see Appendix E, Table 1).

6.4. Category C -- Water contact recreation. -- This category includes swimming, fishing, water skiing and certain types of pleasure boating such as sailing in very small craft and outboard motor boats. (See Appendix D for a representative list of category C waters.)

6.5. Category D. -- Agriculture and wildlife uses.

6.5.a. Category D1 -- Irrigation. -- This category includes all stream segments used for irrigation.

6.5.b. Category D2 -- Livestock watering. -- This category includes all stream segments used for livestock watering.

6.5.c. Category D3 -- Wildlife. -- This category includes all stream segments and wetlands used by wildlife.

6.6. Category E -- Water supply industrial, water transport, cooling and power. -- This category includes cooling water, industrial water supply, power production, commercial and pleasure vessel activity, except those small craft included in Category C.

6.6.a. Category E1 -- Water Transport. -- This category includes all stream segments modified for water transport and having permanently maintained navigation aides.

6.6.b. Category E2 -- Cooling Water. -- This category includes all stream segments having one (1) or more users for industrial cooling.

6.6.c. Category E3 -- Power production. -- This category includes all stream segments extending from a point 500 feet upstream from the intake to a point one half (1/2) mile below the wastewater discharge point. (See Appendix C for representative list.)

6.6.d. Category E4 -- Industrial. -- This category is used to describe all stream segments with one (1) or more industrial users. It does not include water for cooling.

§46-1-7. West Virginia Waters.

7.1. Major River Basins and their Alphanumeric System. All streams and their tributaries in West Virginia shall be individually identified using an alphanumeric system as identified in the "Key to West Virginia Stream Systems and Major Tributaries" (1956) as published by the Conservation Commission of West Virginia and revised by the West Virginia Department of Natural Resources, Division of Wildlife (1985).

7.1.a. J - James River Basin. All tributaries to the

West Virginia - Virginia State line.

7.1.b. P - Potomac River Basin. All tributaries of the main stem of the Potomac River to the West Virginia - Maryland - Virginia State line to the confluence of the North Branch and the South Branch of the Potomac River and all tributaries arising in West Virginia excluding the major tributaries hereinafter designated:

7.1.b.1. S - Shenandoah River and all its tributaries arising in West Virginia to the West Virginia - Virginia State line.

7.1.b.2. PC - Cacapon River and all its tributaries.

7.1.b.3. PSB - South Branch and all its tributaries.

7.1.b.4. PNB - North Branch and all tributaries to the North Branch arising in West Virginia.

7.1.c. M - Monongahela River Basin. The Monongahela River Basin main stem and all its tributaries excluding the following major tributaries which are designated as follows:

7.1.c.1. MC - Cheat River and all its tributaries except those listed below:

7.1.c.1.A. MCB - Blackwater River and all its tributaries.

7.1.c.2. MW - West Fork River and all its tributaries.

7.1.c.3. MT - Tygart River and all its tributaries except those listed below:

7.1.c.3.A. MTB - Buckhannon River and all its tributaries.

7.1.c.3.B. MTM - Middle Fork River and all its tributaries.

7.1.c.4. MY - Youghigheny River and all its tributaries to the West Virginia - Maryland State line.

7.1.d. O Zone 1 - Ohio River - Main Stem. The main stem of the Ohio River from the Ohio - Pennsylvania - West

Virginia state line to the Ohio - Kentucky - West Virginia State line.

7.1.e. O Zone 2 - Ohio River - Tributaries. All tributaries of the Ohio River excluding the following major tributaries:

7.1.e.1. LK - Little Kanawha River. The Little Kanawha River and all its tributaries excluding the following major tributary which is designated as follows:

7.1.e.1.A. LKH - Hughes River and all its tributaries.

7.1.e.2. K - Kanawha River Zone 1. The main stem of the Kanawha River from mile point 0, at its confluence with the Ohio River, to mile point 72 near Diamond, West Virginia.

7.1.e.3. K - Kanawha River Zone 2. The main stem of the Kanawha River from mile point 72 near Diamond, West Virginia and all its tributaries from mile point 0 to the headwaters excluding the following major tributaries which are designated as follows:

7.1.e.3.A. KP - Pocatalico River and all its tributaries.

7.1.e.3.B. KC - Coal River and all its tributaries.

7.1.e.3.C. KE - Elk River and all its tributaries.

7.1.e.3.D. KG - Gauley River. The Gauley River and all its tributaries excluding the following major tributaries which are designated as follows:

7.1.e.3.D.1. KG-19 - Meadow River and all its tributaries.

7.1.e.3.D.2. KG-34 - Cherry River and all its tributaries.

7.1.e.3.D.3. KGC - Cranberry River and all its tributaries.

7.1.e.3.D.4. KGW - Williams River and all its tributaries.

7.1.e.3.E. KN - New River. The New River from its confluence with the Gauley River to the Virginia - West Virginia State line and all tributaries excluding the following major tributaries which are designated as follows:

7.1.e.3.E.1. KNG - Greenbrier River and all its tributaries.

7.1.e.3.E.2. KNB - Bluestone River and all its tributaries.

7.1.e.3.E.3. KN-60 - East River and all its tributaries.

7.1.e.3.E.4. K(L)-81-(1) - Bluestone Lake.

7.1.e.4. OG - Guyandotte River. The Guyandotte River and all its tributaries excluding the following major tributary which is designated as follows:

7.1.e.4.1. OGM - Mud River and all its tributaries.

7.1.e.5. BS - Big Sandy River. The Big Sandy River to the Kentucky - Virginia - West Virginia State lines and all its tributaries arising in West Virginia excluding the following major tributary which is designated as follows:

7.1.e.5.1 BST - Tug Fork and all its tributaries.

7.2. Applicability of Water Quality Standards. The following shall apply at all times unless a specific exception is granted in this section:

7.2.a. Water Use Categories as described in section 6, herein.

7.2.a.1. Based on meeting those Section 6 definitions, tributaries or stream segments may be classified for one or more Water Use Categories. When more than one use exists, they shall be protected by criteria for the use category requiring the most stringent protection.

7.2.a.2. Each segment extending upstream from the intake of a water supply public (Water Use Category A), for a distance of one half (1/2) mile or to the headwater, must be protected by prohibiting the discharge of any pollutants in excess of the concentrations designated for this Water Use Category in section 8, herein. In addition, within that one half (1/2) mile zone, the Chief may establish for any discharge, effluent limitations for the protection of human health that require additional removal of pollutants than would otherwise be provided by this rule. (If a watershed is not significantly larger than this zone above the intake, the water supply section may include the entire upstream watershed to its headwaters.) Until September 1, 2010, or until action by the Environmental Quality Board to revise this provision, whichever comes first, the one-half (1/2) mile zone described in this section shall not apply to the Ohio River main channel (between Brown's Island and the left descending bank) between river mile points 61.0 and 63.5 for the Category A criterion for iron as set forth in §8 herein. Weirton Steel Corporation shall conduct monthly monitoring of the treated water at its drinking water plant for iron and submit the results of such monitoring to the West Virginia Bureau for Public Health and the Office of Water Resources of the West Virginia Department of Environmental Protection. In addition, Weirton Steel Corporation shall submit a written report regarding the status of its drinking water plant and the issues pertaining thereto to the Environmental Quality Board on or before March 1, 2007.

7.2.b. In the absence of any special application or contrary provision, water quality standards shall apply at all times when flows are equal to or greater than the minimum mean seven (7) consecutive day drought flow with a ten (10) year return frequency (7Q10). NOTE: With the exception of section 7.2.c.5 listed herein exceptions do not apply to trout waters nor to the requirements of section 3, herein.

7.2.c. Exceptions: Numeric water quality standards shall not apply: (See section 7.2.d, herein, for site-specific revisions)

7.2.c.1. When the flow is less than 7Q10;

7.2.c.2. In wet weather streams (or intermittent streams, when they are dry or have no measurable flow): Provided, That the existing and designated uses of downstream waters are not adversely affected;

7.2.c.3. In any assigned zone of initial dilution of any mixing zone where a zone of initial dilution is required by section 5.2.b herein, or in any assigned mixing zone for human health criteria or aquatic life criteria for which a zone of initial dilution is not assigned; In zones of initial dilution and certain mixing zones: Provided, That all requirements described in section 5 herein shall apply to all zones of initial dilution and all mixing zones;

7.2.c.4. Where, on the basis of natural conditions, the Board has established a site-specific aquatic life water quality criterion that modifies a water quality criterion set out in Appendix E, Table 1 of this rule. Where a natural condition of a waterbody is demonstrated to be of lower quality than a water quality criterion for the use classes and subclasses in section 6 of this rule, the Board, in its discretion, may establish a site-specific water quality criterion for aquatic life. This alternate criterion may only serve as the chronic criterion established for that parameter. This alternate criterion must be met at end of pipe. Where the Board decides to establish a site-specific water quality criterion for aquatic life, the natural condition constitutes the applicable water quality criterion. A site-specific criterion for natural conditions may only be established through the legislative rulemaking process in accordance with W.Va. Code §29A-3-1 et seq. and must satisfy the public participation requirements set forth at 40 C.F.R. 131.20 and 40 C.F.R. Part 25. Site-specific criteria for natural conditions may be established only for aquatic life criteria. A public notice, hearing and comment period is required before site-specific criteria for natural conditions are established.

Upon application or on its own initiative, the Board will determine whether a natural condition of a waterbody should be approved as a site-specific water quality criterion. Before it approves a site-specific water quality criterion for a natural condition, the Board must find that the natural condition will fully protect existing and designated uses and ensure the protection of aquatic life. If a natural condition of a waterbody varies with time, the natural condition will be determined to be the actual natural condition of the waterbody measured prior to or concurrent with discharge or operation. The Board will, in its discretion, determine a natural condition for one or more seasonal or shorter periods to reflect variable ambient conditions; and require additional or continuing monitoring of natural conditions.

An application for a site-specific criterion to be established on the basis of natural conditions shall be filed with the Board and shall include the following information:

7.2.c.4.A. A U.S.G.S. 7.5 minute map showing the stream segment affected and showing all existing discharge points and proposed discharge point;

7.2.c.4.B. The alphanumeric code of the affected stream, if known;

7.2.c.4.C. Water quality data for the stream or stream segment. Where adequate data are unavailable, additional studies may be required by the Board;

7.2.c.4.D. General land uses (e.g. mining, agricultural, recreation, residential, commercial, industrial, etc.) as well as specific land uses adjacent to the waters for the affected segment or stream;

7.2.c.4.E. The existing and designated uses of the receiving waters into which the segment in question discharges and the location where those downstream uses begin to occur;

7.2.c.4.F. General physical characteristics of the stream segment, including, but not limited to width, depth, bottom composition and slope;

7.2.c.4.G. Conclusive information and data of the source of the natural condition that causes the stream to exceed the water quality standard for the criterion at issue.

7.2.c.4.H. The average flow rate in the segment and the amount of flow at a designated control point and a statement regarding whether the flow of the stream is ephemeral, intermittent or perennial;

7.2.c.4.I. An assessment of aquatic life in the stream or stream segment in question and in the adjacent upstream and downstream segments; and

7.2.c.4.J. Any additional information or data that the Board deems necessary to make a decision on the application.

7.2.c.5. For the upper Blackwater River from the mouth of Yellow Creek to a point 5.1 miles upstream, when flow is less than 7Q10. Naturally occurring values for Dissolved Oxygen as established by data collected by the dischargers within this reach and reviewed by the Board and Division of Environmental Protection shall be the applicable criteria.

7.2.d. Site-specific applicability of water use categories and water quality criteria - State-wide water quality standards shall apply except where site-specific numeric criteria, variances or use removals have been approved following application and hearing, as provided in 46 C.S.R. 6. (See section 8.3 and section 8.4, herein) The following are approved site-specific criteria, variances and use reclassifications:

7.2.d.1. James River - (Reserved)

7.2.d.2. Potomac River

7.2.d.2.1. Except that a site-specific numeric criterion for aluminum, not to exceed 500 ug/l, shall apply to the section of Opequon Creek from Turkey Run to the Potomac River.

7.2.d.3. Shenandoah River - (Reserved)

7.2.d.4. Cacapon River - (Reserved)

7.2.d.5. South Branch - (Reserved)

7.2.d.6. North Branch

7.2.d.6.1 Except that the Stony River downstream from the limit of the thermal mixing zone (as established by Board Order of 11/20/75) for the Mount Storm Lake wastewater treatment facility to its confluence with the North Branch of the Potomac River is exempt from the 5°F above natural temperature rise; however, the maximum temperature outside the mixing zone shall not exceed 87°F at any time during the months of May through November and not exceed 73°F at any time during the months of December through April. This exception shall apply until the successful completion of a study conducted pursuant to section 316(a) of the Federal Act or December 31, 1998, whichever comes first.

7.2.d.7. Monongahela River

7.2.d.7.1. Except that flow in the main stem of the Monongahela River, as regulated by the Tygart Reservoir, operated by the U. S. Army Corps of Engineers, is based on a minimum flow of 345 cfs at Lock and Dam No. 8, river mile point 90.8. This exception does not apply to tributaries of the Monongahela River.

7.2.d.8. Cheat River

7.2.d.8.1. Except that in the unnamed tributary of Daugherty Run, approximately one mile upstream of Daugherty Run's confluence with the Cheat River, a site-specific numeric criterion for iron of 3.5 mg/l shall apply and the following frequency and duration requirements shall apply to the chronic numeric criterion for selenium (5ug/l): the four-day average concentration shall not be exceeded more than three times every three years (36 months), on average. Further, the following site-specific numeric criteria shall apply to Fly Ash Run of Daugherty Run: acute numeric criterion for aluminum: 888.5 ug/l and manganese: 5 mg/l.

7.2.d.9. Blackwater River - The Blackwater River below Davis, West Virginia shall be classified as a trout water, Category B2.

7.2.d.10. West Fork River - (Reserved)

7.2.d.11. Tygart River - (Reserved)

7.2.d.12. Buckhannon River - (Reserved)

7.2.d.13. Middle Fork River - (Reserved)

7.2.d.14. Youghiogheny River

7.2.d.14.1 Water Use Categories A and E are excluded from the tributaries of the Youghiogheny River in West Virginia which flow into Maryland.

7.2.d.15. Ohio River Main Stem - (Reserved)

7.2.d.16. Ohio River Tributaries.

7.2.d.16.1. Except that site-specific numeric criteria shall apply to the stretch of Conners Run (0-77-A), a tributary of Fish Creek, from its mouth to the discharge from Conner Run impoundment, which shall not have the Water Use Category A and may contain selenium not to exceed 62 ug/l; and iron not to exceed 3.5 mg/l as a monthly average and 7 mg/l as a daily maximum.

7.2.d.16.2. Except that a socio-economic variance shall apply to that segment of Harmon Creek (0-97) from its confluence with the Ohio River to a point 2.2 miles upstream, which shall not have water use Category A designation, and which shall have the following instream criteria: Lead 14 ug/l, Daily Maximum, Temperature 100 degree F (monitored per Footnote 12 of the permit); Iron 4.0 mg/l, monthly average and 8.0 mg/l Daily Maximum (monitored per Footnote 12 of the permit). Weirton Steel Corporation shall continue to submit to the Office of Water Resources of West Virginia Department of Environmental Protection, on an annual basis summary reports on the water quality of the discharge from Outlet 004 and the efforts made by Weirton Steel Corporation during the previous year to improve the quality of the discharge. These exceptions shall be in effect until action by the Environmental Quality Board to revise the exceptions or until July 1, 2007, whichever comes first.

7.2.d.17. Little Kanawha River - (Reserved)

7.2.d.18. Hughes River - (Reserved)

7.2.d.19. Kanawha River Zone 1 - Main Stem

7.2.d.19.1 For the Kanawha River main stem, Zone 1, Water Use Category A shall not apply; and

7.2.d.19.2. The minimum flow shall be 1,960 cfs at the Charleston gauge.

7.2.d.19.3. Except that in Ward Hollow of Davis Creek, the following site-specific numeric criterion for chloride shall apply for Category A and Category B1 (chronic aquatic life protection): 310,000 ug/L.;

7.2.d.20. Kanawha River Zone 2 and Tributaries.

7.2.d.20.1. For the main stem of the Kanawha River only, the minimum flow shall be 1,896 cfs at mile point 72.

7.2.d.20.2. Except the stretch between the mouth of Little Scary Creek (K-31) and the Little Scary impoundment shall not have Water Use Category A. The following site-specific numeric criteria shall apply to that section: selenium not to exceed 62 ug/1 and copper not to exceed 105 ug/1 as a daily maximum nor 49 ug/1 as a 4-day average.

7.2.d.20.3. Except for Simmons Creek (K-54) from its mouth to a point 1200 feet upstream to which the following site-specific numeric criteria shall apply: a maximum daily temperature not to exceed 38°C (100°F) nor a monthly average temperature to exceed 34°C. This exception shall apply until the successful completion of a study conducted pursuant to section 316(a) of the Federal Act or May 30, 1998, whichever comes first.

7.2.d.21. Pocatalico River - (Reserved)

7.2.d.22. Coal River - (Reserved)

7.2.d.23. Elk River - (Reserved)

7.2.d.24. Gauley River - (Reserved)

7.2.d.25. Meadow River - (Reserved)

7.2.d.26. Cherry River - (Reserved)

7.2.d.27. Cranberry River - (Reserved)

7.2.d.28. Williams River - (Reserved)

7.2.d.29. New River - (Reserved)

7.2.d.30. Greenbrier River - (Reserved)

7.2.d.31. Bluestone River - (Reserved)

7.2.d.32. Bluestone Lake

7.2.d.33. East River - (Reserved)

7.2.d.34. Guyandotte River - (Reserved)

7.2.d.35. Mud River - (Reserved)

7.2.d.36. Big Sandy River - (Reserved)

7.2.d.37. Tug Fork River - (Reserved)

§46-1-8. Specific Water Quality Criteria.

8.1. Charts of specific water quality criteria are included in Appendix E, Table 1.

8.1.a. Specific state (i.e. total, total recoverable, dissolved, valence, etc.) of any parameter to be analyzed shall follow 40 CFR 136, Guidelines Establishing Test Procedures for Analysis of Pollutants Under the Clean Water Act, as amended, June 15, 1990. (See also 47 C.S.R. 10, section 7.3 - National Pollutant Discharge Elimination System (NPDES) Program.)

8.1.b. Compliance with aquatic life water quality criteria expressed as dissolved metal shall be determined based on dissolved metals concentrations.

8.1.b.1. The aquatic life criteria for all metals listed in Appendix E, Table 2 shall be converted to a dissolved concentration by multiplying each numerical value or criterion equation from Appendix E, Table 1 by the appropriate conversion factor (CF) from Appendix E, Table 2.

8.1.b.2. Permit limits based on dissolved metal water quality criteria shall be prepared in accordance with the U.S. EPA document "The Metals Translator: Guidance For Calculating A Total Recoverable Permit Limit From A Dissolved Criterion, EPA 823-B-96-007 June 1996.

8.1.b.3. NPDES permit applicants may petition the Office of Water Resources of the Division of Environmental Protection (OWR) to develop a site-specific translator consistent with the provisions in this section. The OWR may, on a case-by-case basis require an applicant applying for a translator to conduct appropriate sediment monitoring through SEM/AVS ratio, bioassay or other approved methods to evaluate effluent limits that prevent toxicity to aquatic life.

8.1.c. An "X" or numerical value in the use columns of Appendix E, Table 1 shall represent the applicable criteria.

8.1.d. Charts of water quality criteria in Appendix E, Table 1 shall be applied in accordance with major stream and use applications, sections 6 and 7, herein.

8.2. Criteria for Toxicants

8.2.a. Toxicants which are carcinogenic have human health criteria (Water Use Categories A and C) based upon an estimated risk level of one additional cancer case per one million persons (10^{-6}) and are indicated in Appendix E, Table 1 with an endnote ([b]).

8.2.b. A final determination on the critical design flow for carcinogens is not made in this rule, in order to permit further review and study of that issue. Following the conclusion of such review and study, the Legislature may again take up the authorization of this rule for purposes of addressing the critical design flow for carcinogens: Provided, That until such time as the review and study of the issue is concluded or until such time as the Legislature may again take up the authorization of this rule, the regulatory requirements for determining effluent limits for carcinogens shall remain as they were on the date this rule was proposed.

8.3. Variances from Specific Water Quality Criteria. A variance from numeric criteria may be granted to a discharger if it can be demonstrated that the conditions outlined in subsections 6.1.b.A - F, herein, limit the attainment of one or more specific water quality criteria. Variances shall apply only to the discharger to whom they are granted and shall be reviewed by the Board at least every three years. In granting a variance, the requirements for revision of water quality standards in 46 CSR 6 shall be followed.

8.4. Site-specific numeric criteria. The Board may establish numeric criteria different from those set forth in Appendix E, Table 1 for a stream or stream segment upon a demonstration that existing numeric criteria are either over-protective or under-protective of the aquatic life residing in the stream or stream segment. A site-specific numeric criterion will be established only where the numeric criterion will be fully protective of the aquatic life and the existing and designated uses in the stream or stream segment. The site-specific numeric criterion may be established by conducting a Water Effect Ratio study pursuant to the procedures outlined in US EPA's "Interim Guidance on the Determination and Use of Water-Effect Ratios for Metals" (February 1994); other methods may be used with prior approval by the Board. In adopting site-specific numeric criteria, the requirements for revision of water quality standards set forth in 46 CSR 6 shall be followed.

§46-1-9. Establishment Of Safe Concentration Values.

When a specific water quality standard has not been established by these rules and there is a discharge or proposed discharge into waters of the State, the use of which has been designated a Category B1, B2, B3 or B4, such discharge may be regulated by the Chief where necessary to protect State waters through establishment of a safe concentration value as follows:

9.1. Establishment of a safe concentration value shall be based upon data obtained from relevant aquatic field studies, standard bioassay test data which exists in substantial available scientific literature, or data obtained from specific tests utilizing one (1) or more representative important species of aquatic life designated on a case-by-case basis by the Chief and conducted in a water environment which is equal to or closely approximates that of the natural quality of the receiving waters.

9.2. In those cases where it has been determined that there is insufficient available data to establish a safe concentration value for a pollutant, the safe concentration value shall be determined by applying the appropriate application factor as set forth below to the 96-hour LC 50 value. Except where the Chief determines, based upon substantial available scientific data that an alternate application factor exists for a pollutant, the following appropriate application factors shall be used in the determination of safe concentration values:

9.2.a. Concentrations of pollutants or combinations of pollutants that are not persistent and not cumulative shall not exceed 0.10 (1/10) of the 96-hour LC 50.

9.2.b. Concentrations of pollutants or combinations of pollutants that are persistent or cumulative shall not exceed 0.01 (1/100) of the 96-hour LC 50.

9.3. Persons seeking issuance of a permit pursuant to these rules authorizing the discharge of a pollutant for which a safe concentration value is to be established using special bioassay tests pursuant to subsection 9.1 of this section shall perform such testing as approved by the Chief and shall submit all of the following in writing to the Chief:

9.3.a. A plan proposing the bioassay testing to be performed.

9.3.b. Such periodic progress reports of the testing as may be required by the Chief.

9.3.c. A report of the completed results of such testing including, but not limited to, all data obtained during the course of testing, and all calculations made in the recording, collection, interpretation and evaluation of such data.

9.4. Bioassay testing shall be conducted in accordance with methodologies outlined in the following documents: U.S. EPA Office of Research and Development Series Publication, Methods for Measuring the Acute Toxicity (EPA/600/4-90/027F, August 1993, 4th Edition) or Short Term Methods for Estimating Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms (EPA/600/4-89/001), March 1989; Standard Methods for the Examination of Water and Wastewater (18th Edition); or ASTM Practice E 729-88 for Conducting Acute Toxicity Tests with Fishes, Macroinvertebrates and Amphibians as published in Volume 11.04 of the 1988 Annual Book of ASTM Standards. Test waters shall be reconstituted according to recommendations and methodologies specified in the previously cited references or methodologies approved in writing by the Chief.

APPENDIX A
CATEGORY B-2 - TROUT WATERS

This list contains known trout waters and is not intended to exclude any waters which meet the definition in Section 2.20.

River Basin	County	Stream
James River		
J	Monroe	South Fork Potts Creek
Potomac River		
P	Jefferson	Town Run
P	"	Rocky Marsh Run
P	Berkeley	Opequon Creek
P	"	Tuscarora Creek (Above Martinsburg)
P	"	Middle Creek (Above Route 30 Bridge)
P	"	Mill Creek
P	"	Hartland Run
P	"	Mill Run
P	"	Tillance Creek
P	Morgan	Meadow Branch
PS	Jefferson	Flowing Springs Run (Above Halltown)
PS	"	Cattail Run
PS	"	Evitt's Run
PS	"	Big Bullskin Run
PS	"	Long Marsh Run
PC	Hampshire	Cold Stream
PC	"	Edwards Run and Impoundment
PC	"	Dillons Run
PC	Hardy	Lost River
PC	"	Camp Branch
PC	"	Lower Cove Run
PC	"	Moores Run
PC	"	North River (Above Rio)
PC	"	Waites Run
PC	"	Trout Run
PC	"	Trout Pond (Impoundment)
PC	"	Warden Lake (Impoundment)
PC	"	Rock Cliff Lake (Impoundment)
PSB	Hampshire	Mill Creek
PSB	"	Mill Run
PSB	Hardy	Dumpling Creek
PSB	Grant-Pendleton	North Fork South Branch
PSB	Grant	North Fork Lunice Creek
PSB	"	South Fork Lunice Creek
PSB	"	South Mill Creek (Above Hiser)
PSB	"	Spring Run
PSB	Pendleton	Hawes Run (Impoundment)
PSB	"	Little Fork
PSB	"	South Branch (Above North Fork)

PSB	"	Senena Creek
PSB	"	Laurel Fork
PSB	"	Big Run
PNB	Mineral	North Fork Patterson Creek
PNB	"	Fort Ashby (Impoundment)
PNB	"	New Creek
PNB	"	New Creek Dam 14 (Impoundment)
PNB	"	Mill Creek (Above Markwood)
Monongahela River		
M	Monongalia-Marion	Whiteday Creek (Above Smithtown)
MC	Monongalia	Morgan Run
MC	"	Coopers Rock (Impoundment)
MC	"	Blaney Hollow
MC	Preston	Laurel Run
MC	"	Elsey Run
MC	"	Saltlick Creek
MC	"	Buffalo Creek
MC	"	Wolf Creek
MC	Tucker	Clover Run
MC	"	Elklick Run
MC	"	Horseshoe Run
MC	"	Maxwell Run
MC	"	Red Creek
MC	"	Slip Hill Mill Branch
MC	"	Thomas Park (Impoundment)
MC	"	Blackwater River (Above Davis)
MC	"	Blackwater River (Below Davis) (insert date adopted)
MC	Randolph	Camp Five Run
MC	"	Dry Fork (Above Otter Creek)
MC	"	Glady Fork
MC	"	Laurel Fork
MC	"	Gandy Creek (Above Whitmer)
MC	"	East Fork Glady Fork (Above C & P Compressor Station)
MC	Randolph	Shavers Fork (Above Little Black Fork)
MC	"	Three Spring Run
MC	"	Spruce Knob Lake (Impoundment)
MW	Harrison	Dog Run (Pond)
MW	Lewis	Stonecoal
MT	Barbour	Brushy Fork (Above Valley Furnace)
MT	"	Teter Creek Lake (Impoundment)
MT	"	Mill Run
MT	Taylor-Barbour	Tygart Lake Tailwaters (Above Route 119 Bridge)
MT	Preston	Roaring Creek (Above Little Lick Branch)
MT	Randolph	Tygart River (Above

Huttonsville)

MT	"	Elkwater Fork
MT	"	Big Run
MTB	Upshur-Randolph-Lewis	Right Fork Buckhannon River
MTB	Upshur	Buckhannon River (Above Beans Mill)
MTB	Upshur	French Creek
MTB	Upshur-Randolph	Left Fork Right Fork
MTN	Upshur	Right Fork Middle Fork River
MTM	Randolph	Middle Fork River (Above Cassity)
MY	Preston	Rhine Creek

Little Kanawha River

LK	Upshur	Left Fork-Right Fork Little Kanawha River)
LK	Upshur-Lewis	Little Kanawha River (Above Wildcat)

Kanawha River

KE	Braxton	Sutton Reservoir
KE	"	Sutton Lake Tailwaters (Above Route 38/5 Bridge)
KE	Webster	Back Fork
KE	"	Desert Fork
KE	"	Fall Run
KE	"	Laurel Fork
KE	"	Left Fork Holly River
KE	"	Sugar Creek
KE	"	Elk River (Above Webster Springs)
KC	Raleigh	Stephens Lake (Impoundment)
KC	"	Marsh Fork (Above Sundial)
KG	Nicholas	Summersville Reservoir (Impoundment)
KG	"	Summersville Tailwaters (Above Collison Creek)
KG	Nicholas	Deer Creek
KG	Randolph-Webster	Gauley River (Above Moust Coal Tipple)
KG	Fayette	Glade Creek
KG	Nicholas	Hominy Creek
KG	"	Anglins Creek
KG	Greenbrier	Big Clear Creek
KG	"	Little Clear Creek and Laurel Run
KG	"	Meadow Creek
KG	Fayette	Wolf Creek
KG	Nicholas	Cherry River
KG	Greenbrier-Nicholas	Laurel Creek
KG	" "	North Fork Cherry River
KG	Greenbrier	Summit Lake (Impoundment)

KG	Greenbrier-Nicholas	South Fork Cherry River
KGC	Pocahontas-Webster-Nicholas	Cranberry River
KGC	Pocahontas	South Fork Cranberry River
KGW	Pocahontas	Tea Creek
KGW	Pocahontas-Webster	Williams River (Above Dyer)
KN	Raleigh	Glade Creek
KN	Summers	Meadow Creek
KN	Fayette	Mill Creek
KN	"	Laurel Creek (Above Cotton Hill)
KN	Raleigh	Pinch Creek
KN	Monroe	Rich Creek
KN	"	Turkey Creek
KN	Fayette	Dunloup Creek (Downstream from Harvey Sewage Treatment Plant)
KN	Mercer	East River (Above Kelleysville)
KN	"	Pigeon Creek
KN	Monroe	Laurel Creek
KNG	Monroe	Kitchen Creek (Above Gap Mills)
KNG	Greenbrier	Culverson Creek
KNG	"	Milligan Creek
KNG	Greenbrier-Monroe	Second Creek (Rt. 219 Bridge to Nickell's Mill)
KNG	Greenbrier	North Fork Anthony Creek
KNG	"	Spring Creek
KNG	"	Anthony Creek (Above Big Draft)
KNG	Pocahontas	Watoga Lake
KNG	"	Beaver Creek
KNG	"	Knapp's Creek
KNG	"	Hills Creek
KNG	"	North Fork Deer Creek (Above Route 28/5)
KNG	"	Deer Creek
KNG	"	Sitlington Creek
KNG	"	Stoney Creek
KNG	"	Swago Creek
KNG	"	Buffalo Fork (Impoundment)
KNG	"	Seneca (Impoundment)
KNG	"	Greenbrier River (Above Hosterman)
KNG	"	West Fork-Greenbrier River (Above the impoundment at the tannery)
KNG	"	Little River-East Fork
KNG	"	Little River-West Fork
KNG	"	Five Mile Run
KNG	"	Mullenax Run
KNG	"	Abes Run
KNB	Mercer	Marsh Fork
KNB	"	Camp Creek

OG	Wyoming	Pinnacle creek
BST	McDowell	Dry Fork (Above Canebrake)

APPENDIX B

This list contains known waters used as public water supplies and is not intended to exclude any waters as described in section 6.2, herein.

River Basin	County	Operating Company	Source
Shenandoah River			
S	Jefferson	Charlestown Water	Shenandoah River
Potomac River			
P	Jefferson	3-M Company	Turkey Run
P	"	Shepherdstown Water	Potomac River
P	"	Harpers Ferry Water	Elk Run
P	Berkeley	DuPont Potomac River Works	Potomac River
P	"	Berkeley County PSD	Le Feure Spring
P	"	Opequon PSD	Quarry Spring
P	"	Hedgesville PSD	Speck Spring
P	Morgan	Paw Paw Water	Potomac River
PSB	Hampshire	Romney Water	South Branch Potomac River
PSB	"	Peterkin Conference Center	Mill Run
PSB	Hardy	Moorefield Municipal Water	South Fork River
PSB	Pendleton	U.S. Naval Radio Sta.	South Fork River
PSB	"	Circleville Water Inc.	North Fork of South Branch, Potomac River
PSB	Grant	Mountain Top PSD	Mill Creek, Impoundment
PSB	"	Petersburg Municipal Water	South Branch, Potomac River
PNB	Grant	Island Creek Coal	Impoundment
PNB	Mineral	Piedmont Municipal Water	Savage River, Maryland
PNB	"	Keyser Water	New Creek
PNB	"	Fort Ashby PSD	Lake
Monongahela River			
M	Monongalia	Morgantown Water Comm.	Colburn Creek & Monongahela River
M	"	Morgantown Ordinance Works	Monongahela River
M	Preston	Preston County PSD	Deckers Creek
M	Monongalia	Blacksville # 1 Mine	Impoundment
M	"	Loveridge Mine	Impoundment
M	"	Consolidation Coal Co.	Impoundment
M	Preston	Mason Town Water	Block Run
MC	Preston	Fibair Inc.	Impoundment
MC	Monongalia	Cheat Neck PSD	Cheat Lake
MC	"	Lakeview County Club	Cheat Lake-Lake Lynn

MC	"	Union Districk PSD	Cheat Lake-Lake Lynn
MC	"	Cooper's Rock State Park	Impoundment
MC	Preston	Kingwood Water	Cheat River
MC	"	Hopemount State Hosp.	Snowy Creek
MC	"	Rowlesburg Water	Keyser Run & Cheat River
MC	"	Albright	Cheat River
MC	Tucker	Parsons Water	Shavers & Elk Lick Fork
MC	"	Thomas Municipal	Thomas Reservoir
MC	"	Hamrick PSD	Dry Fork
MC	"	Douglas Water System	Long Run
MC	"	Davis Water	Blackwater River
MC	"	Hambleton Water System	Roaring Creek
MC	"	Canaan Valley State Park	Blackwater River
MC	Pocahontas	Cheat Mt. Sewer	Shavers Lake
MC	"	Snowshoe Co. Water	Shavers Fork
MC	Randolph	Womelsdorf Water	Yokum Run
MW	Harrison	Lumberport Water	Jones Run
MW	"	Clarksburg Water Bd.	West Fork River
MW	"	Bridgeport Mun. Water	Deecons & Hinkle Creek
MW	"	Salem Water Board	Dog Run
MW	"	West Milford Water	West Fork River
MW	Lewis	W.V. Water-Weston District	West Fork River
MW	"	Jackson's Mill Camp	Impoundment
MW	"	West Fork River PSD	West Fork River
MW	"	Kennedy Compresssor Station	West Fork River
MW	"	Jane Lew Water Comm.	Hackers Creek
MW	Harrison	Bel-Meadow Country Club	Lake
MW	"	Harrison Power Station	West Fork River
MW	"	Oakdale Portal	Impoundment
MW	"	Robinson Port	Impoundment
MT	Marion	Fairmont Water Comm.	Tygart River
MT	"	Mannington Water	Impoundment
MT	"	Monongah Water Works	Tygart River
MT	"	Eastern Assoc. Coal Corp	Impoundment
MT	"	Four States Water	Impoundment
MT	Harrison	Shinnston Water Dept.	Tygart River
MT	Taylor	Grafton Water	Tygart River-Lake
MT	Barbour	Phillippi Water	Tygart River
MT	"	Bethlehem Mines Corp.	Impoundment
MT	"	Belington Water Works	Tygart River & Mill Run Lake
MT	Randolph	Elkins Municipal Water	Tygart River
MT	"	Beverly Water	Tygart river
MT	"	Valley Water	Tygart River
MT	"	Huttonsville Medium Security Prison	Tygart River
MT	"	Mill Creek Water	Mill Creek
MTB	Upshur	Buckhannon Water Board	Buckhannon River

Ohio River

O	Zone 1	Hancock	Chester Water & Sewer	Ohio River
O	"	Brooke	City of Weirton	Ohio River
O	"	"	Weirton Steel Division	Ohio River
O	"	Ohio	Wheeling Water	Ohio River
O	"	Tyler	Sistersville Mun. Water	Ohio River
O	"	Pleasants	Pleasants Power Station	Ohio River
O	"	Cabel	Huntington Water Corp.	Ohio River
O	"	Marshall	Mobay Chemical Co.	Ohio River
O	"	Wood	E. I. DuPont	Ohio River
O	Zone 2	Marshall	meron Water	Glass House Hollow
O	"	"	New Urindahana Water	Wheeling Creek System
O	"	Wetzel	Pine Grove Water	North Fork, Fishing Creek
O	"	Marshall	Consolidated Coal Co.	Impoundment
O	"	Tyler	Middlebourne Water	Middle Island Creek
O	"	Doddridge	West Union Mun. Water	Middle Island Creek
O	"	Mason	Hidden Valley Country	Lake/Impoundment
O	"	Jackson	Ripley Water	Mill Creek
O	"	Wayne	Wayne Municipal Water	Twelve Pole Creek
O	"	"	East Lynn Lake	East Lynn Lake
O	Zone 2	Wayne	Monterey Coal Co.	Impoundment

Little Kanawha

LK	Wood	Claywood Park PSD	Little Kanawha River
LK	Calhoun	Grantsville Mun. Water	Little Kanawha River
LK	Gilmer	Glenville Utility	Little Kanawha River
LK	"	Consolidated Gas Compressor	Steer Creek
LK	Braxton	Burnsville Water Works	Little Kanawha River
LK	Roane	Spencer Water	Spring Creek Mile Tree Reservoir
LK	Wirt	Elizabeth Water	Little Kanawha River
LKH	Ritchie	Cairo Water	North Fork Hughes River
LKH	"	Harrisville Water	North Fork Hughes River
LKH	"	Pennsboro Water	North Fork Hughes River

Kanawha River

K	Putnam	Buffalo Water	Cross Creek
K	"	Winfield Water	Poplar Fork & Crooked Creek
K	"	South Putnam PSD	Poplar Fork & Crooked Creek

K	Kanawha	Cedar Grove Water	Kanawha River
K	"	Pratt Water	Kanawha River
K	Fayette	Armstrong PSD PO-K1-CO-EL	Kanawha River & Gum Hollow
K	"	Kanawha Water Co.-	Unnamed Tributary Kanawha Beards Fork River
K	Kanawha	Midland Trail School	Impoundment
K	"	Cedar Coal Co.	Impoundment
K	Fayette	Elkem Metals Co.	Kanawha River
K	"	Deepwater PSD	Kanawha River
K	"	Kanawha Falls PSD	Kanawha River
K	"	W.V. Water-Montgomery	Kanawha River

Pocatalico River

KP	Kanawha	Sissonville PSD	Pocatalico River
KP	Roane	Walton PSD	Silcott Fork Dam

Coal River

KC	Kanawha	St. Albans Water	Coal River
KC	"	Washington PSD	Coal River
KC	Lincoln	Lincoln PSD	Coal River
KC	Boone	Coal River PSD	Coal River
KC	"	Whitesville PSD	Coal River
KC	Raleigh	Armco Mine 10	Marsh Fork
KC	"	Armco Steel-Montc. Stickney	Coal River
KC	Raleigh	Peabody Coal	Coal River
KC	"	Stephens Lake Park	Lake Stephens
KC	Boone	W.V. Water-Madison Dist.	Little Coal River
KC	"	Van PSD	Pond Fork
KC	Raleigh	Consol. Coal Co.	Workmans Creek
KC	Boone	Water Ways Park	Coal River

Elk River

KE	Kanawha	Clendenin Water	Elk River
KE	"	W.V. Water-Kanawha Valley District	Elk River
KE	Kanawha	Pinch PSD	Elk River
KE	Clay	Clay Waterworks	Elk River
KE	"	Procious PSD	Elk River
KE	Braxton	Flatwoods-Canoe Run PSD	Elk River
KE	"	Sugar Creek PSD	Elk River
KE	"	W.V. Water-Gassaway Dist.	Elk River
KE	"	W.V. Water-Sutton Dist.	Elk River
KE	Webster	W.V. Water-Webster Springs	Elk River
KE		Holly River State Park	Holly River

Gauley River

KG	Nicholas	Craigsville PSD	Gauley River
KG	"	Summersville Water	Impoundment/Muddlety Creek

KG	"	Nettie-Leivasy PSD	Jim Branch
KG	Webster	Cowen PSD	Gauley River
KG	Nicholas	Wilderness PSD	Anglins Creek & Meadow River
KG	"	Richwood Water	North Fork Cherry River

New River

KN	Fayette	Ames Heights Water	Mill Creek
KN	"	Mt. Hope Water	Impounded Mine (Surface)
KN	"	Ansted Municipal Water	Mill Creek
KN	"	Fayette Co. Park	Impoundment
KN	"	New River Gorge Campground	Impoundment
KN	"	Fayetteville Water	Wolfe Creek
KN	Raleigh	Beckley Water	Glade Creek
KN	"	Westmoreland Coal Co.	Farley Branch

Bluestone River

KNB	Summers	Jumping Branch-Nimitz	Mt. Valley Lake
KNB	"	Bluestone Conf. Center	Bluestone Lake
KNB	"	Pipestem State Park	Impoundment
KNB	Mercer	Town of Athens	Impoundment
KNB	"	Bluewell PSD	Impoundment
KNB	"	Bramwell Water	Impoundment
KNB	"	Green Valley-Glenwood PSD	Bailey Reservoir
KNB	"	Kelly's Tank	Spring
KNB	"	W.V. Water Princeton	Impoundment/Brusch Creek
KNB	"	Lashmeet PSD	Impoundment
KNB	"	Pinnacle Water Assoc.	Mine
KNB	"	W.V. Water Bluefield	Impoundment

Greenbrier River

KNG	Summers	W.V. Water Hinton	Greenbrier River & New River.
KNG	"	Big Bend PSD	Greenbrier River
KNG	Greenbrier	Alderson Water Dept.	Greenbrier River
KNG	"	Ronceverte Water	Greenbrier River
KNG	"	Lewisburg Water	Greenbrier River
KNG	Pocahontas	Denmar State Hospital Water	Greenbrier River
KNG	"	City of Marlinton Water	Knapp Creek
KNG	"	Cass Scenic Railroad	Leatherbark Creek
KNG	"	Upper Greenbrier PSD	Greenbrier River
KNG	"	The Hermitage	Greenbrier River

Guyandotte River

OG	Cabell	Salt Rock PSD	Guyandotte River
OG	Lincoln	West Hamlin Water	Guyandotte Rriver

OG	Logan	Logan Water Board	Guyandotte River
OG	"	Man Water Works	Guyandotte River
OG	"	Buffalo Creek PSD	Buffalo Creek/ Mine/Wells
OG	Logan	Chapmanville	Guyandotte River
OG	"	Logan PSD	Whitman Creek/ Guyandotte River
OG	Mingo	Gilbert Water	Guyandotte River
OG	Wyoming	Oceana Water	Laurel Fork
OG	"	Glen Rogers PSD	Impoundment
OG	"	Pineville Water	Pinnacle Creek/ Guyandotte River
OG	Raleigh	Raleigh Co. PSD-Amigo	Tommy Creek
OMG	Cabell	Milton Water Works	Guyandotte River
OMG	"	Culloden PSD	Indian Fork Creek
OMG	Putnam	Hurricane Municipal Water	Impoundment
OMG	"	Lake Washington PSD	Lake Washington

Big Sandy River

BS	Wayne	Kenova Municipal Water	Big Sandy River
BS	"	Fort Gay Water	Tug Fork
BST	Mingo	Kermit Water	Tug Fork
BST	"	Matewan Water	Tug Fork
BST	"	A & H Coal Co., Inc.	Impoundment
BST	"	Williamson Water	Impoundment
BST	McDowell	City of Welch	Impoundment/Wells
BST	"	City of Gary	Impoundment/Mine

APPENDIX C
CATEGORY E-3 - POWER PRODUCTION

This list contains known power production facilities and is not intended to exclude any waters as described in section 6.6.c, herein.

River Basin	County	Station Name	Operating Company
Monongahela River			
M	Monongalia	Fort Martin Power Station	Monongahela Power
M	Marion	Rivesville Station	Monongahela Power
MC	Preston	Albright Station	Monongahela Power
Potomac	Grant	Mt. Storm Power Station	Virginia Electric & Power Company
Ohio River			
O - Zone 1	Wetzel	Hannibal (Hydro)	Ohio Power
O " "	Marshall	Kammer	Ohio Power
O " "	"	Mitchell	Ohio Power
O " "	Pleasants	Pleasants Station	Monongahela Power
O " "	"	Willow Island Station	Monongahela Power
O " "	Mason	Phillip Sporn Plant	Central Operating (AEP)
O " "	"	Racine (Hydro)	Ohio Power
O " "	"	Mountaineer	Appalachian Power Co.
K	Putnam	Winfield (Hydro)	Appalachian Power Co.
K	Kanawha	Marmet (Hydro)	Appalachian Power Co.
K	"	London (Hydro)	Appalachian Power Co.
K	"	Kanawha River	Appalachian Power Co.
K	"	John E. Amos	Appalachian Power Co.

APPENDIX D
CATEGORY C - WATER CONTACT RECREATION

This list contains waters known to be used for water contact recreation and is not intended to exclude any waters as described in section 6.4, herein.

River Basin	Stream Code	Stream	County
Shenandoah	S	Shenandoah River	Jefferson
Potomac	P	Potomac River	Jefferson
	P	" "	Hampshire
	P	" "	Berkeley
	P	" "	Morgan
	P-9	Sleepy Creek & Meadow Branch	Berkeley
	P-9-G-1	North Fork of Indian Run	Morgan
South Branch	PSB	South Branch of Potomac River	Hampshire
	PSB	" "	Hardy
	PSB	" "	Grant
	PSB-21-X	Hawes Run	Pendleton
	PSB-25-C-2	Spring Run	Grant
	PSB-28	North Fork South Branch Potomac River	Grant
North Branch	PNB	North Branch of Potomac River	Mineral
	PNB-4-EE	North Fork Patterson Creek	Grant
	PNB-7-H	Linton Creek	Grant
	PNB-17	Stoney River-Mt. Storm Lake	Grant
	PC	Cacapon River	Hampshire
Monongalia			
Cheat	MC	Cheat Lake/Cheat river	Monongalia/Preston
	MC	Alpine Lake	Preston
	MC-6	Coopers Rock Lake/ Quarry Run	Monongalia
	MC-12	Big Sandy Creek	Preston
	MSC	Shavers Fork	Randolph
	MTN	Middle Fork River	Barbour/ Randolph/ Upshur
	MW	West Fork River	Harrison
	MW-18	Stonecoal Creek/ Stonecoal Lake	Lewis
Ohio	O	OhioRiver	Brooke/ Cabell/

			Hancock/ Jackson/ Marshall/ Mason/Ohio/Pleasants/ Tyler/Wayne/Wood/Wetzel
	O-2-H	Beech Fork of Twelvepole Creek/Beech Fork Lake	Wayne
	O-2-Q	East Fork of Twelvepole Creek/East Lynn Lake	Wayne
	O-3	Fourpole Creek	Cabell
	O-21	Old Town Creek/ McClintic Ponds	Mason
	OMI	Middle Island Creek/ Crystal Lake	Doddridge
	OG	Guyandotte River	Cabell
	OG	Guyandotte River/ R. D. Bailey Lake	Wyoming
	OGM	Mud River	Cabell
Little Kanawha	LK	Little Kanawha River/ Burnsville Lake	Braxton
Kanawha	K	Kanawha River	Fayette/ Kanawha/ Mason/ Putnam
	K-1	Unnamed Tributary Krodel Lake	Mason
	KC	Coal River	Kanawha
	KC-45-Q	Stephens Branch/ Lake Stephens	Raleigh
	KE	Elk River	Kanawha/ Clay/ Braxton/ Webster/ Randolph
	KE	Sutton lake	Braxton
	KN	New River	Fayette/ Raleigh/ Summers
	KN-26-F	Little Beaver Creek	Raleigh
	KNG	Greenbrier River	Greenbrier/Pocahontas/Summers
	KNG-23-E-1	Little Devil Creek/ Moncove Lake	Monroe
	KNG-28	Anthony Creek	Greenbrier
	KNG-28-P	Meadow Creek/	Greenbrier

	Lake Sherwood	
KNB	Bluestone River/ Bluestone Lake	Summers
KG	Gauley River	Webster
KG	Gauley River/ Summersville Lake	Nicholas
KGW	Williams River	Webster

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C[3]	A[4]	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
8.1 Dissolved Aluminum (ug/l) Not to exceed [(e)]:	750xCF[5]	87xCF[5] [(e)]	750xCF[5]	87xCF[5] [(e)]			
8.2. Acute and chronic aquatic life criteria for ammonia shall be determined using the National Criterion for Ammonia in Fresh Water[d] from USEPA's 1999 Update of Ambient Water Quality Criteria for Ammonia (EPA-822-R-99-014, December 1999)	X	X	X	X			
8.3 Antimony (ug/l) Not to exceed:					4300	14	
8.4 Arsenic[b] (ug/l) Not to exceed:					50	50	100
8.4.1 Dissolved Trivalent Arsenic Not to exceed:	360 x CF[5]	190 x CF[5]	360 x CF[5]	190 x CF[5]			
8.5 Barium (mg/l) Not to exceed:						1.0	
8.6 Beryllium (ug/l)	130 .		130			.0077	

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C[3]	A[4]	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
8.7 Cadmium (ug/l) Hardness (mg/l $CaCO_3$) / Soluble Cd 0 - 35 / 1.0 36 - 75 / 2.0 76 - 150 / 5.0 > 150 / 10.0						X	
8.7.1 Not to exceed 10 ug/l in the Ohio River (O Zone 1) main stem (see section 7.1.d, herein)						X	
8.7.3 The four-day average concentration of dissolved cadmium shall not exceed the value determined by the following equation: $Cd = e^{(0.7852[\ln(hardness)]-3.490)} \times CF^5$		X		X			
8.7.4 The one-hour average concentration of dissolved cadmium shall not exceed the value determined by the following equation: $Cd = e^{(1.128[\ln(hardness)]-3.828)} \times CF^5$	X		X				
8.8 Chloride (mg/l) Not to exceed:	860	230	860	230	250	250	

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C^3	A^4	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
8.9.1 Chromium, dissolved hexavalent (ug/l): Not to exceed:	16 x CF^5	11 x CF^5	16 x CF^5	7.2 x CF^5		50	
8.9.2 Chromium, trivalent (ug/l) The one-hour average concentration of dissolved trivalent chromium shall not exceed the value determined by the following equation: $\exp\{0.8190[\ln(\text{hardness})]+3.7256\} \times (CF^5)$	X		X				
8.9.3 The four-day average concentration of dissolved trivalent chromium shall not exceed the value determined by the following concentration: $\exp\{0.8190[\ln(\text{hardness})]+0.6848\} \times (CF^5)$.		X		X			
8.10 Copper (ug/l) Not to exceed:						1000	
8.10.1 The four-day average concentration of dissolved copper shall not exceed the value determined by the following equation[a]: $Cu = e^{(0.8545[\ln(\text{hardness})]-1.465)} \times CF^5$		X		X			

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C[3]	A[4]	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
8.10.2 The one-hour average concentration of dissolved copper shall not exceed the value determined by the following equation[a]: $Cu = e^{(0.9422[\ln(hardness)]-1.464)} \times CF^5$	X		X				
8.11 Cyanide (ug/l) (As free cyanide $HCN+CN^-$) Not to exceed:	22	5.0	22	5.0	5.0	5.0	
8.12 Dissolved Oxygen[c]: not less than 5 mg/l at any time.	X				X	X	X
8.12.1 Kanawha River main stem, Zone 1 - Not less than 4.0 mg/l at any time.	X						
8.12.2 Ohio River main stem - the average concentration shall not be less than 5.0 mg/l per calendar day and shall not be less than 4.0 mg/l at any time or place outside any established mixing zone - provided that a minimum of 5.0 mg/l at any time is maintained during the April 15-June 15 spawning season.	X						

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C[3]	A[4]	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
8.12.3 Not less than 7.0 mg/l in spawning areas and in no case less than 6.0 mg/l at any time.			X				
8.13 Fecal Coliform: Maximum allowable level of fecal coliform content for Primary Contact Recreation (either MPN or MF) shall not exceed 200/100 ml as a monthly geometric mean based on not less than 5 samples per month; nor to exceed 400/100 ml in more than ten percent of all samples taken during the month.					X	X	
8.13.1 Ohio River main stem (zone 1) - During the non-recreational season (November through April only) the maximum allowable level of fecal coliform for the Ohio River (either MPN or MF) shall not exceed 2000/100 ml as a monthly geometric mean based on not less than 5 samples per month.					X		
8.14 Fluoride (mg/l) Not to exceed:						1.4	

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C[3]	A[4]	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
8.14.1 Not to exceed 2.0 for category D uses.							X
8.15 Iron[c] (mg/l) Not to exceed:		1.5		0.5		1.5	
8.16 Lead (ug/l) Not to exceed:						50	
8.16.1 The four-day average concentration of dissolved lead shall not exceed the value determined by the following equation[a]: $Pb = e^{(1.273[\ln(hardness)]-4.705)} x\ CF^5$		X		X			
8.16.2 The one-hour average concentration of dissolved lead shall not exceed the value determined by the following equation[a]: $Pb = e^{(1.273[\ln(hardness)]-1.46)}\ x\ CF^5$	X		X				
8.17 Manganese (mg/l) (see §6.2.d) Not to exceed:						1.0	

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C[3]	A[4]	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
8.18 Mercury The total organism body burden of any aquatic species shall not exceed 0.5 ug/g as methylmercury.					0.5	0.5	
8.18.1 Total mercury in any unfiltered water sample shall not exceed (ug/l):	2.4		2.4		0.15	0.14	
8.18.2 Methylmercury (water column) Not to exceed (ug/l):		.012		.012			
8.19 Nickel (ug/l) Not to exceed:					4600	510	
8.19.1 The four-day average concentration of dissolved nickel shall not exceed the value determined by the following equation[a]: $Ni = e^{(0.846[\ln(hardness)]+1.1645)} \times CF^5$		X		X			
8.19.2 The one-hour average concentration of dissolved nickel shall not exceed the value determined by the following equation[a]: $Ni = e^{(0.846[\ln(hardness)]+3.361)} \times CF^5$	X		X				
8.20 Nitrate (as Nitrate-N) (mg/l)						10	

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C[3]	A[4]	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
8.21 Nitrite (as Nitrite-N) (mg/l) Not to exceed:	1.0		.060				
8.22 Organics							
Chlordane[b] (ng/l)	2400	4.3	2400	4.3	0.46	0.46	0.46
DDT[b] (ng/l)	1100	1.0	1100	1.0	0.024	0.024	0.024
Aldrin[b] (ng/l)	3.0		3.0		0.071	0.071	0.071
Dieldrin[b] (ng/l)	2500	1.9	2500	1.9	0.071	0.071	0.071
Endrin (ng/l)	180	2.3	180	2.3	2.3	2.3	2.3
Toxaphene[b] (ng/l)	730	0.2	730	0.2	0.73	0.73	0.73
PCB[b] (ng/l)		14.0		14.0	0.045	0.044	0.045
Methoxychlor (ug/l)		0.03		0.03	0.03	0.03	0.03
Dioxin (2,3,7,8- TCDD)[b] (pg/l)					0.014	0.013	0.014
Acrylonitrile[b] (ug/l)					0.66	0.059	
Benzene[b] (ug/l)					71	0.66	
1,2-dichlorobenzene (mg/l)					17	2.7	

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C[3]	A[4]	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
1,3-dichlorobenzene (mg/l)					2.6	0.4	
1,4-dichlorobenzene (mg/l)					2.6	0.4	
2,4-dinitrotoluene[b] (ug/l)					9.1	0.11	
Hexachlorobenzene[b] (ng/l)					0.77	0.72	
Carbon tetrachloride[b] (ug/l)					4.4	0.25	
Chloroform[b] (ug/l)					470	5.7	
Halomethanes (ug/l)					15.7	0.19	
1,2-dichloroethane[b] (ug/l)					99	0.035	
1,1,1- trichloroethane[b] (mg/l)						12	
1,1,2,2-tetrachloroethane (ug/l)					11	0.17	
1,1-dichloroethylene[b] (ug/l)					3.2	0.03	
Trichloroethylene[b] (ug/l)					81	2.7	
Tetrachloroethylene[b] (ug/l)					8.85	0.8	
Toluene[b] (mg/l)					200	6.8	

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C[3]	A[4]	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
Polynuclear Aromatic Hydrocarbons (PAH)[b] (ug/l)					0.031	.0028	
Phthalate esters (ug/l)		3.0		3.0			
Vinyl chloride[b] (chloroethene)(ug/l)					525	2.0	
alpa-BHC (alpha- Hexachloro-cyclohexane)[b] (ug/l)					0.013	.0039	
beta-BHC(beta- Hexachloro-cyclohexane)[b] (ug/l)					0.046	0.014	
gamma-BHC (gamma- Hexachloro-cyclohexane)[b] (ug/l)	2.0	0.08	2.0	0.08	0.063	0.019	
Chlorobenzene (mg/l)					21	0.68	
Ethylbenzene (mg/l)					29	3.1	
Heptachlor[b] (ng/l)	520	3.8	520	3.8	0.21	0.21	
2-methyl-4,6-Dinitrophenol (ug/l)					765	13.4	
Fluoranthene (ug/l)					370	300	

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C[3]	A[4]	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
8.22.1 The organic chemicals listed in §8.22 shall not exceed the specified water quality criteria. When the specified criteria are less than the practical laboratory quantification level, instream values will be calculated from discharge concentrations and flow rates, where applicable.							
8.23 pH[c] No values below 6.0 nor above 9.0. Higher values due to photosynthetic activity may be tolerated.	X	X	X	X	X	X	X
8.24 Phenolic Materials							
8.24.1 Phenol (ug/l) Not to exceed:					4,600,000	21,000	
8.24.2 2-Chlorophenol (ug/l) Not to exceed:					400	120	
8.24.3 2,4-Dichlorophenol (ug/l) Not to exceed:					790	93	
8.24.4 2,4-Dimethylphenol (ug/l) Not to exceed:					2300	540	
8.24.5 2,4-Dinitrophenol (ug/l) Not to exceed:					14,000	70	

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C[3]	A[4]	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
8.24.6 Pentachlorophenol[b] (ug/l)					8.2	0.28	
8.24.6.a The one-hour average concentration of pentachlorophenol shall not exceed the value determined by the following equation: exp(1.005(pH)-4.869)	X		X				
8.24.6.b The 4-day average concentration of pentachlorophenol shall not exceed the value determined by the following equation: exp(1.005(pH)-5.134).		X		X			
8.24.7 2,4,6-Trichlorophenol[b] (ug/l) Not to exceed:					6.5	2.1	
8.25 Radioactivity: Gross Beta activity not to exceed 1000 picocuries per liter (pCi/l), nor shall activity from dissolved strontium-90 exceed 10 pCi/l, nor shall activity from dissolved alpha emitters exceed 3 pCi/l.	X		X		X	X	X

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C[3]	A[4]	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
8.25.1 Gross total alpha particle activity (including radium-226 but excluding radon and uranium shall not exceed 15 pCi/l and combined radium-226 and radium-228 shall not exceed 5pCi/l; provided that the specific determination of radium-226 and radium-228 are not required if dissolved particle activity does not exceed 5pCi/l; the concentration of tritium shall not exceed 20,000 pCi/l; the concentration of total strontium-90 shall not exceed 8 pCi/l in the Ohio River main stem.	X		X		X	X	X
8.26 Selenium (ug/l) Not to exceed:	20	5	20	5		10	
8.27 Silver (ug/l) Hardness / Silver 0-50 / 1 51-100 / 4 101-200 / 12 >201 / 24				X		X	

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C[3]	A[4]	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
8.27.1 0-50 1 51-100 4 101-200 12 201-400 24 401-500 30 501-600 43		X					
8.27.2 The one-hour average concentration of dissolved silver shall not exceed the value determined by the following equation: $Ag = e^{(1.72[\ln(hardness)]-6.52)} \times CF^{5}$	X		X				

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C[3]	A[4]	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
8.28 Temperature Temperature rise shall be limited to no more than 5°F above natural temperature, not to exceed 87°F at any time during months of May through November and not to exceed 73°F at any time during the months of December through April. During any month of the year, heat should not be added to a stream in excess of the amount that will raise the temperature of the water more than 5°F above natural temperature. In lakes and reservoirs, the temperature of the epilimnion should not be raised more than 3°F by the addition of heat of artificial origin. The normal daily and seasonable temperature fluctuations that existed before the addition of heat due to other natural causes should be maintained.	X						
8.28.1 For the Kanawha River Main Stem (K-1): Temperature rise shall be limited to no more than 5°F above natural temperature, not to exceed 90°F in any case.	X						

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C[3]	A[4]	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
8.28.2 For the Bluestone R (KNB), Bluestone Lake (KN-60) East River (KNE), New River (KN), Gauley R. (KG) and Greenbrier River (KNG): Temperature rise shall be limited to no more than 5°F above natural temperature, not to exceed 81°F at any time during the months of May through November and not to exceed 73°F at any time during December through April.			X				
8.28.3 No heated effluents will be discharged in the vicinity of spawning areas. The maximum temperatures for cold waters are expressed in the following table: Daily Mean °F / Hourly Max °F Oct-Apr 50 55 Sep-May 58 62 Jun-Aug 66 70			X				

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C[3]	A[4]	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
8.28.4 For Ohio River Main Stem (01) (see section 7.1.d, herein): Dates / Period Ave. / Inst. Max. Jan 1-31 / 45°F / 50°F February / 45 / 50 March 1-15 / 51 / 56 March 16-31 / 54 / 59 April 1-15 / 58 / 64 April 16-30 / 64 / 69 May 1-15 / 68 / 73 May 16-31 / 75 / 80 June 1-15 / 80 / 85 June 16-30 / 83 / 87 July 1-31 / 84 / 89 August 1-31 / 84 / 89 Sept 1-15 / 84 / 87 Sept 16-30 / 82 / 86 Oct 1-15 / 77 / 82 Oct 16-31 / 72 / 77 Nov 1-30 / 67 / 72 Dec 1-31 / 52 / 57	X						
8.29 Thallium (ug/l)					6.3	1.7	

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C[3]	A[4]	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
8.30 Threshold odor[c] Not to exceed a threshold odor number of 8 at 104°F as a daily average.		X		X	X	X	
8.31 Total Residual Chlorine (ug/l - measured by amperometric or equivalent method) Not to exceed:	19	11					
8.31.1 No chlorinated discharge allowed			X				
8.32 Turbidity No point or non-point source to West Virginia's waters shall contribute a net load of suspended matter such that the turbidity exceeds 10 NTU's over background turbidity when the background is 50 NTU or less, or have more than a 10% increase in turbidity (plus 10 NTU minimum) when the background turbidity is more than 50 NTUs.							

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C[3]	A[4]	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
This limitation shall apply to all earth disturbance activities and shall be determined by measuring stream quality directly above and below the area where drainage from such activity enters the affected stream. Any earth disturbing activity continuously or intermittently carried on by the same or associated persons on the same stream or tributary segment shall be allowed a single net loading increase.		X		X	X	X	
8.32.1 This rule shall not apply to those activities at which Best Management Practices in accordance with the State's adopted 208 Water Quality Management Plan are being utilized, maintained and completed on a site-specific basis as determined by the appropriate 208 cooperative or an approved Federal or State Surface Mining Permit is in effect. This exemption shall not apply to Trout Waters.		X			X	X	

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2		C[3]	A[4]	
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]			
8.33 Zinc (ug/l) The four-day average concentration of dissolved zinc shall not exceed the value determined by the following equation[a]: $Zn = e^{(0.8473[\ln(hardness)]+0.7614)} \times CF^5$		X		X			
8.33.1 The one-hour average concentration of dissolved zinc shall not exceed the value determined by the following equation[a]: $Zn = e^{(0.8473[\ln(hardness)]+0.8604)} \times CF^5$	X		X				

1 One hour average concentration not to be exceeded more than once every three years on the average, unless otherwise noted.

2 Four-day average concentration not to be exceeded more than once every three years on the average, unless otherwise noted.

3 These criteria have been calculated to protect human health from toxic effects through fish consumption, unless otherwise noted.

4 These criteria have been calculated to protect human health from toxic effects through drinking water and fish consumption, unless otherwise noted.

5 The appropriate Conversion Factor (CF) is a value used as a multiplier to derive the dissolved aquatic life criterion is found in Appendix E, Table 2.

a Hardness as calcium carbonate (mg/l). The minimum hardness allowed for use is this equation shall not be less than 25 mg/l, even if the actual ambient hardness is less than 25 mg/l. The maximum hardness value for use in this equation shall not exceed 400 mg.l even if the actual hardness is greater than 400 mg/l.

b Known or suspected carcinogen. Human health standards are for a risk level of 10^{-6}.

c May not be applicable to wetlands (B4) - site-specific criteria are desirable.

d The early life stage equation in the National Criterion shall be used to establish chronic criteria throughout the state unless the applicant demonstrates that no early life stages of fish occur in the affected water(s).

e Until July 4, 2007, the aluminum criteria will be implemented as follows: the chronic aluminum criterion shall be 87 ug/l for trout waters (as defined in section 2.20 of this rule) and shall be 750 ug/l for all other waters of the state. The implementation of the interim criteria provides time for a study to develop aluminum criteria for waters of the state which are based upon sound science and are protective of aquatic life.

APPENDIX E
TABLE 2

Conversion Factors

Metal	Acute	Chronic
Aluminum	1.000	1.000
Arsenic (III)	1.000	1.000
Cadmium	1.136672-[(ln hardness)(0.041838)]	1.101672-[(ln hardness)(0.041838)]
Chromium (III)	0.316	0.860
Chromium(VI)	0.982	0.962
Copper	0.960	0.960
Lead	1.46203-[(ln hardness)(0.145712)]	1.46203-[(ln hardness)(0.145712)]
Nickel	0.998	0.997
Silver	0.85	N/A
Zinc	0.978	0.986

ORIGINAL

ENVIRONMENTAL QUALITY BOARD

IN RE: AQUATIC LIFE ALUMINUM CRITERION

SEPTEMBER 15, 2004
PUBLIC HEARING

CHARLESTON, WEST VIRGINIA

Transcript of the proceedings had in the public hearing held before the said Environmental Quality Board on the 15th day of September, 2004, commencing at 6:06 p.m., at Charleston, West Virginia, and reported by Lisa K. Okes, Court Reporter.

BEFORE: EDWARD SNYDER, Chairman
EDWARD C. ARMBRECHT, JR.

ALSO PRESENT: ELIZABETH M. CHATFIELD, Technical Advisor
MELISSA CARTE, Clerk

P.O. Box 1928
Beckley, West Virginia 25802-1928

KBM COURT REPORTING

(304) 253-4095
1-800-866-3500
Fax (304) 253-4096

CHAIRMAN ED SNYDER: We have two issues that we're going to be addressing in the public hearing this evening. And two Board members are here, Ted Armbrecht from Charleston; Ed Snyder, me, from Shepherdstown. We have Melissa Carte, Clerk of the Board, and Libby Chatfield, our Technical Advisor.

We will proceed then to aquatic life aluminum criterion, and this is a proposed revision to the chronic aquatic life limit for aluminum.

The current effective chronic aquatic life value is 87 micrograms per liter, which applies in warm water fishery streams as well as trout streams. The acute aquatic life value is 750 micrograms per liter.

We have proposed to narrow the application of 87 micrograms per liter value to apply only to trout streams by adding the following language to the aluminum criterion in section 8.1 of the rule: "The current chronic aluminum standard of 87 micrograms per liter will be suspended in all but trout waters until July 4, 2007. During the period of the suspension, the acute and chronic aquatic life values for aluminum are 750 micrograms per liter."

This suspension means that the 87 microgram per liter value will not be used for regulatory purposes, including NPDES permits, 303(d) listings and development of TMDLs for the waters subject to the suspension.

In addition to this change, the Board has asked for comments on two additional matters related to the revision. These are, first, how will the use of the 750 microgram/liter numeric criterion, measured based on dissolved concentrations rather than total concentrations, ensure the protection of warm water fishery streams? These would be the Category B1 waters.

The second item, how will the suspension of the 87 microgram per liter value affect waters listed for aluminum on the Clean Water Act Section 303(d) list of impaired waters for West Virginia, which were finalized before the effective date of the suspension?

And this -- we're, basically, addressing this issue based on House Bill 4193, passed by the West Virginia Legislature on March 12th, 2004, which directed the Board to, by or before the first day of October 2004, revise the aquatic life aluminum criterion, which we have done and are in the process of doing, as is evidenced by the public hearing on the issue, which has been done in a very short period of time with a tremendous amount of effort by the staff and the Board members, and also by input from the public as well.

What I would like to do now -- Libby, do you have any comments on that?

MS. ELIZABETH CHATFIELD: No.

CHAIRMAN SNYDER: What I would like to do now is open this up to comments from the public. We have six people who would like to speak. We try to keep the comment period down to around five minutes, in that general area. Again, we're not going to be as strict as we would under other circumstances because we don't have forty-seven speakers. We have had forty-seven speakers. With six, we can be a little more relaxed.

The first person on the list is Lawrence W. White. Mr. White, if you would go to the podium so everything gets properly recorded.

MR. LAWRENCE WHITE: Okay. Thank you.

CHAIRMAN SNYDER: Thank you.

MR. WHITE: I was born in West Virginia. Did most of my adult years in the work force in Detroit, Michigan. I worked with the Department of Building and Safety Engineering for the City of Detroit as a building inspector for 15 years working. In demolition, as a demolition inspector, supervising contractual obligations by contractors who bidded on -- had bids on the demolition of residential, commercial and industrial building sites.

We had to also see, on commercial and industrial sites, to the elimination of various toxins, which the U.S. Government, as well as other state governments, adopted precautionary measures for the health and safety of the general public.

And when I read the articles that appeared in The Daily Mail, and I saw where the Board of the Environmental Protection Agency here in Charleston eliminated -- agreed to eliminate the minimum 87 micrograms per liter of aluminum as a standard to go by, and I wondered why. It's better to have that in place than not to have it at all.

I wanted to get some more information about aluminum because I didn't have that much personal knowledge about it. I went on the internet, and I'd like to share with you a few things that I found out. For those of you who are on the Board and didn't take this in consideration, I think Jacques Cousteau sort of brought contamination of our environment to our attention for the fact that most land-based waterways eventually end up in our oceans. And, of course, it's well publicized throughout the world.

But what this information says here, aluminum - European spelling aluminium - is harmful to all life forms. It damages all types of tissue. It is a protoplasmic poison and a pernicious and persistent neurotoxin. No living systems use aluminum as a part of a biochemical process. It has a tendency to accumulate in the brain and the bones. It is considerably less toxic than mercury, arsenic, lead or cadmium, but it is much more common in our environment. It also appears to be more persistent than most -- than most of the others.

The danger is one that only manifests itself over long periods of time. It is therefore prudent to avoid consumption. When I read in your article that it takes 150 micrograms to 200 micrograms to kill a trout, is a trout less valuable than a human life or more valuable than a human life?

Avoidance is currently the best way of protecting you and your family from the serious, long-term damage that can result from ingestion. Pregnant and lactating women, the young and the elderly are at risk. The most effective way of preserving your mental acuity into your later years appears to be eliminating the sources of aluminum in the diet.

Avoiding it -- a sustained, three-pronged attack is the most effect response, avoiding it, blocking its uptake with supplements - calcium and magnesium - eating foodstuffs that help eliminate it from your system. Sulfur-rich foods, such as cabbage, beans and lentils, onions and garlic and egg yolks. I'll give you a copy of this so that you'll have it.

Aluminum contaminated consumables are very common. Being aware of the sources is the first step in elimination. Removing aluminum from your diet can be quite easy if a gradual approach is taken.

And some of the items that are, every day, found in our diet, in our environment that we use and don't even think about it twice. Many junk and fake foods contain additives, for example, raising agents and muffins and doughnuts. Most water utilities use aluminum sulfate to clarify drinking water. Other sources include antacids, buffered aspirin and antiperspirants that we put under our arms to block our pores to keep us from perspiring. Colored candies most always have aluminum-enhanced food colors. And it goes on to say this.

I would like to -- I imagine I'm getting close to my five-minute limit here, so I'd like to close this with a quote that I have and give us all cause to pause and reflect what our job is. Environmental protection means just that, protect the environment. Protect the environment for the people of this state. The U.S. Government Environmental Protection Agency protects the environment, supposedly, for the people of the United States. Sometimes those in authority get sidetracked by one thing or another.

What I wanted to share is this, and it comes from my religious writings: "Oh, son of being, bring thyself to account each day ere thou art summoned to a reckoning; for death, unheralded, shall come upon thee and thou shall be called to give account for thy deeds. It is clear and evident that all men shall, after their physical death, estimate the worth of their deeds and realize all that their hands have wrought."

So I would want to make a recommendation to the Board that they strongly reinstate that minimum requirement and not do away with it. It will do no harm to leave it as it is while you do a three-year study. But to have it not there at all doesn't make common sense. Thank you.

CHAIRMAN SNYDER: Thank you. Thank you, Mr. White.

The next speaker, Randy Maggard.

MR. RANDY MAGGARD: Hello, my name is Randy Maggard, and I'm here representing the Twelvepole Watershed Association.

The West Virginia DEP Division of Water has stated during other hearings that the 87 microgram per liter chronic criteria for aluminum is overprotective and needs to be changed. I am here to express support for the proposed revision.

We all have limited resources, and we need to expend those resources in an efficient manner. Creating a problem where none appears to exist is not in the best interest of the citizens or the waters of West Virginia.

In closing, I'm urging the approval of the chronic aluminum revision. Thank you.

CHAIRMAN SNYDER: Thank you, Mr. Maggard.

The next speaker, Jason Bostic, please.

MR. WHITE: Excuse me, I have to excuse myself from this meeting because a friend has passed and family hour is now and I'd like to attend that.

CHAIRMAN SNYDER: Okay. Let me make sure I point out, if you have further written comments you want to provide, you have until September 24th to get those to us, and we'll certainly review them.

MR. WHITE: All right. Thank you very much for having me and allowing me to speak.

CHAIRMAN SNYDER: Thank you for speaking.

Mr. Bostic.

MR. JASON BOSTIC: Good evening, I'm Jason Bostic with the West Virginia Coal Association. I would like to speak to you briefly regarding the submission of an adequate justification document to support the Board's final action with respect to aluminum.

And, as all of us in this room have heard before, be it from the Legislature, the Environmental Quality Board, itself, or the Federal Environmental Protection Agency, final decisions on state water quality revisions hinge on the submission of scientific support documentation - and if hearing this repeatedly from components of the government was not enough, past experience, experiences with previous disapprovals from EPA should be educational enough, prior undertakings in aluminum and manganese, which the coal industry has specific knowledge, too much knowledge - although supported by science and thoroughly considered by the Board, were submitted lacking any of the scientific information collected through the rule-making process. A glance at the Board's current statement of circumstances requiring proposed amendments reveals that it suffers similar flaws, with no reference to the vast amount of scientific information considered by the Board in the previous months.

I urge you to consult the scientific information you have reviewed during this rule-making period and prepare a justification document worthy of the Environmental Quality Board and reflective of the considerable time and efforts expended on this issue.

I would also like to respectfully request, that because this is such an important issue to the regulated community and in order to allow the interim study to proceed as quickly as possible, that the Board forward the emergency rule package directly to the Environmental Protection Agency for immediate consideration. Thank you.

CHAIRMAN SNYDER: Thank you, Mr. Bostic.

The next speaker, Richard Thomas.

MR. RICHARD THOMAS: Hello, my name is Richard Thomas, and I'm here tonight on behalf of Century Aluminum. Century has been a participant for about ten years in the Board's effort to prepare an appropriate aluminum criterion for West Virginia, and I want to thank you for that opportunity.

For the 1997 Tri-Annual Review, Century and others provided extensive information to the Board regarding the lack of scientific justification regarding a chronic aluminum criteria. The Board accepted these comments and ultimately deleted the chronic criteria. Legislation approved this deletion in 1998. However, this deletion was rejected by EPA because the justification documents submitted to EPA did not include the extensive science reviewed by the Board regarding the lack of scientific support for chronic criteria.

The emphasizes the importance of providing a thorough record to EPA regarding the Board's decision rationale. Century commends the Board on its recent work reviewing the flawed science regarding chronic aluminum criteria and DEP's effort to inform the Board of the problems caused by applications that was flawed chronic criterion in warm waters.

Century believes that the additional protection provided by retaining chronic criteria on trout streams is appropriate. The revised aluminum criteria proposed by the Board protects aquatic species in West Virginia. In fact, West Virginia's aluminum criteria is among the most protective in the nation.

In its written comments, Century and other industrial groups will provide the Board with a complete review of all 50 states' aluminum criterion. In all, only 19 states have some form of aluminum criterion. This evening, I will mention a few of the highlights from this review.

Only five states have adopted both of EPA's chronic and acute aluminum criterion for a total aluminum number. Four states, including West Virginia, have adopted EPA's proposed chronic and acute aluminum as a dissolved concentration. Of the remaining ten states, five have adopted dissolved aluminum chronic criteria of 750 micrograms or greater, but did not adopt a chronic criterion. Pennsylvania has an acute criteria of 750 micrograms and is the only state which borders West Virginia that adopted an aluminum criterion. In our region, Region III, Maryland, Virginia and the

District of III, did not adopt an aluminum criterion.

All of the water quality standards that I've been talking about have been accepted by EPA. Clearly, EPA has provided the states with a broad discretion of establishing aluminum criteria.

The actions that were proposed by the Board is based on solid analysis and provides West Virginia with an opportunity to develop an appropriate criterion in a timely matter.

And I have a copy of the states' reviews and stuff like that, but, also to sort of address what Mr. White discussed, working for Century, and I work with the employees there, the union, addressing their health concerns. What he was discussing was the aluminum that we consume in food, and that is much higher than the amount that you'll find that is soluble in water, especially in neutral pH water. And the main consumption if you can -- consumable aluminum will be in antacids or your buffered aspirins, and it is in everything.

He mentioned baked goods. It's in the baking powder that you use. And it's used by, like he was talking about, water treatment plants. They use it to clean out other things, such as harmful bacterias. They use alum to filter out those type of things. And what happens is you don't really retain very much dissolved aluminum in the treated water.

But, upon the average, humans do consume about 50 -- I think it's 50 milligrams, parts per million, a day from bread, from cheese and things like that. But aluminum is everywhere. I mean, it's 8 percent of the earth's crust, so our exposure to it is continuously throughout our lifetime. Thank you.

CHAIRMAN SNYDER: Thank you very much.

Jenny Henthorn.

MS. JENNY HENTHORN: Hello, I'm Jenny Henthorn, and I offer these comments tonight on behalf of the West Virginia Coal Association, West Virginia Manufacturers Association and the West Virginia Chamber of Commerce. The industry groups support the proposed revision to the chronic aluminum criterion with some minor clarifications.

In general, the Board has proposed to retain the chronic criterion of 87 micrograms per liter for trout waters and to suspend the chronic criterion on all other streams until July 4th, 2007. Based on the discussions of the Board in its meeting, the suspension will allow interested parties to perform a study to prepare an appropriate chronic aquatic life criterion for West Virginia waters.

The industry groups and their members have submitted many comments since 1996 demonstrating the flawed science on which the current chronic criterion of 87 micrograms per liter is based. I will not belabor the Board tonight by repeating the detail of those comments. However, I do want to emphasize, had EPA followed its own protocol for preparing aquatic life criteria, the chronic criterion would be equal to the acute criterion of 750 micrograms per liter. Therefore, based on EPA's own science, the chronic criterion should have been set at 750 micrograms per liter.

The industry groups support the Board's decision to retain the chronic criterion of 87 micrograms per liter on trout waters. This support does not imply that the industry groups agree that 87 is the correct number for trout streams, but instead is a recognition that the sensitive nature of these streams warrant retaining the chronic criterion on those streams until an adequately developed number can be prepared.

The Board's proposal states that the chronic criterion for waters other than trout streams shall be 750 micrograms per liter until July 4th, 2007. In effect, the Board has not suspended the chronic criterion, but instead has adopted an interim criterion which will be in place for a little under three years. Accordingly, the term "suspension" is a misnomer for what the Board has done. The industry groups suggest that the footnote be reworded to indicate that its action is a temporary modification, not a suspension.

In addition, the footnote does not mention the study on which the Board's decision to suspend the criterion is based. This clearly was an important factor to the Board's decision, and the industry groups believe that the text of the footnote should be revised to inform anyone who reviews the rule of the planned study. Importantly, the industry groups support a study to develop an appropriate chronic aluminum criterion for West Virginia and are willing to participate in both the design and funding of the study. There are several national experts in aluminum who can do this work, and we are interested in seeing that work proceed.

The industry groups acknowledge the concern expressed by the Appalachian Center and others regarding the protection of aquatic life from aluminum toxicity. However, the interim criterion is protective of warm water species in waters which would otherwise comply with the West Virginia water quality standards. Industry, as well as others, have described to the Board the effects of pH and hardness and other water quality standards -- or water quality characteristics on aluminum toxicity.

Recent studies of aluminum toxicity show that it is the form and bioavailability of aluminum in the water column that demonstrates its toxicity. Bioavailable aluminum is a gill toxicant to adult fish, and this toxicity is manifested where the water column pH is low and the monomeric forms of aluminum are present. For streams which do not meet the pH criteria, either seasonally or continuously, the streams will be listed as impaired for pH. Aluminum toxicity be -- sorry. Aluminum toxicity would be secondary to the effect of low pH, which can be addressed, as appropriate, in a future TMDL.

In those streams that meet the West Virginia water quality criteria for pH, the aluminum in the stream is not bioavailable and is not toxic to aquatic life. Some of the leading scientists in aluminum research have documented the mitigating effects of water hardness, dissolved organic matter and other water quality characteristics on aluminum toxicity. These water quality characteristics occur in many West Virginia streams. Since these factors are not taken into account in the current aluminum criteria, they provide additional protection for aquatic life.

Specifically, the Board has asked for input on whether the aluminum criteria are adequately protective of warm water species if implemented as dissolved concentrations.

The industry groups submitted comments in 1999 based on the work of Robert Gensemer, a national expert in aluminum, which demonstrate that the implementation of the aluminum criteria as dissolved concentrations is appropriate. Significantly, the Board based its proposal in part on the EPA-approved Wyoming aluminum criteria.

I would like to note for the Board, based on conversations recently with Wyoming, Wyoming has recently proposed converting its criteria to dissolved concentrations, noting the lack of correlation in Wyoming streams with toxicity based on total aluminum concentrations.

The industry groups will submit further information in their written comments regarding the appropriateness of the dissolved aluminum measurement in determining aluminum toxicity. This information will describe the margin of safety which exists based on filter size for the dissolved aluminum measurement and due to the naturally occurring conditions which protect aquatic life from aluminum toxicity.

The Board has also solicited comments on the effect of the proposed change on streams previously listed as impaired based on the 87 micrograms per liter chronic criterion. DEP has a broad range of discretion in managing its list of impaired streams, and the industry groups defer to DEP's assessment on this issue. However, we would note that many of these previously listed streams were also impaired for parameters other than aluminum and, therefore, a TMDL must be prepared for these streams regardless of the aluminum criteria. On the other hand, as DEP described to the Board during the prior meetings, the Board's current proposed action would prevent healthy streams from being improperly listed for aluminum until an appropriate aluminum criterion can be prepared.

Thank you for your time and consideration in this matter. I know that this has been a long road for the Board. We appreciate that you continue to work diligently on this matter. Our written comments will be submitted next week.

CHAIRMAN SNYDER: Thank you, Ms. Henthorn.

And Mark Chatfield.

MR. MARK CHATFIELD: Good evening. I'm representing myself. I'll just read this statement.

I am concerned in the general regulatory trends that the EQB has taken that loosens stringency on numerous water quality issues over the past decade. Use my glasses, sorry. It implies you take the people's water for granted. I am positive you know these waters belong to all people of West

Virginia, not just the locals or the dischargers, but everyone. I and numerous like-minded West Virginians would prefer to be able to just drink from local waters without carrying tertiary or quaternary water purification gadgets that must be -- absorb all the inorganics and organic chemicals that you permit in our waters.

Luckily, West Virginians have always been allowed to comment on water quality rule changes during public comment periods. These comment periods should not be reduced in length from that already prescribed by law to whatever the EQB feels is more appropriate. If the duration of public comment periods becomes an issue in future meetings, I suggest you change them to longer timeframes that would give all West Virginians time to evaluate what you are doing to our waters, not just those that can afford to pay lawyers and lobbyists that already have the ear of often ill-advised legislators.

I am concerned that the EQB both does not and cannot ever understand the full implications of their suspension of the chronic aluminum standard. For regulatory purposes, this suspension allows the dissolved aluminum levels to increase 862 percent higher than the current standards. As already noted, aluminum is toxic. At just a 19 percent increase from the current standard, plant roots will show adverse and measurable growth inhibition and physiological impairment in two hours, and I could demonstrate that for you in a lab in two hours. This is just a minor increase above the current levels. Yet you propose an almost order of magnitude increase from 87 to 750 micrograms per liter. This proposed more permissive regulation is going the wrong way.

In the proposed change, your condition to restrict the suspension to non-trout waters suggests that the rule is arbitrary and, likely, that aquatic life in some streams could be impaired by the change. The EQB and the DEP need to develop a scientific basis for the distinction between trout and non-trout streams. I do not accept that it is just temperature differences. If certain physical or chemical parameters should be considered in the true evaluation of aluminum toxicity, then these factors should be part of the basis for excluding certain streams.

It is evident that you are only considering aluminum concentration limits, that is the presence of certain aluminum levels in streams, in your rule change. Have you considered what increases in permissible aluminum will have on the removal of both dissolved and suspended solids? Inorganic aluminum is very effective in precipitating both particulates and ions such as phosphate. Also, aluminum will remove living microbes suspended in these waters and microbes associated with solids. Some of these microbes will be beneficial. The EQB and the DEP should consider the loss of dissolved and suspended solids and organisms that are removed from the riparian systems that they are permitting exposure to an 862 percent increase in soluble aluminum.

Lastly, this rule change will facilitate increased metal discharges from mountaintop mining sites in about half of West Virginia. The EQB and the DEP must consider the full impact of these increased discharges collectively over time.

You are well aware of the accuracy of the wealth of data that the coal industry provides your Board. If their projections are close, then 10 percent plus of mountain sites in southern counties will be mined and become potential discharge sites. The associated intermittent streams will be filled with the broken pieces of mountains that reside above coal seams. An accurate way to view these valley-fill sites is that they are leach beds for dissolved and suspended materials forever.

Will the EQB and the DEP guarantee that environmental conditions do not change in a way that will increase metal concentrations above permissible limits? Will your rule consider these cumulative effects over long time periods?

I recognize this asks the EQB to predict the long-term future of all these sites and model what may happen in the geochemistry of a valley fill. Modeling requires assumptions. Experts are now recognizing that almost all long-term projections have been wrong. Pick your expert, pick your topic, all wrong.

I don't expect EQB or DEP to be the first groups to break this trend. Therefore, when considering pollution loads in our waters, I implore you to be cautious. Errors should be on the more stringent side of aluminum and all water pollutants. Do not reduce my water's quality. Do not reduce your water's quality.

Protecting water is a good investment in the future. Companies can mine, log and make widgets and also be responsible for their pollution. It works elsewhere in the U.S. and also in Europe. Do not believe otherwise. It will pay West Virginia back many fold.

References on any of this can be provided on request. I've already submitted this electronically. Thank you.

CHAIRMAN SNYDER: Thank you, Doctor Chatfield.

Are there -- no one else has indicated they would like to speak.

MS. CHATFIELD: If we could get all comments by email.

CHAIRMAN SNYDER: Yeah, if we could get all comments electronically, that would help us out a great deal. As some of you, I think most of you, know, our office is moving and we are submitting things within a matter of a day before we move; correct?

MS. CHATFIELD: The day of the move.

CHAIRMAN SNYDER: The day of the move. There is -- and I'm hoping everything will work all right. We have computers being unplugged. We have servers that may or may not end up doing what we want them to do. Hopefully, everything will go forward in the fashion and in the timing that we have in mind. If something happens, we are pushing the envelope significantly on this.

If you can get things to us electronically, then they can get things to us electronically, and then we can review them and have a chance to look through them. If you have documentation that you can't get electronically, if you can get that as soon as possible so we can get it mailed out, realizing our interesting circumstance, that would really help.

MS. HENTHORN: Yeah, I was just going to ask - I'm sorry - do you even want -- we normally send a hardcopy for each of the Board members. If we can send it all electronically, do you want that considering the move, to receive a hardcopy, still, of everything?

MS. MELISSA CARTE: Just one.

CHAIRMAN SNYDER: One hardcopy.

MS. HENTHORN: Just one hardcopy.

CHAIRMAN SNYDER: Save some trees, do it electronically to us and give them a hardcopy. But, yeah, it will just help because I do have concerns. Our staff is working above and beyond the call at this point in time to get these items taken care of before the move. Part of the reason we're doing this is, it's going to take us -- if we're settled in, in two weeks and have everything functioning, that will be a heroic effort as well after the move, so this is why we're trying to get these things done beforehand. And I hope everything works out okay. I'm giving this as a caveat, understanding that things may happen. I just want to let people know that.

Would anyone else like to speak?

(No Response)

Well, I thank you all for your comments. They're much appreciated and I echo some of the presenter's comments. We have been working on aluminum for a long time. We have been trying to do the right thing with aluminum for a long time and we still are trying to do the right thing with aluminum, and it's going to be three years before we get everything together for the right thing. But I think we're going in the right direction. We're doing it scientifically, and you're all helping and that's much appreciated.

We'll go off the record. Thanks again.

(WHEREUPON, the public hearing concluded at 6:41 p.m.)

* * * * *

REPORTER'S CERTIFICATE

STATE OF WEST VIRGINIA

COUNTY OF KANAWHA, to-wit:

I, Lisa K. Okes, Court Reporter and Notary Public within and for the State aforesaid, duly commissioned and qualified; do hereby certify that the foregoing is, to the best of my skill and ability, a true and accurate transcript of the public meeting held on the 15th day of September, 2004.

Given under my hand this 20th day of September, 2004.

LISA K. OKES, COURT REPORTER

NOTARY PUBLIC FOR STATE OF WEST VIRGINIA

My commission expires: May 20, 2008.

OFFICIAL SEAL
NOTARY PUBLIC
STATE OF WEST VIRGINIA
LISA K. OKES
702 MT. VIEW ROAD
COOL RIDGE, WV 25825
My commission expires May 20, 2008

KRM

Aluminum – Proposed Rule

WV Environmental Quality Board
September 15, 2004
PUBLIC HEARING
6:00 P.M.
Sign-In Sheet

NAME:	SPEAKING:
1) Larry Emerson	No
2) Laurence W. White	Yes
3) Randy Maggard	Yes
4) Jason Bostic	Yes
5) Richard Thomas	Yes
6) Kim Parsons	no
7) Jennie Henthorn	yes
8) Mark Crawford	Yes
9) Randy Jovic	No
10) Tim Mallan	No.

11) LINDA Keller NO
12)
13)
14)
15)
16)
17)
18)
19)
20)
21)
22)
23)
24)
25)
26)
27)
28)

PUBLIC COMMENTS REC'D DURING PUBLIC COMMENT PERIOD RE: ALUMINUM 8-11-04 THROUGH 09-24/04

1. Robert Radabaugh
   IOGA West Virginia
   405 Capitol Street, Suite 507
   Charleston, WV 25301
   344-9867

2. Pamela Faggert
   Dominion Power
   5000 Dominion Blvd.
   Glen Allen, VA 23060
   804-273-3467

3. Evan Hansen
   WV Rivers Coalition
   801 N. Randolph Road
   Elkins, WV 26241
   637-7201

Signing for: Frank Young, WV Highlands Conservancy
Cindy Rank, Friends of the Little Kanawha
Vivian Stockman, Ohio Valley Environmental Coalition
Keith Pitzer, Friends of the Cheat
Patty Sebok, Coal River Mountain Watch
Fred Sampson, WV Environmental Council
Margaret Janes, Appalachian Center for the Economy and the Environment

4. Bowles, Rice, McDavid, Graff & Love
   Jenny Henthorn
   P.O. Box 1386
   Charleston, WV 25301
   347-1100

Sign by: Bill Raney, WV Coal Assoc.
Karen Price, WV Manufacturer's Assoc.
David Flannery, WV Chamber of Commerce

5. Allyn Turner, Director
WV Department of Environmental Protection
Division of Water and Waste Management
414 Summers Street
Charleston, WV 25301
558-2107

6. Don Garvin
WV Environmental Council
1324 Virginia Street, E.
Charleston, WV 25301
346-5905

IOGA
WEST VIRGINIA

RECEIVED
SEP 23 2004
ENVIRONMENTAL QUALITY BOARD
AIR QUALITY BOARD

September 23, 2004

Ms. Melissa Carte
West Virginia Environmental Quality Board
1615 Washington Street East, Suite 301
Charleston, WV 25311-2126

Re: Proposed Changes to the Water Quality Standards Rule (Suspension of Current Chronic Aluminum Standard)

Dear Ms. Carte:

Thank you for the opportunity to submit these comments on behalf of the Independent Oil & Gas Association of West Virginia ("IOGA") on the Environmental Quality Board's ("EQB") proposed changes to 46 CSR 1 ("Water Quality Standards rule"). IOGA is a statewide non-profit trade association representing companies engaged in the exploration, production and development of natural gas and oil resources in West Virginia, and the companies and individuals who support these activities. A part of IOGA's mission is to protect and improve both the business climate and natural environment of our state. In pursuit of these goals, IOGA has worked closely with the West Virginia Department of Environmental Protection ("WVDEP") and WVDEP's Office of Oil and Gas to ensure the application of reasonable and effective environmental regulatory requirements to oil and gas operations.

With these comments IOGA responds to a public notice filed with the Secretary of State on August 11, 2004, in which the EQB announced a proposed revision to the Water Quality Standards rule. IOGA supports the EQB's proposal to suspend the current chronic dissolved aluminum level of 87 µg/liter and, additionally, the finalization of a chronic dissolved aluminum level of 750 µg/liter. Based on the available scientific evidence, IOGA believes that a chronic dissolved aluminum level of 750 µg/liter is the appropriate criterion and will fully protect aquatic life in West Virginia waters.

As addressed in the June 25, 2004 comments submitted jointly by the West Virginia Coal Association, the West Virginia Chamber of Commerce, and the West Virginia Manufacturers Association ("industry comments"), the available scientific data supports the permanent adoption of a chronic dissolved aluminum level of 750 μg/liter. For instance, data collected by WVDEP between 1990 and 1996 revealed the existence of several West Virginia streams with a chronic dissolved aluminum level in excess of the 87 μg/liter level which also maintained healthy levels of aquatic life. Furthermore, adherence to United States Environmental Protection Agency ("EPA") guidance regarding the determination of chronic criteria for the protection of aquatic life would result in a chronic dissolved aluminum level of 750 μg/liter.

Additionally, the reliability and applicability of the striped bass and brook trout studies on which the EQB relied when establishing the current chronic dissolved aluminum level of 87 μg/liter are highly questionable. The industry comments provide a thorough explanation of the flaws in the two studies, which include unreliable quality assurance and control measures, inconsistent results, and the use of streams with conditions uncommon to West Virginia streams (i.e. low pH and low hardness).

Based on the foregoing reasons, IOGA supports the proposed suspension of the chronic dissolved aluminum level of 87 μg/liter and, furthermore, the permanent adoption of a chronic dissolved aluminum level of 750 μg/liter.

IOGA appreciates this opportunity to offer its concerns regarding the proposed rule. If you should have any questions, please contact me at your convenience.

Sincerely yours,

Robert Radabaugh

Robert Radabaugh
Chairman, IOGA Environmental Committee

Pamela F. Faggert
Vice President and Chief Environmental Officer
5000 Dominion Boulevard, Glen Allen, VA 23060
Phone: 804-273-3467

Dominion

September 22, 2004

Edward M. Snyder, Ph.D
Chair
West Virginia Environmental Quality Board
1615 Washington Street, East, Suite 301
Charleston, West Virginia 25311

Re: Proposed Suspension of the Chronic Aluminum Water Quality Criterion

Dear Chairman Snyder:

Dominion appreciates the opportunity to submit the enclosed comments in support of the Board's proposal to suspend the existing chronic aluminum water quality standard until July 4, 2007, and to evaluate aluminum impacts and derive an appropriate criterion to protect West Virginia Waters. We believe that there are serious technical flaws with the existing criterion, which render it grossly over-protective of West Virginia surface waters. These technical deficiencies must be corrected in order to ensure that public and private resources are not further wasted through the development and implementation of TMDLs and associated wasteload allocations that produce no real environmental benefit. Dominion is willing to work with the Board, DEP, EPA and other interested stakeholders in the development of a technically sound criterion that will protect surface water quality and allow for economic enterprise.

During the three-year suspension, Dominion believes that the Board should discontinue efforts to develop or implement TMDLs that are based on the 87 ug/l criterion. We also request that the Board order DEP not to enforce water quality-based effluent limitations that were derived from the 87 ug/l aluminum criterion.

Please feel free to contact Ken Roller at (804) 273-3494 should you have any related questions or concerns.

Sincerely,

Pamela F. Faggert

Pamela F. Faggert

Attachments

West Virginia Environmental Quality Board

46 CSR 1
Requirements Governing Water Quality Standards
Appendix E, Table 1, Section 8.1
Proposal to suspend the chronic aluminum criterion

Dominion Comments on the Proposal by the West Virginia Environmental Quality Board to Temporarily Suspend the 87 ug/l Water Quality Criterion for Category B1 Waters

---

The Board has wisely proposed to suspend the 87 ug/l chronic aluminum water quality criterion for category B1 waters (warm waters) until July 4, 2007. The Board has also indicated its intent to work with interested stakeholders to evaluate the effects of aluminum on aquatic life and to develop a more appropriate criterion for protecting state waters.

The existing EPA chronic criterion is widely recognized by water quality professionals, including the DEP's Water and Waste Division, as scientifically flawed and overly protective of state waters. Moreover, EPA scientists have acknowledged, in numerous personal communications with state regulatory and industry scientists that the aluminum criterion is flawed and "needs to be fixed". Unfortunately, EPA has not undertaken revision of the aluminum criterion (along with a host of other water quality criteria) due to resource constraints and regulatory priorities. Aluminum is classified as a non-priority pollutant (not one of the 126 priority pollutants) as defined by the Clean Water Act and therefore, the criterion is not an EPA priority for revision.

In light of the above, the Board's adoption of the proposed three-year suspension of the aluminum criteria is critical and timely. Water quality criteria are the foundation of the national and state water quality management programs and must be based on the best available science. Good public policy dictates that water quality criteria be derived using the best scientific data and derivation methodology so that they are not over- or under-protective. Such a policy ensures that limited resources are directed at real water quality impairments in the state instead of being misused on the development of TMDLs and the establishment of effluent limitations that are not necessary to protect or restore the quality of state waters. The proposed three-year suspension should provide adequate time for the development of a more appropriate criterion to protect state waters. Dominion supports the suspension and pledges to work with the Board, DEP, EPA and other interested parties to develop the scientific basis for deriving an appropriate chronic aluminum water quality criterion that will protect both state waters and economic interests.

Justification for Suspension

Serious deficiencies in the existing aluminum criterion were identified and discussed in detail in the recent WV Industry Group submittal in response to the Boards request for information regarding the Legislature's mandate to revise the aluminum criterion (June 24, 2004). Major problems with the criterion include the fact that EPA did not follow its own water quality criteria derivation guidelines by basing the chronic criterion on only two laboratory toxicity tests, which were conducted in soft water at low pH under less than adequate quality control and assurance conditions. Had EPA followed their derivation guidelines the chronic aluminum criterion would be the same as the acute criterion of 750 ug/l.

Moreover, neither the EPA acute or chronic criteria reflect the relationship between water quality variables (i.e., pH and hardness) and the bioavailability and observed toxicity of aluminum to aquatic life. Aluminum chemistry (speciation) and ambient water quality substantially alter the bioavailability and toxicity of aluminum. Due to the amphoteric (soluble at low and high pH) nature of aluminum, its toxicity is more pH dependent than most metals. The inorganic monomeric dissolved form of aluminum, which is known to be the most toxic from of aluminum to aquatic life, predominates at a pH of less than 5.5. In a pH range of 6.0 to 9.0, typical of unimpaired WV waters, aluminum becomes insoluble and very low inorganic monomeric aluminum concentrations are present. Additionally, more recent scientific literature indicates that calcium related hardness reduces aluminum toxicity by stabilizing fish gills by out-competing aluminum for binding sites on the epithelial membrane. Yet the EPA and WV criteria are neither pH nor hardness dependent.

The significant technical deficiencies associated with the aluminum criteria are well recognized by the scientific community and they are the reason

Pennsylvania has rejected adoption of the chronic aluminum criterion. Based on overwhelming evidence that the aluminum criterion is scientifically flawed, Dominion urges the Board to finalize suspension of the chronic aluminum water quality criterion. We also urge the Board to actively work with interested stakeholders as proposed to derive appropriate acute and chronic aluminum water quality criteria for protecting both Category B1 and B2 waters.

The Board Should Modify the Proposal Language

The Board proposes to "suspend" the chronic aluminum standard of 87 ug/l in all but trout waters until July 4, 2007. However, the Board also proposes that during the period of suspension both the acute and chronic aquatic life values for aluminum be temporarily established at 750 ug/l. Therefore, in addition to suspending the current 87ug/l chronic criterion, the Board would also be establishing an "interim" chronic criterion of 750 ug/l for a three-year period. Dominion suggests that in order to avoid any confusion the Board modify the proposed language to also reflect that the 750 ug/l chronic criterion will be the interim criterion until July 4, 2007.

Existing Aluminum TMDLs and Effluent Limitations

The Board should issue an order to prohibit DEP from implementing all final TMDLs that have been developed for aluminum impairment and to prohibit enforcement of water quality-based aluminum NPDES permit effluent limitations that were derived from the 87 ug/l criterion. DEP has finalized a number of TMDLs for abandoned mine drainage (AMD) impaired streams that contain aluminum wasteload allocations. In addition, many NPDES permits, particularly those issued to the mining and coal-fired electric generation industries, contain aluminum discharge restrictions based on the 87 ug/l criterion. Because the aluminum criterion is flawed, it is simply a waste of limited resources to continue (or begin) implementing the aluminum TMDLs that have been developed until after July 2007. Similarly, it would be inequitable to enforce aluminum effluent limitations that are now known to be unjustified because they were derived from the flawed 87ug/l chronic aluminum criterion. Therefore, during the 3-year suspension the Board should ensure that DEP does not take enforcement action against any NPDES discharger whose aluminum discharge concentration is in compliance with a water quality-based effluent limitation based on the 750 ug/l interim chronic criterion.

The Proposed Interim Chronic Criterion is Protective

In the proposal to suspend the current chronic aluminum criterion the Board requested comments on how the use of the interim 750 ug/l chronic criterion, based on dissolved concentration, would ensure protection of warm water fishery streams. Dominion believes that the 750 ug/l interim chronic criterion will be sufficiently protective for several reasons.

First, as mentioned above, had EPA followed its own criteria derivation guidelines the 1988 chronic criterion would have been equal to the acute criterion of 750 ug/l. Moreover, the toxicity tests used to justify the 87 ug/l criterion were conducted in laboratory water of low pH and hardness, which is atypical of warm water streams in West Virginia that are unimpaired by other pollutants.

Secondly, the inorganic monomeric, dissolved form of aluminum known to be toxic to aquatic life predominates at a pH of less than 5.5. In a pH range of 6.0 to 9.0, typical of unimpaired streams in West Virginia, the solubility of aluminum decreases, and very low concentrations of inorganic monomeric aluminum are present. In addition, the EPA approved method for dissolved aluminum likely overestimates the dissolved (or bioavailable) component in the water column. This overestimation occurs because the analytical method for dissolved aluminum requires that samples be filtered through a 0.45 um filter before acidification and analysis. DEP has shown in its survey of state waters that small suspended and colloidal particles will pass through a filter of this size resulting in artificially high dissolved aluminum measurements.

Finally, the DEP dissolved aluminum database clearly shows that WV streams with dissolved aluminum concentrations less than 750 ug/l are not biologically impaired. This real world observation is compelling and should not be overlooked in its importance.

WEST VIRGINIA RIVERS COALITION
801 N. Randolph Avenue • Elkins, West Virginia 26241 • (304) 637-7201 • www.wvrivers.org

Post-it® Fax Note 7671	Date 9/24/04	# of pages ▶ 11
To Ed Snyder	From Evan Hansen	
Co./Dept. EQB	Co. WVRC	
Phone #	Phone # 304-291-8205	
Fax # 304-558-4116	Fax # 291-0979	

September 24, 2004

Dr. Edward M. Snyder, Chair
West Virginia Environmental Quality Board
1615 Washington Street East, Suite 301
Charleston, West Virginia 25311-2126
Email: clerk@wvaqbeqb.org

RE: Comments on revisions to the West Virginia aluminum criterion

Dear Dr. Snyder:

On June 23, 2004, the Appalachian Center for the Economy and the Environment, West Virginia Highlands Conservancy, West Virginia Rivers Coalition, Friends of the Cheat, Ohio Valley Environmental Coalition, Friends of the Little Kanawha, Coal River Mountain Watch, and West Virginia Environmental Council submitted joint comments on the Environmental Quality Board's reconsideration of the West Virginia aluminum criteria.

Now that EQB has made a preliminary decision, this letter reiterates those original comments. The scientific literature summarized here shows that suspending the 87 ug/L chronic criteria in all but trout waters is not supported by science.

The obligation to promulgate protective criteria

Pursuant to Section 303 of the Clean Water Act (CWA), "[s]tates must adopt those water quality criteria that protect the designated use. Such criteria must be based on sound scientific rationale and must contain sufficient parameters or constituents to protect the designated use. For waters with multiple use designations, the criteria shall support the most sensitive use." 40CFR131.11(a). In other words, criteria must be set to support uses and must be independent of land use or economic considerations. Clearly to fulfill this duty the Board must among other things promulgate criteria that protect streams meeting their designated uses even if excursions from other numeric water quality criteria occur. In the case of aluminum this means promulgating protective criteria over a wide range of pHs and stream conditions.

In adopting criteria states have several options: 1) to adopt criteria established by EPA under Section 304(a) of the CWA; 2) to adopt criteria modified from 304(a) guidance to reflect site specific conditions; or 3) to use other scientifically defensible methods to establish new criteria. 40CFR131.11(b).

Further, EPA directs states in its Water Quality Standards Handbook to be conservative in establishing criteria. "Until a model has been demonstrated to explain the quantitative relationship between chemical and toxicological measurements, aquatic life criteria should be established in an environmentally conservative manner with provision for site-specific adjustment" (USEPA, 1994, Appendix L, p. 109). State regulations provide for site specific considerations and adjustments for all criteria through variances and site specific criteria. § 46-1-8.3 & 8.4. Thus, the Board has a clear remaining obligation to promulgate criteria in an environmentally conservative and protective manner.

EPA's disapproval of West Virginia deletion of a chronic aquatic life numeric criterion

"In 1998, EPA disapproved West Virginia's aluminum criteria which deleted a chronic aquatic life numeric criterion of 87 ug/l. In order to address that disapproval, EPA had requested that West Virginia adopt the chronic number, or provide a sound scientific rationale as to why such criterion is not necessary to protect the designated use." (USEPA, 2003, p 8). The Board reconsidered the aluminum criteria and after considerable effort and appropriate public notice and comment submitted the current dissolved criteria to the legislature for approval. At the time the regulated community did not object to the criteria and the legislature approved the submission. Subsequently in an April 17, 2003 letter, EPA approved what had been passed by the legislature. In doing so EPA obviously expended significant effort in evaluating West Virginia's proposed criteria and cited numerous studies supporting the need for the adopted chronic value. (USEPA, 2003). *Clearly, eliminating the chronic criterion is not an option that complies with the Board's minimum legal requirements and the need to adopt conservative and protective criteria.* In addition, for the regulated community to object to fairly promulgated criteria after the fact is a "late hit" that wastes the earlier efforts not only of the Board but also EPA.

Factors in Aluminum Toxicity

The toxicology of aluminum to aquatic biota is extremely complex. However, it is clear that the toxic effects of aluminum depend not only on the species of aluminum present but also the presence of other parameters or conditions that may increase or decrease harmful effects. Among other things temperature and levels of Ca, K, Mg, P, Si, Fl and dissolved organic matter may significantly alter aluminum toxicity with increasing hardness generally having an ameliorating effect. In addition, changing instream conditions may result in nearly instantaneous shifts or take minutes to hours to reach equilibrium in the predominant aluminum species present (Logan, 1999). Aluminum is relatively insoluble at pH 6 to 8 but the solubility of Al increases under more alkaline or acidic conditions. Generally, monomeric Al species, increased at a lower pH, have the greatest toxicity.

Most toxicity studies have been done in the lower pH range. Toxicity is in two categories and is "bimodal in that it causes asphyxiation at higher pHs (5.5-6.5) and interferes with electrolyte balance at lower pH." (Sparling, 1996, p112). In addition, to adequately consider impacts on aquatic life "[t]he pH of the microenvironment near biological membranes such as fish gills must be considered particularly in poorly buffered waters where the pH changes at the gills will be the greatest. In essence, acidic water is made more basic in the gill microenvironment, and basic water is made more acidic, both of which could lead to oversaturated Al conditions leading to precipitation or polymerization of Al on fish gills." (Logan, 1999, p 423).

There is also great variation in the sensitivity of aquatic life to elevated aluminum (Logan, 1999). Additionally different life stages of a species may be more or less sensitive. For example, eggs and larval fish, and tadpoles tend to be more sensitive to Al and pH than older fish or frogs. (Sparling, 1996). Therefore, in establishing criteria it is critical to evaluate studies that evaluate impacts on earlier life stages and not strictly adult survivability. Generally, the sensitivity of fish to elevated levels of aluminum is significantly greater than that of macroinvertebrates, plants and algal forms *counter to statements in EPA's aluminum criteria document.* [1] (Logan, 1999) (Sparling, 1997).

Assessment of aluminum impacts in West Virginia

The sensitivity of macroinvertebrates to aluminum versus that of other species is particularly important because WVDEP relies on macroinvertebrate populations as opposed to other aquatic life to assess watershed health. (Montali, 2004). WVDNR's assessment of game and nongame fish populations have covered only a tiny percentage of West Virginia streams and are generally not correlated with instream aluminum levels. In addition, in a number of situations, WVDEP's stream health assessments do not correlate with the vitality or even presence or absence of fish populations. (Cincotta, 2004). *Thus, the impacts of aluminum on the numbers and diversity of fish and other aquatic species in West Virginia have not been adequately characterized or in most cases characterized at all.* This lack of state information reinforces the need for the Board to weigh credible data collected outside of West Virginia (many referenced in our comments).

Aluminum criteria must protect the headwaters

A large number of headwater streams in the State are impacted by acid precipitation and exhibit significant seasonal variations in pH (4.9 – 6.0). (Tolin, 2003). While stressed, many of those streams support viable fish populations. If Al concentrations are allowed to increase significant toxicity can occur. Aluminum moves to surface water through acid precipitation or is mobilized from stream substrates. A 1994 field study by Carline et al. in Pennsylvania looked at acidic episodes (depressed alkalinity and pH and in some cases increased Al) in five streams. The study showed that the most impaired stream had a pH of 4.8 (range 4.69-6.7) and highest concentrations of total dissolved Aluminum > 400 ug/l during periods of high discharge. Among the other streams in the study, brook trout

[1] USEPA Office of Water. 1988. Ambient Water Quality Criteria for Aluminum – 1988. August.

density was highest where the acidic episodes were the least severe and the density of age-0 brook trout was lowest when precipitation during the early months of the year was above normal. Increase in aluminum levels accompanied pH drops. Mottled sculpins were not found in streams with severe episodes despite the fact that mottled scuplins are usually sympatric with brook trout in eastern headwaters. The researchers "suggest that toxic conditions during acidic episodes cause high mortality of juvenile and adult brook trout and that the persistence of a remnant population in the main channel is due to colonization from alkaline tributaries and the presence of small refugia at their inflow points." (Carline, 1994, p 113). A survey by Sharpe "revealed that streams with both brook trout and mottled scuplins had higher average pH (6.75) and lower average Al concentration (23 ug/l) than streams with only brook trout (pH 6.47 and Al = 45 ug/l). (Carline, 1994, p 108).

In short, many headwater streams with marginal to neutral average pH are vulnerable to the toxic effects of episodic increases of aluminum and would be in increased jeopardy if criteria are set that allow increased aluminum loading. (Tolin, 2003). Any criteria promulgated by the Board must be protective of these streams anticipating episodes characterized by decreased pH and increased aluminum concentrations. Clearly the episodic nature of aluminum loading and toxicity in headwater streams further complicates setting appropriate criteria.

Aluminum criteria must protect streams impaired by AMD and downstream reaches

Hundreds of streams are impaired by AMD in West Virginia. These streams are made more toxic by the presence of aluminum. Field studies have shown that increased fish mortalities are associated with high levels of Al at pH levels that would not otherwise prove fatal. (Gagen, 1993). In addition, if a tributary of low pH and high Al flows into a stream with neutral to elevated pH a mixing zone of increased toxicity can occur. The toxicity of these mixing zones is greater than that in the original acidic water before mixing. (Poleo, 1994).

Another study focused on mixing zones of Al laden water. Mixing of acid river water containing pH 5.1, total acid reactive aluminum 345 ug/l with neutral water of a lake (pH 7.0, total acid reactive aluminum 73 ug/l) resulted in water with pH of 6.4 and Al of 245 ug/l. The resultant water was expected to be of relatively low toxicity based on current toxicity models. However, under semi-field conditions the freshly mixed water in minutes proved to be highly acutely toxic to brown trout. This phenomenon will be detrimental to migrating trout in natural conditions. (Verbost, 1995).

Mixing zones may also pose potential threats in situations where the pH and Al content of permitted discharges vary significantly from conditions in the receiving stream.

Literature Review supports the need for protective criteria

Below is a brief summary of our review of other literature. While the information presented does not always correspond to the acute one hour timeline or the chronic four day average timeline of the water quality criteria, these studies clearly indicate the toxicity of aluminum in acidic pHs, in mixing zones, and in alkaline pHs.

Studies in alkaline pHs are sparse but do present data indicating toxicity. An extensive recent review of aluminum research concludes there is a relative paucity of toxicity studies in waters with a pH above 7 and "predicting Al toxicity as pH values increase above 7 may not be a simple matter and is restricted by our limited understanding of Al bioavailability under such conditions. In particular, the toxicity of $Al(OH)_4$, which predominates at pH 7 is very poorly understood." (Logan, 1999, p. 423). This uncertainty underlines the need for a conservative approach by the Board when reevaluating the existing criteria.

Studies reviewed include:

1) Studies were performed in 20-day in situ cages on five streams to determine relative sensitivities to aluminum in field conditions. Aluminum levels are reported as total dissolved. Al levels of 294 ug/l and a mean pH of 5.29 were associated with 100% mortality of brook trout. Al levels of 205 ug/l and a mean pH of 5.53 were associated with 57% mortality of mottled sculpins. Al levels of 151 ug/l and pH of 5.53 were associated with 46% mortality of mottled sculpins. Al levels of 71 ug/l and pH of 5.65 were associated with a 14% mortality of brook trout. Mortalities in the field study were associated with high levels of Al at pH levels that would not otherwise prove fatal. (Gagen, 1993).
2) This study is one of few on aluminum and alkaline pHs. Evaluated toxic effects of aluminum in neutral and alkaline pHs. Dissolved concentrations over 1.5 ppm caused drastic physiological and behavioral changes. Concluded the safe concentration of either dissolved or suspended aluminum is well below .5 ppm (500 ug/l). (Freeman, 1971).
3) Aluminum toxicities were investigated in a Swiss alpine lake. Moderate (total) Al concentrations of 121 $\pm$ 28 ug/l and a pH of 5.41 $\pm$ 0.21 caused acute aluminum intoxication of one to two year old brown trout exposed through a keep-net. Low Na, Cl and Ca concentrations in the lake seemed to have rendered the fish more susceptible to aluminum intoxication. Also quotes other studies indicating where Ca is low, pH between 4.6 and 5.3, and labile Al levels from 25 to75 ug/l can be acutely toxic. (Dietrich, 1989).
4) Study measured caged overwintering young-of-the-year and introduced free swimming adult smallmouth bass in five lakes that varied in pH from 4.9 to 5.9 (winter values). Survival of adult and overwintering young-of-the-year fish declined with decreasing pH and increasing metal concentrations. Young--of-the-year, which appeared to be more sensitive than adults, were unable to survive through an entire winter at pH 5.9 or below and total Al levels of 55 ug/l and above. (Snucins, 1991).

5) Survival of artificially implanted eggs, alevins and parr of brown trout was assessed in streams of different acidity. Egg survival from two minutes after fertilization to hatching was usually above 71% and independent of the mean concentration of total monomeric aluminum over the range of 3-397 ug/l. The survival of alevins exposed for 28 or 42 days was most strongly related to the mean concentration of total monomeric aluminum and to pH. For 28 and 42-day exposures, LC50 values for total monomeric Al were approximately 19 and 15 ug/l respectively or 79 and 72 ug/l for .45 um filterable aluminum. The 21-day LC50 of Apr (3 month old) was between 84 and 105 ugh/ mean filterable Al concentration. (Weatherley, 1990).
6) Soft water acclimated cannulated brown trout were exposed to various pH and aluminum regimes. Aluminum was in the labile monomeric form. All trout died within 48 hours at pH of 5 in the presence of Al at 50 ug/l and 67% died over a five-day period at a pH of 5 and in the presence of Al at 25 ug/l. Surviving fish at 25 ug/l Al showed few signs of physiological recovery while continually exposed to this regime. No fish died during the 5-day exposure to waters of pH 5 and Al of 12.5 ug/l but physiological disturbance was still apparent. (Waring, 1995).
7) Yearling brown trout were maintained in a synthetic medium at pH 5.2 with various concentrations of calcium and aluminum from 0 to 3 umol/l (note 1uM Al = 27 ug/l, and aluminum was monomeric). In general higher mortality rates and lower growth rates were found at higher aluminum concentrations with these effects being reduced by high ambient calcium. Aluminum toxicity was greater in February through March than October to December. (Sadler, 1988).
8) Juvenile rainbow trout were chronically exposed to acidified soft water and a sublethal dose of monomeric aluminum (30 ug/l total). The Al exposed fish suffered electrolyte losses and a 30% reduction in swimming speed. Increased resistance to acutely lethal doses of Al (200 ug/l at pH 5.2) was observed from day 17 onwards in the Al exposed fish. Costs of acclimation to higher levels of aluminum were impairment of swimming speed and growth. (Wilson, 1992).
9) Juvenile rainbow trout became acclimated to lethal Al levels, 162 ug/l (monomeric, pH 5.2) after 5 days when exposed to sublethal Al (38ug/l) in acidified soft water. However, decreased growth must be considered one of the costs of acclimation during chronic sublethal exposures. (Wilson, 1994).
10) Pennsylvania study of acidic streams indicate that total dissolved aluminum in excess of 200 ug/l for 24 – 48 hours or 100-200 ug/l for 48-400 hours may be lethal to caged brook trout. Agrees with other studies that indicate dissolved aluminum in range of 100-200 ug/l will produce mortalities in brook trout. Total dissolved Al rather than dissolved inorganic monomeric Al concentrations were used to assess toxicity of aluminum to brook trout in this study. Inorganic monomeric Al has been found to be primarily responsible for toxic effects. However total dissolved and inorganic monomeric concentrations were similar in the study streams with high Al. (DeWalle, 1994).
11) Under laboratory conditions fish can acclimate to Al exposure. However, fish in the wild are likely to experience chronic sub-lethal exposure, with occasional elevations to much higher levels. Experiment looked at a four-day pulse exposure to a high level of labile aluminum (36ug/l) in two groups of juvenile rainbow trout – one

preexposed to (24 ug/l) labile AL. Mortality in the Al acclimated groups was 4% and 26% in the aluminum naive fish. (Allin, 2000).

12) Study found that lakes with lost fish populations had a mean Al (inorganic) more than three time higher (27ug/l) as that of lakes whose fish populations were unaffected (8.01 ug/l). There were no other differences in water quality. (Hesthagen, 1998).
13) Study conducted using native brook trout and blacknose dace in headwater streams. Fish survived well during baseflow conditions but during periods of spring snow melt or large precipitation events, survival was poor. Black nose dace were more sensitive than trout. Mortality was best correlated with median inorganic monomeric aluminum concentration. (Simonin, 1993).
14) Two strains of 1 yr-old brook trout were exposed to 14 combinations of pH, aluminum and calcium during a 28-day experiment. Survival was strongly dependent on combined aluminum and pH exposure. Brook trout exposed to elevated levels of aluminum or acidity often exhibit reduced feeding, loss of equilibrium, excessive mucus secretion, or changes in skin pigmentation. Summary of results below. (Ingersoll, 1990).

TABLE 2. Mean survival and final weight (SEM) for the New York-strain (NY-c) fish confined in PVC tubes and free-swimming New York- (NY-b) and Washington strain (WA-b) fish. Measured (SEM) pH, calcium (mg/L) and nominal (Al), total (TAl), monomeric (MAl) and inorganic monomeric (IAl) aluminum (µg/L) are listed.

						Survival (%)			Weight (g)		
pH	Ca	Al	TAl	MAl	IAl	WA-b	NY-b	NY-c	WA-b	NY-b	NY-c
6.52(0.09)	1.86(0.09)	0	3(1.40)	7(0.85)	4(0.95)	100.0	100.0	90.0	11.5(0.65)	13.2(0.79)	8.2(1.20)
5.24(0.03)	1.89(0.10)	0	5(0.60)	7(0.61)	3(0.42)	98.0	100.0	100.0	10.5(0.68)	[illegible]	6.7(0.64)
5.18(0.03)	1.78(0.12)	111	118(25.1)	103(9.55)	29(11.2)	78.0	89.6	100.0	7.8(0.48)	10.0(0.67)	7.8(0.99)
4.77(0.03)	1.76(0.19)	0	4(0.61)	7(0.97)	4(0.60)	100.0	100.0	90.0	[illegible]	13.6(0.77)	7.9(1.26)
4.79(0.03)	1.83(0.12)	133	74(18.9)	109(20.3)	43(13.2)	98.0	100.0	90.0	7.2(0.52)	12.4(0.58)	9.2(1.64)
4.64(0.02)	1.76(0.08)	333	191(84.2)	261(95.1)	237(64.7)	57.4	75.5	80.0	6.0(0.52)	[illegible]	7.0(0.45)
4.44(0.02)	1.85(0.12)	0	3(0.79)	8(0.34)	4(0.30)	96.1	100.0	74.0	4.6(0.36)	10.9(0.78)	[illegible]
4.40(0.02)	1.75(0.13)	111	131(47.6)	113(9.26)	21(15.6)	92.3	98.0	27.3	6.5(0.34)	8.4(0.49)	6.5(1.28)
4.38(0.01)	1.80(0.07)	333	322(70.6)	341(118.)	238(83.0)	88.0	80.4	48.0	5.9(0.37)	7.8(0.42)	8.2(0.97)
4.33(0.01)	1.85(0.08)	666	665(180.1)	646(46.2)	352(81.3)	28.8	42.9	20.0	5.0(0.72)	8.8(1.03)	12.2(1.30)
4.43(0.02)	1.05(0.05)	0	8(1.67)	7(0.57)	3(1.33)	100.0	100.0	77.8	7.6(0.48)	11.6(1.01)	8.1(1.15)
4.46(0.02)	1.00(0.08)	111	108(25.0)	91(11.8)	34(11.0)	98.0	98.0	90.0	6.8(0.41)	9.4(0.50)	8.2(0.93)
4.39(0.01)	0.98(0.04)	333	290(27.1)	313(20.9)	239(41.6)	77.4	68.8	50.0	6.4(0.30)	7.9(0.67)	9.5(1.37)
4.32(0.01)	0.96(0.02)	666	704(133.3)	660(35.7)	463(107.)	14.0	2.0	0.0	6.0(0.60)	—	—

1642 Can. J. Fish. Aquat. Sci., Vol. 47, 1990

15) Main objective of the study was to quantify the acid-base status of surface water in the US. In this national study most of the acidic stream length was in the Mid-Atlantic Highlands and Coastal Plain. Inorganic monomeric Al concentrations increased with decreasing pH; 6 % had inorganic monomeric Al levels greater than 50 ug/l. Many lakes and streams that were not acidic during the index sampling may be acidic at other times of the year particularly during peak flow periods. (Baker, 1990).
16) We include as attachments, data summarizing toxic effects on various species. (Sparling, 1996).
    - Table 5. Acute, chronic, and sublethal effects of Aluminum on aquatic invertebrates. (p. 22-25).
    - Table 7. Percent survival, LT50, and sizes of fish exposed to various pH, Ca (mg/l), and Al (ug/l) levels in laboratory experiments. (p. 37-62).
    - Table 12. Influence of dissolved organic carbon (DOC) (mg/l) on percentage survival of fish experimentally exposed to different levels of AL (ug/l) and Ca (mg/l). (p. 84-85).

Summary of findings and how they relate to the existing criteria

In summary:

- Toxicity of aluminum at low pHs and in mixing zones of neutral or alkaline pH is supported by an abundance of data.
- Aluminum magnifies the negative impacts of low pHs
- There is less data, especially recent data on the effects of increased aluminum concentrations at pH above 7 but toxicity has been demonstrated.
- An abundance of data indicates monomeric species are very toxic and increase as pH decreases.
- The toxic effects of Al can be altered by temperature and other factors with hard water having an ameliorating impact.
- Aluminum toxicity also depends on the aquatic species in question and the life stage of that species.
- Highly toxic mixing zones of neutral or alkaline pH can be created from waters of varying pH and aluminum content.
- Some species can to some degree acclimate to increased levels of aluminum but the cost of acclimation is decreased growth and reduced swimming speed.

In general the levels of aluminum causing chronic toxicity in these studies are in the same range as EPA's chronic criterion value, 87 ug/l. However at low pHs juvenile stages of some species can be severely impacted at levels significantly below the chronic criterion. In addition, data clearly show the acute criterion of 750 ug/l is not protective in mixing zones of waters of differing pH and aluminum content. In these situations aluminum concentrations of around 250 ug/l can be extremely toxic, killing most fish exposed in a short period of time. Mixing zones are undoubtedly prevalent in West Virginia due to among other things acid mine drainage, acid precipitation, and their treatment and drinking water treatment.

Conclusions

As a headwater state West Virginia has a wealth of water resources that support a vast array of aquatic life, the day-to-day activities of our industries and citizens and an important recreational economy. The already significant challenge of protecting our water resources is made more difficult by the extreme complexity of aluminum toxicity and by the current political climate. Nonetheless the Board has only two reasonable options that fulfill the mandates of federal law.

In order to comply with the Clean Water Act, the Board must promulgate conservative and protective aluminum criteria. In particular, the Board has two options that comply with the Act: 1) retain existing criteria that comply with Section 304(a) guidance (already approved by EPA); or 2) use other scientifically defensible methods to establish new criteria. 40CFR131.11(b). The preponderance of data reviewed indicate current criteria are not sufficiently stringent to protect juveniles or adults of some species or numerous species in mixing zones of divergent pH and aluminum concentrations. Thus, if the Board alters existing criteria the only defensible course is to promulgate more stringent acute and chronic aluminum criteria.

Again, we thank the Board for the opportunity to comment.

Sincerely,

Evan Hansen, Watershed Permit Assistance Program Director
West Virginia Rivers Coalition
801 N. Randolph Avenue
Elkins, WV 26241

On behalf of:

Dr. Margaret Janes
Senior Policy Analyst
Appalachian Center for the Economy and the Environment
5640 Howards Lick Road
Mathias, WV 26812

References:

Allin, C.J., Wilson, R.W. 2000. Effects of preacclimation to aluminum on the physiology and swimming behavior of juvenile rainbow trout during a pulsed exposure. Aquatic Toxicology, 51:213-224.

Baker, Lawrence A., Kaufmann, Phillip R., Herlihy, Alan T., Eilers, Joseph M. 1990. Current Status of Surface Water Acid Base Chemistry. NAPAP Vol. 2, Report No 9.

Carline, R.F., Cagen, C.J., Sharpe, W.E. 1994. Brook trout population dynamics and mottled sculpin occurrence in relation to acidic episodes in streams. Ecology of Freshwater Fish. 3:107-115.

Cincotta, Dan. West Virginia Division of Natural Resources. 2004. Telephone conversation with M. Janes. June 18.

DeWalle, David R., Swistock, Bryan R., Sharpe, William E. 1995. Episodic flow-duration analysis: a method of assessing toxic exposure of brook trout to episodic increases in aluminum. Can. J. Fish. Aquatic Sci. 52:816-827.

Dietrich, Daniel; Schlatter, Ch., 1989. Low levels of aluminum causing death of brown trout in a Swiss alpine lake. Aquatic Sciences. 51/4.

Freeman, Robert A., Everhart, W. Harry. 1971. Toxicity of Aluminum Hydroxide in Neutral and Basic Media to Rainbow Trout. Transactions of the American Fisheries Society. Vol. 100, No. 4 p 644-658.

Gagen, Charles J., Sharpe, William E., Carline, Robert F. 1993. Mortality of Brook Trout, Mottled Sculpins and Slimy Sculpins during Acidic Episodes. Transactions of the American Fisheries Society. 122:616-628.

Hesthagen, T., Aastorp, G., Langaker, Roy M., Farstad, M., Mack Berger, H 2000. Response of brown trout to acidification and excess critical loads in lakes of western Norway with low ionic content. Proceedings of International Association of Theoretical and Applied Limnology. Vol. 27, Part 4, p 2079-2089.

Ingersall, C.G., Gulley, D.D., Mount, D.R., Mueller, M.E., Fernandez, J.D., Hockett, J.r., Bergman, H.L. 1990. Aluminum and Acid Toxicity to Two Strains of Brook Trout. Can. J. Fish. Aquat. Sci. 47: 1641-1648.

Logan, Terry J. Editor. 1999. Critical Reviews in Environmental Science and Technology. CRC Press. Boca Raton, FL. October. p 315-453.

Montali, Dave. West Virginia Department of Environmental Protection, Division of Water and Waste Management. 2004. Telephone conversation with M. Janes. June 10.

Poleo, A.B.S., Lydersen, E., Rosseland, B.O., Kroglund, F., Salbu, B., Vogt, R.D., and Kvellestad, A. 1994. Increased Mortality of Fish due to Changing Al-Chemistry of Mixing Zones Between Limed Streams and Acidic Tributaries. Water, Air and Soil Pollution. 75:339-351.

Sadler, K. and Lynam, S. 1988. The influence of calcium on aluminum-induced changes in the growth rate and mortality of brown trout. Journal of Fish Biology. 33:171-179.

Simonin, Howard a., Kretser, Walter A., Bath, Dale W., Olson, Mark, Gallagher, James. 1993. In situ Bioassays of Brook Trout and Black Nose Dace in Adirondack Streams Affected by Episodic Acidification. Can. J. Fish Aquat. Sci. 50:902-912.

Snucins, E. J., Shuter, B.J. 1991. Survival of Introduced Smallmouth Bass in Low-pH Lakes. Transactions of the American Fisheries Society. 120:209-216.

Sparling, Donald W. Lowe, T. Peter. 1996. Environmental Hazards of Aluminum to Plants, Invertebrates, Fish and Wildlife. Reviews of Environmental Contamination and Toxicology. Vol 145.

Sparling, Donald W. Ph.D. Research Biologist, USGS, Patuxent Wildlife Research Center. 1997. Letter to Dan Ramsey of USFWS. February 14.

Tolin, Wm. Acting Supervisor, USFWS. 2003. Comment letter to Environmental Quality Board. April 11.

United States Environmental Protection Agency (USEPA). Office of Water. 1988. Ambient Water Quality Criteria for Aluminum – 1988. August.

United States Environmental Protection Agency (USEPA). Office of Water. 1994. Water Quality Standards handbook, Second Edition. August.

United States Environmental Protection Agency (USEPA). 2003. Letter from John Capacasa,. Acting Director Water Protection Division to Dr. Edward Snyder, Chair Environmental Quality Board. April 17.

Verbost, P.M., Berntssen, M.H.G., Kroglund, F., Lydersen, E., Witters, H.E., Rosseland, B.O., Salbu, B., Wendelaar Bonga, S.E. 1995. The Toxic Mixing Zone of Neutral and Acidic River Water: Acute Aluminum Toxicity in Brown Trout. Water, Air, and Soil Pollution. 85:341-346.

Waring, Colin P. and Brown, Anne. 1994. Ionoregulatory and respiratory responses of brown trout exposed to lethal and sublethal aluminum in acidic soft waters. Fish Physiology and Biochemistry. 14:81-91.

Weatherley, N.S., Rogers, A. P., Goenaga, X., Ormerod, S.J. 1990. The survival of early life stages of brown trout in relation to aluminum speciation in upland Welsh streams. Aquatic Toxicology. 17:213-230.

Wilson, Rod W. and Wood, Chris M. 1992. Swimming performance, whole body ions, and gill Al accumulation during acclimation to sublethal aluminum in juvenile rainbow trout. Fish Physiology and Biochemistry. 10:149-159.

Wilson, Rod W., Bergman, Harold L., Wood, Chris M. 1994. Metabolic Costs and Physiological Consequences of Acclimation to aluminum in Juvenile Rainbow Trout. 1: Acclimation Specificity, Resting Physiology, Feeding, and Growth. Can. J. Fish. Aquatic Sci. 51:527-535.

19 West Cork Street, Suite 102
Winchester, Virginia 22601
Telephone (540) 723-8877

101 South Queen Street
Martinsburg, West Virginia 25401
Telephone (304) 263-0836

7000 Hampton Center, Suite K
Morgantown, West Virginia 26505
Telephone (304) 285-2500

Bowles Rice McDavid Graff & Love LLP

ATTORNEYS AT LAW

600 Quarrier Street
Charleston, West Virginia 25301

Post Office Box 1386
Charleston, West Virginia 25325-1386
Telephone (304) 347-1100
www.bowlesrice.com

5th Floor, United Square
501 Avery Street
Parkersburg, West Virginia 26101
Telephone (304) 485-8500

333 West Vine Street, Suite 1201
Lexington, Kentucky 40507
Telephone (859) 225-8700

September 24, 2004

Jennie L. Henthorn
Telephone — (304) 347-1162
Facsimile — (304) 347-1196

E-Mail Address:
jhenthorn@bowlesrice.com

Dr. Edward M. Snyder, Chair
West Virginia Environmental Quality Board
1615 Washington Street, East
Charleston, West Virginia 25311

VIA HAND DELIVERY

RECEIVED
SEP 24 2004
ENVIRONMENTAL QUALITY BOARD
AIR QUALITY BOARD

Re: 46 CSR 1 – WV Water Quality Standards
Aluminum Criteria

Dear Dr. Snyder:

The West Virginia Coal Association, the West Virginia Chamber of Commerce, and the West Virginia Manufacturers Association (collectively the "Industry Groups") offer the following comments in response to the proposed revisions to the aluminum criteria set forth in 46 CSR 1, the West Virginia Water Quality Standards. In general, the Board has proposed to retain the chronic aluminum criterion of 87 ug/l for trout waters, and to suspend the chronic criterion on all other streams until July 4, 2007. Based on the discussions of the Board in its meeting, the suspension will allow interested parties to perform a study to prepare an appropriate chronic aquatic life criterion for West Virginia waters. The Industry Groups support the proposed revision to the chronic aluminum aquatic life criterion with two minor clarifications.

First, the Board's proposal states that the chronic criterion for waters other than trout streams shall be 750 ug/l until July 4, 2007. In effect, the Board has not suspended the chronic criterion, but instead has adopted an interim criterion which will be in place for less than three years. Accordingly, the term "suspension" is a misnomer for the Board's actions. The Industry Groups suggest that the footnote be reworded to indicate that its action is a temporary modification, not a suspension.

Second, the footnote does not mention the proposed scientific study to develop appropriate aluminum criteria for West Virginia. This proposed study was clearly an important factor in the Board's decision, and the Industry Groups believe that the text of the footnote should be revised to inform anyone who reviews the rule of the planned study so they might participate if they so choose. Importantly, the Industry Groups support a study to develop appropriate aluminum criteria for West Virginia and are willing to participate in the design and funding of the study.

To resolve these two concerns, the Industry Groups propose that the footnote be rewritten as follows:

> Until July 7, 2004, the aluminum criteria will be implemented as follows: the chronic aluminum criterion shall be 87 ug/l for trout waters (as defined in section 2.20 of this rule) and shall be 750 ug/l for all other waters of the State. The implementation of the interim criteria provides time for a study to develop aluminum criteria for waters of the State which are based upon sound science and are protective of aquatic life.

The Industry Groups support the Board's decision to retain the chronic criterion of 87 ug/l on trout streams. This support does not imply that the Industry Groups agree that 87 ug/l is a valid criterion for trout streams, but instead is a recognition that the sensitive nature of these streams warrant retaining the current criterion while scientifically justified aluminum criteria can be developed.

The Board has worked on the aluminum criteria for a number of years, and a wealth of information already exists within the Board's files on this topic. The Industry Groups and their member companies have submitted many comments since 1996 demonstrating the flawed science on which the current chronic criterion of 87 ug/l is based. Had EPA followed its own protocol for preparing aquatic life criteria, the chronic criterion would be equal to the acute criterion of 750 ug/l. Instead, EPA attempted to rely on an alternate method to establish the chronic criterion, relying on two studies based on brook trout and striped bass. EPA's reliance on these two studies has been criticized by numerous scientists and has been rejected by many States.

Earlier this summer, the Industry Groups submitted a detailed document containing a discussion of the flaws with the chronic criterion of 87 ug/l, a proposal for revision of the chronic aluminum criteria, treatises and toxicity studies related to aluminum, and stream data. The Industry Groups incorporate that document herein by reference. In addition, the West Virginia Division of Environmental Protection submitted detailed field data which demonstrates that many high quality waters in West Virginia contain more than 87 ug/l when either total recoverable or dissolved aluminum is measured. These streams show no impairment. However, based on the Board's current chronic aluminum criterion, these streams must be listed as impaired and scheduled for development of a Total Maximum Daily Load ("TMDL").

The Industry Groups acknowledge the concerns expressed during recent Board meetings regarding the protection of aquatic life from aluminum toxicity, especially in streams which are acidic either seasonally or continuously. However, the interim criterion is protective of warmwater species in waters which otherwise comply with WV water quality standards. The Industry Groups, as well as others, have described to the Board the effects of pH, hardness, and other factors on aluminum toxicity.

Recent studies on aluminum toxicity shows that it is the form and bioavailability of aluminum in the water column that determines its toxicity. Bioavailable aluminum acts as a gill toxicant to adult fish, and this toxicity is manifested primarily where the water column pH is low and the monomeric forms of aluminum are present. For streams which do not meet the pH criteria, either seasonally or continuously, the streams will be listed as impaired for pH. Aluminum toxicity would be secondary to the effect of low pH, which can be addressed as appropriate in a future TMDL.

In those streams that meet the West Virginia water quality criteria for pH, the aluminum in the stream generally is not bioavailable and is not toxic to aquatic life. Some of the leading scientists in aluminum research have documented the mitigating effects that water hardness, dissolved organic matter, and other water quality characteristics have on aluminum toxicity. These water quality characteristics occur in many West Virginia streams. Since these factors are not taken into account in the current aluminum criteria, they provide additional protection for aquatic life. These mitigating factors may be important considerations in future studies to develop appropriate aluminum criteria.

Clearly, the Industry Groups and other commenters have provided the Board with information regarding countless studies which have been performed since 1988 regarding aluminum toxicity. Many of these studies focus on effects of aluminum in acidic waters. Others describe the mitigating effects of certain water quality characteristics on aluminum toxicity. Some recent studies have focused on aluminum toxicity in mixing zones caused by liming stations to mitigate manmade stream acidity. Scientists have also made significant effort to determine the subchronic effects of aluminum exposure.

Some studies support that the criteria should be higher based on mitigating water quality characteristics or toxicity tests conducted at circumneutral pH. Other studies argue the importance of subchronic effects of aluminum, especially based on specific stream conditions which occur in certain water bodies. The Industry Groups advocate the development of aluminum criteria which consider the entire realm of available data, taking into account both factors which limit aluminum toxicity as well as specific circumstances where additional protection might be required. However, this must be done systematically based upon EPA's approved methodology for preparing aluminum criteria. It is not appropriate to consider either one study or a group of studies in isolation.

Even if one were to adopt a chronic criterion based on a commercially or recreationally important species as outlined in the *Guidelines*, this must be done based on a "species mean chronic value" as set forth in EPA's *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses* (1985). A "species mean chronic value" is calculated by the geometric mean of **all** chronic values for the species, not based on a single study or a subset of studies for that species. The *Guidelines* also specify that a Final Chronic Equation should be derived if the chronic toxicity of the material has been shown to be related to a water quality characteristic, such as hardness or particulate matter. A study, as advocated by DEP to the Board, is the appropriate mechanism to make these revisions.

In the notice of the proposed revisions to the aluminum criteria, the Board asked for input on two matters related to the revision. First, the Board has asked for input on whether the aluminum criteria are adequately protective of warmwater species if implemented as dissolved concentrations. The Industry Groups submitted comments in 1999 based on the work of Robert Gensemer, a national expert in aluminum, which demonstrate that the implementation of the aluminum criteria as dissolved concentrations is appropriate. Significantly, the Board based its proposal in part on the EPA-approved Wyoming aluminum criteria. Wyoming has recently proposed converting its criteria to dissolved concentrations, noting the lack of correlation in Wyoming streams between elevated total aluminum concentrations and aquatic life impairment. The Industry Groups submitted detailed information in their response document earlier this summer supporting the implementation of the aluminum criteria as dissolved concentrations.

In addition, the Board solicited comments on the effect of the proposed change on streams previously listed as impaired based on the 87 ug/l chronic criterion. DEP has discretion in managing its list of impaired streams, and the Industry Groups defer to DEP's assessment of this issue. However, many of these previously listed streams were also impaired for parameters other than aluminum, and therefore a TMDL must be prepared for these streams regardless of the aluminum criteria. On the other hand, as DEP described to the Board during prior meetings, the Board's current proposed action would prevent healthy streams from being improperly listed for aluminum until appropriate aluminum criteria can be prepared.

The Industry Groups appreciate the work of the Board in this matter and the efforts to prepare a simple, understandable "Statement of Circumstances Requiring Proposed Amendments" to accompany the proposed rule. However, we suggest that the "Statement" be revised to contain a greater description of the science that has been presented to the Board which describes the reasons that the chronic criterion of 87 ug/l is invalid. Clearly, EPA has told the Board in the past of the importance of a scientific justification for a proposed change, and the Industry Groups believe that it is equally important to transmit this information to the Legislature so that it can make an informed decision. Attachment 1 to this letter contains a proposed Statement for inclusion with the rule package. Attachment 2 contains a proposed Rationale Document supporting the proposed revision, which is based in large part on the previous submittal by the Industry Groups in June 2004.

The Rationale Document contains a summary of the current EPA-approved aluminum criteria for all fifty States. This summary is based upon the information available on the EPA website and generally has not been confirmed by contacts to the States due to time constraints. In all, only nineteen states have adopted some form of aluminum criteria. Only five states have adopted both EPA's proposed chronic and acute criterion as total aluminum concentrations. Four additional states, including West Virginia, have adopted EPA's proposed chronic and acute aluminum concentrations as dissolved concentrations. The remaining ten states have a variety of different aluminum criteria. Of the remaining ten states, approximately five have adopted dissolved aluminum criteria, including Texas, Utah, and Missouri, which have no chronic criterion and an acute criterion of 750 ug/l or greater.[1]

Pennsylvania, which has an acute criterion of 750 ug/l, is the only state which borders West Virginia that has adopted an aluminum criterion. Pennsylvania and Delaware are the only other states in EPA Region 3 which have any aluminum criteria. Based on the information available on the EPA website, all of the state water quality standards discussed herein have been approved by EPA. Clearly, EPA has provided the States with broad discretion in establishing aluminum criteria.

---

[1] The number of states with dissolved criteria is an approximation, because it was not clear in some circumstances whether the standards were based on dissolved or total recoverable concentrations.

Bowles Rice McDavid Graff & Love LLP

Finally, if the Board decides to submit the proposed revisions as an emergency rule, the Industry Groups ask that the Board submit the emergency rule to EPA for approval, rather than waiting for Legislative action on the corresponding proposed rule. This would allow for a more timely consideration of the revisions by EPA, and earlier implementation of the change should the revisions be approved by EPA. Attachment 3 contains EPA's approval of a DEP emergency rule in 1997. The approval was made contingent upon adoption of a final Legislative rule within six months of EPA's action.

Thank you for your continued interest and involvement in this matter. In the meantime, if you have any questions, please do not hesitate to contact me or any of the undersigned.

Very truly yours,

Jennie L. Henthorn
Environmental Chemist

Supported by:

West Virginia Coal Association

West Virginia Manufacturers Association

West Virginia Chamber of Commerce

cc: Allyn Turner, Director, DWWM

JLH/vls
1309901

STATEMENT OF CIRCUMSTANCES
REQUIRING PROPOSED AMENDMENTS

During its 2004 session, the West Virginia Legislature passed H.B. 4193, which mandates that the Environmental Quality Board (the "Board") shall, with the cooperation of the Department of Environmental Protection ("DEP") and the regulated community, propose an emergency and legislative rule to revise the aluminum criteria in the West Virginia Water Quality Standards, 46 CSR §1.

In response to this directive, the Board began consideration of the aquatic life aluminum criteria at its April 2004 meeting. The Board circulated a *Request for Information on Aluminum Water Quality Standard* asking for "information from all interested parties regarding appropriate aquatic life protection limits for aluminum." The Board received written comments from ten individuals and organizations, and heard oral comments from five speakers.

Based on the information presented, the Board agreed to propose a modification of the aluminum criteria by adding the following footnote to the current aluminum criteria:

> The current chronic aluminum standard of 87 ug/l will be suspended in all but trout waters until July 4, 2007. During the period of the suspension, the acute and chronic aquatic life values for aluminum are 750 ug/l.

The Board conducted a public comment period on the proposed modification. A public hearing on the proposed rule was conducted on September 15, 2004, and written comments were received until September 24, 2004.

Based on the comments received by the Board both in 2004 and in past triennial reviews, the Board believes that a modification of the aluminum criteria is appropriate in light of the questions regarding the scientific validity of the 87 ug/l chronic criterion proposed by US Environmental Protection Agency ("EPA"), the stream data presented by DEP, and the disparity between the current chronic criterion and the aluminum criteria adopted by other states, in particular those states surrounding West Virginia. This information is set forth in greater detail in the Board's Rationale Document. In consideration of public comments, the language of the footnote has been rewritten in the emergency rule and the proposed Legislative rule as follows:

Until July 7, 2004, the aluminum criteria will be implemented as follows: the chronic aluminum criterion shall be 87 ug/l for trout waters (as defined in section 2.20 of this rule) and shall be 750 ug/l for all other waters of the State. The implementation of the interim criteria provides time for a study to develop aluminum criteria for waters of the State which are based upon sound science and are protective of aquatic life.

The aluminum criteria remain as dissolved concentrations. In 1999, the Board established that studies conducted in both the laboratory and in the field clearly demonstrate that the dissolved aluminum fraction is the toxic portion and that the particulate associated forms of aluminum are regarded as nontoxic. Thus, the most scientifically defensible alternative is to regulate only the dissolved (bioavailable) form of aluminum by establishing dissolved criteria.

Importantly, the current criteria do not address any of the water quality characteristics which exist in many West Virginia streams which mitigate aluminum toxicity. In addition, the EPA-approved method for dissolved aluminum measurements utilizes a 0.45 μm filter, which allows a considerable amount of particulate aluminum to pass through and therefore be included in the dissolved aluminum measurement. Most toxicity tests which measure a dissolved aluminum concentration utilize a 0.1 μm filter, which is a smaller portion of the total aluminum concentration.

A critical component of the Board's consideration is the study which has been planned to develop scientifically sound aluminum criteria for West Virginia. The modification to the aluminum criteria will allow all interested parties, including EPA, DEP, WV Division of Natural Resources, and all other interested parties, to develop and implement scientific studies to evaluate aquatic life effects of aluminum in state waters. However, the study must be completed in a timely manner. If no new criteria are promulgated on or before July 4, 2007, the chronic criterion of 87 ug/l will be reinstated for all waters of the State.

WV ALUMINUM CRITERIA

Draft Rationale Document for
Proposed Amendments

September 24, 2004

TABLE OF CONTENTS

I. INTRODUCTION

During its 2004 session, the West Virginia Legislature passed H.B. 4193, which mandates that the Environmental Quality Board (the "Board") shall, with the cooperation of the Department of Environmental Protection ("DEP") and the regulated community, propose an emergency and legislative rule to revise the aluminum criteria in the West Virginia Water Quality Standards, 46 CSR §1.

In response to this directive, the Board began consideration of the aquatic life aluminum criteria at its April 2004 meeting. The Board circulated a *Request for Information on Aluminum Water Quality Standard* asking for "information from all interested parties regarding appropriate aquatic life protection limits for aluminum." The Board received written comments from ten individuals and organizations, and heard oral comments from five speakers.

Based on the information presented, the Board agreed to propose a modification of the aluminum criteria by adding the following footnote to the current aluminum criteria:

> The current chronic aluminum standard of 87 ug/l will be suspended in all but trout waters until July 4, 2007. During the period of the suspension, the acute and chronic aquatic life values for aluminum are 750 ug/l.

The Board conducted a public comment period on the proposed modification. A public hearing on the proposed rule was conducted on September 15, 2004, and written comments were received until September 24, 2004.

Based on the comments received by the Board both in 2004 and in past triennial reviews, the Board believes that a modification of the aluminum criteria is appropriate in light of the questions regarding the scientific validity of the 87 ug/l chronic criterion proposed by US EPA, the stream data presented by the Department of Environmental Protection, and the disparity between the current chronic criterion and the aluminum criteria adopted by other states, in particular those states surrounding West Virginia. This information is set forth in greater detail in following sections of this Rationale Document. In consideration of public comments, the language of the footnote has been rewritten in the emergency rule and the proposed Legislative rule as follows:

> Until July 7, 2004, the aluminum criteria will be implemented as follows: the chronic aluminum criterion shall be 87 ug/l for trout waters (as defined in section 2.20 of this rule) and shall be 750 ug/l for all other waters of the State. The implementation of the interim criteria provides time for a study to develop aluminum criteria for waters of the State which are based upon sound science and are protective of aquatic life.

II. HISTORY OF THE WEST VIRGINIA ALUMINUM CRITERIA

In 1994, at the urging of the United States Environmental Protection Agency ("EPA"), West Virginia adopted EPA's proposed aluminum aquatic life criteria of 87 $\mu g/l$ for chronic exposures and 750 $\mu g/l$ for acute exposures. While these criteria were proposed by EPA as acid soluble concentrations, the Board adopted these standards as total concentrations to correspond to the method of measurement required for NPDES (water discharge) permits.

In 1996, DEP made a presentation to the Board regarding DEP stream data collected since 1990. This data indicated that 87.6% of all total aluminum samples collected (3,293 samples) from various streams throughout the state exceeded the Board's chronic aquatic life aluminum criterion of 87 $\mu g/l$ total aluminum, and 28.5% of the stream samples exceeded the current acute aluminum aquatic life criterion of 750 $\mu g/l$ total aluminum.

In its presentation, DEP outlined that although the chronic and often the acute aluminum criteria were exceeded, the majority of these streams support large, diverse and healthy populations of aquatic life. Using the Board's criteria in place at that time, DEP would have been required to place the vast majority of West Virginia's streams on the State's 303(d) list despite the fact that these streams are healthy. Further, DEP expressed its belief that EPA's recommended acute and chronic aluminum criteria are overprotective and inappropriate for many streams in West Virginia.

DEP's original presentation provided the groundwork for the Board's reconsideration of its aluminum criteria. Based on this presentation, the Board requested additional data to support DEP's belief that streams were not being adversely affected by total aluminum concentrations in excess of the Board's criteria. In addition, the Board created an informal aluminum task force to evaluate available toxicity data on aluminum and possible alternative aluminum criteria.

During the 1997 triennial review, the Board reevaluated its aluminum criteria in detail. Much time was devoted during the Board's meetings to examining EPA's document setting forth its rationale for EPA's recommended aluminum criteria, as well as EPA's guidance document for preparing aquatic life water quality criteria. Based on this review, the Board determined that EPA's criteria were not scientifically justifiable. In fact, had EPA followed its own guidance document for preparing water quality criteria, the chronic aluminum criterion would be equal to the acute aluminum criterion of 750 μg/l.[1] Accordingly, the Board determined that EPA's recommended chronic aluminum criterion was technically deficient and should be removed from the state water quality standards.

This modification was approved by the West Virginia Legislature and was submitted to EPA for approval. However, the justification provided to the EPA for the deletion of the chronic criterion did not the detail of the large amount of science supporting the Board's decision to delete the chronic criterion. Instead, the rationale document submitted to EPA referred primarily to the large number of streams in West Virginia that violate the chronic criterion and the problems with issuing NPDES permits based upon the chronic criterion.

[1] The scientific justification for rejecting the chronic aluminum criterion is discussed in detail on pages 6 to 8 herein.

At the same time, DEP conducted its further study of the aluminum concentrations and aquatic life communities in West Virginia's streams. Following the Board's decision, DEP presented the results of its stream study to the Board in 1998. The study indicated that many streams in the State with total aluminum concentrations in excess of 87 $\mu g/l$ support healthy benthic communities. In addition, the study indicated that most of the streams with total aluminum concentrations in excess of 87 $\mu g/l$ had nondetectable or very low concentrations of dissolved aluminum.

In addition, the Board's informal work group continued its study of the Board's aluminum criteria. The research done by this work group clearly indicates that the dissolved fraction of the total aluminum concentration is the portion that is toxic to aquatic life.

On June 22, 1999, EPA Region III notified the Board that it was disapproving the Board's deletion of the chronic aluminum criterion. EPA stated that the Board had failed to provide EPA with a scientific rationale to support the deletion of the chronic criterion. EPA requested that the Board take one of the following actions: (1) readopt the chronic criterion of 87 $\mu g/l$ total aluminum, or (2) adopt an alternative chronic criterion that is scientifically defensible.

In 1999, the Board considered its alternatives to address EPA's disapproval of its deletion of the chronic aluminum criterion. A number of commenters requested that the Board provide a scientific justification for the deletion of the chronic criterion, and adopt a chronic criterion of 750 $\mu g/l$. Other commenters requested that the Board adopt dissolved aluminum criteria. After considering its alternatives, the Board decided that it would adopt dissolved aluminum criteria in place of the technically deficient total recoverable aluminum criteria. This revision was approved by EPA.

III. LITERATURE REVIEW

The rationale for revision of the chronic aluminum criteria is based in part on an evaluation of the content and validity of the Criteria Document as well as a literature review of recent studies performed regarding aluminum toxicity. The results of these efforts are outlined briefly in this section. The best scientific evidence demonstrates that, for streams which meet the West Virginia water quality standards for pH, a chronic criterion of 750 μg/l (0.75 mg/l) dissolved is scientifically justified and is protective of aquatic life.

A. EPA's Criteria Document

EPA's recommended aluminum criteria are set forth in EPA's *Ambient Aquatic Life Water Quality Criteria for Aluminum* (1988) ("Criteria Document"). During the 1997 triennial review, the Board received detailed comments demonstrating that EPA's chronic criterion of 87 μg/l is scientifically flawed.

In fact, EPA failed to follow its own guidance document, (*Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and their Uses* (1985). (the "Guidelines") for setting aquatic life criteria when it established the chronic aluminum criterion of 87 μg/l. If EPA had followed its guidance document, the chronic aluminum criterion would be equal to the acute criterion of 750 μg/l.

The data relied upon by EPA to justify the current chronic aluminum criterion of 87 μg/l is inadequate. Chronic criteria are typically calculated by determining the acute to chronic ratios for acutely sensitive species. In the case of aluminum, calculating the acute to chronic ratio for the most acutely sensitive species results in a chronic criterion which is *higher* than the acute criterion of 750 μg/l. According to the guidance document relied upon by EPA for calculating numeric criteria, in such instances the chronic criterion should be equal to the acute criterion of 750 μg/l.

Instead of doing this, EPA attempted to rely on an alternate method of establishing the chronic criterion. According to the *Guidelines*, EPA may adopt the species mean chronic value for a commercially or recreationally important species as the chronic criterion instead of using the calculated chronic value. In other words, EPA may adopt the chronic value for one particular species as determined in laboratory studies instead of a chronic criterion calculated from the chronic values for multiple species. In setting its chronic criterion, EPA rejected its calculated chronic criterion and instead relied on data from two studies to set the chronic criterion. (Cleveland, et al, 1986, on brook trout); (Buckler, et al., 1987 on striped bass). EPA's reliance on these two studies is seriously misplaced.

First, and most importantly, the *Guidelines* specify that a Species Mean Chronic Value for a commercially or recreationally important species may be adopted as the chronic criterion in place of a calculated chronic value. Neither of the two studies relied upon by EPA report final chronic values for brook trout or striped bass, and therefore cannot justify adopting a lower chronic criterion.

Second, the two studies had significant quality assurance and quality control deficiencies which made them inadequate for use in the actual calculation of the chronic and acute criteria, and in fact were excluded by EPA from those calculations. The Guidelines require that "[q]uestionable data, whether published or unpublished, should not be used." The dilution water in the striped bass study caused considerable mortality to 11-day-old fish (26%) and the 13-day-old fish (20% to 100% based on pH). The dilution water in the brook trout study caused an 11 percent mortality of juvenile brook trout in the pH 7.0 control group, and a 7.5 percent mortality in the pH 5.7 control group. The brook trout study monitored water quality in modified flow-through proportional diluters only once per week, which is insufficient to ensure constant water quality in the test chambers. Water quality in the striped bass study was monitored only twice per week. In addition, the brook trout study used a 0.1 μm filter in the dissolved aluminum measurement, while the applicable EPA analytical method requires the use of a 0.45 μm filter. While the striped bass study does not specify the filter size used, it was performed by the same scientists at virtually the same time and likely also used a 0.1 μm filter. This likely resulted in significantly lower aluminum concentrations than if they had been measured with a 0.45 μm filter.

Third, the studies are internally inconsistent. For example, toxicity tests on 160 day-old striped bass experienced 100% mortality at 349 μg/l. However, both 159 day-old and 190 day-old striped bass experienced 0% mortality at 390 μg/l, the highest concentration to which they were exposed. Surely, the results of this study for 160 day-old striped bass are suspect. The brook trout study was based on two separate exposure scenarios. However, the control groups between the two scenarios experienced very different mortalities at the same background aluminum concentration and virtually identical pH (10.8% at pH 7.0; 1.0% at pH 6.9).

Fourth, while neither study reports a final chronic value, both studies indicate that concentrations of aluminum significantly higher than 87 μg/l did not cause mortality. The striped bass study noted a significantly greater mortality only when aluminum concentrations exceeded 292 μg/l. Concentrations of aluminum as high as 390 μg/l did not cause mortality in striped bass based on the age of the fish, and aluminum concentrations at the maximum exposure of 300 ug/l had no apparent mortality to brook trout eggs and larva at a circumneutral pH.

Finally, the two studies do not correspond well to natural conditions in West Virginia streams. These studies generally were performed with water of low pH and low hardness. The water in the toxicity tests would violate West Virginia's water quality criteria for pH. The water in the brook trout study had an average hardness of 25 mg/l $CaCO_3$, with only 3 mg/l Ca^{+2}. Based on the water preparation method in the striped bass study, the water would be practically devoid of hardness. Other studies demonstrate that hardness plays an important role in mitigating the toxicity of aluminum. Further discussion of this issue is provided on pages 10 to 12 herein.

A letter from Eder Associates to EPA providing additional detail on the problems with these two studies and EPA's May 10, 1996, response are provided in Attachment A. In its response, EPA stated, "Available data indicates that aluminum is less toxic in waters having more typical hardness and neutral or higher pH, than in soft acidic waters. We are hoping to obtain sufficient data to rigorously account for this phenomenon." To date, no such work has been completed by EPA.

B. Recent Studies on Aluminum Toxicity

When EPA published the Criteria Document, EPA's recommended aluminum criteria were based on the limited information available at that time. Since then, a significant amount of new research has been conducted on aluminum bioavailability and toxicity. A literature review of recent studies on aluminum toxicity shows that it is the form and bioavailability of aluminum in the water column that determines its toxicity.

Assessments of fish, benthic macroinvertebrates, and other aquatic biota conducted under the auspices of the National Acid Precipitation Assessment Program ("NAPAP") clearly document that the amount of total recoverable aluminum within a given stream provides no meaningful information regarding aluminum toxicity. Instead, it is the form and bioavailability of the metal in the water column combined with the relevant chemical properties of surface waters (e.g., pH, acid neutralizing capacity, etc.) that determine aluminum toxicity. NAPAP Report 9 (Current Status of Surface Water Acid-Base Chemistry) and Report 13 (Biological Changes in Surface Water Acid-Base Chemistry).

These reports also outline that the single most important chemical parameter that determines the toxicity of aluminum is pH. If a stream has a seasonal or continuously low pH (<5.5-6.0) and little buffering capacity, then the form of aluminum present in the water column will generally be bioavailable, and if present in a high enough concentration, toxic. However, at a pH in the range from 6.6 to 8.8, the form of aluminum in the water column is not generally bioavailable or toxic. In other words, in those streams that meet the West Virginia water quality criteria for pH, the aluminum is not in the stream is not bioavailable and is not toxic to aquatic life.

The NAPAP literature also shows that many acidic surface waters with pH <5.5 have elevated concentrations of the toxic form of aluminum (i.e., inorganic monomeric aluminum). NAPAP Report 9. The studies referenced in these reports also show that measurements of labile monomeric aluminum serve as better predictors of potential biotic effects than do total aluminum concentrations.

The sum of the three primary forms of aluminum that make up the inorganic monomeric aluminum include the aluminum hydroxide complexes [$Al(OH)^{+2}$ and $Al(OH)^{+3}$] and the free aluminum ion (Al^{+3}). However, inorganic monomeric aluminum is generally not present in the water column at a higher pH range. At a pH >6.0, the monomeric aluminum converts to an insoluble precipitate. This relationship between increasing inorganic monomeric aluminum concentrations at pH<6.0 and very low inorganic monomeric aluminum concentrations at pH>6.0 is documented by Wigington, et al. (1996).

A recent comprehensive literature review confirms previous studies documenting that bioavailable aluminum acts as a gill toxicant to adult fish, and that this toxicity is manifested where the water column pH is low and the monomeric forms of aluminum are present. (Gensemer 1999). Further, scientists now have a much greater understanding of the mechanisms that cause toxicity at the gill surface than they did back in 1988 when EPA last updated its aluminum criteria document. In a paper presented at the 20th Annual Meeting of the Society of Environmental Toxicology and Chemistry (1999), Gensemer et al. speculated that calcium-related hardness reduced aluminum toxicity by stabilizing fish gills by out- competing Al for binding sites on the epithelial membrane.

Gensemer's review of the bioavailability and toxicity of aluminum in aquatic environments provides more than adequate documentation of the effect of pH on aluminum toxicity and further explains the problems with the chronic criterion in the Criteria Document. Gensemer's research also demonstrates that the criteria should be established based on dissolved aluminum concentrations. Further, Gensemer suggests that EPA should update the Criteria Document to address the ameliorating effects that water hardness, dissolved organic matter, and other water quality characteristics have on aluminum toxicity. EPA should initiate a thorough and comprehensive review and update of its Criteria Document.

Gensemer's review references a 1996 literature review by Donald W. Sparling and T. Peter Lowe. The Sparling and Lowe summary provides a detailed review of toxicity studies performed on plants, invertebrates, fish, and wildlife. The literature review states, "The toxicity of aluminum is intimately associated with pH in that the metal is soluble and biologically available in acidic (pH<5.5) soils and water but relatively innocuous in circumneutral (pH 5.5-7.5) conditions." The Sparling review indicates that aluminum toxicity is "greatly influenced by" alkalinity, acidity, calcium, dissolved organic carbon, and fluoride. Specifically, the Sparling review cites studies which indicate that small increases in calcium levels "can dramatically improve" alevin and adult survival of brown trout, brook trout, and rainbow trout when exposed to waters with low pH and elevated aluminum concentrations. The hardness-related protective mechanism was confirmed by Lyderson, et al. (2002), who tested the mitigating effect of ionic strength on the toxicity of aluminum in fish. Their study demonstrated that increasing the water ionic strength by adding Ca or Na reduced the toxic effect of aluminum. They concluded that Ca and Na mitigate the aluminum toxicity by their effect on the ability for aluminum to bind with the gill surface.

As set forth in the *Toxicology Profile for Aluminum* (1999), aluminum is the most abundant metal and third most abundant element, after oxygen and silicon, in the earth's crust. It is commonly found in soil, minerals, rocks, and clays. It also occurs as bauxite ore. Aluminum concentrations in soil can range from 0.07% by weight (700 ppm) up to and over 10% by weight (100,000 ppm). The typical concentration is around 7.1% by weight (71,000 ppm). *Most aluminum containing compounds do not dissolve much in water unless the water is acidic.*

Aluminum occurs ubiquitously in natural waters as a result of weathering of aluminum-containing clays, rocks, and minerals. The toxicological profile also states that aluminum can also be mobilized from terrestrial environments through acidification (e.g., seasonal snow melts, runoff into streams with low acid neutralizing capacity, or from acid mine drainage); however, at a pH>5.5, naturally occurring aluminum compounds exist predominantly in an undissolved form such as gibbsite, $Al(OH)_3$, or aluminosilicates. In the presence of high amounts of dissolved organic material, dissolved aluminum generally is not present in a form which will cause aquatic life impairment.

The toxicological profile also outlines study results conducted by Goenaga and Williams (1988), that, in general, decreasing the water pH (acidification) results in an increase in mobility of the monomeric (toxic) forms of aluminum. The predominant form at pH<4 is the hydrated trivalent aluminum ion. Between pH of 5 and 6, the predominant forms are $Al(OH)^{+2}$ and $Al(OH)_2^+$, while the solid $AL(OH)_3$ is most prevalent between pH 5.2 and 8.8 (Martell and Motekaitis 1989). The soluble species $Al(OH)_4^-$ is the predominant species above pH 9 and the only species above pH 10.

All available data indicates that bioavailable forms of aluminum at low pH can be toxic; however, aluminum is generally not going to be present in a toxic or bioavailable form in waters that are not violating the State's water quality standards for pH.

IV. OTHER STATE'S ALUMINUM CRITERIA

Attachment B provides a summary of the current EPA-approved aluminum criteria for all fifty States. This summary is based upon the information available on the EPA website and generally has not been confirmed by contacts to the States due to time constraints. In all, only nineteen states have adopted some form of aluminum criteria. Only five states have adopted both EPA's proposed chronic and acute criterion as total aluminum concentrations. Four additional states, including West Virginia, have adopted EPA's proposed chronic and acute aluminum concentrations as dissolved concentrations. The remaining ten states have a variety of different aluminum criteria. Of the remaining ten states, approximately five have adopted dissolved aluminum criteria, including Texas, Utah, and Missouri, which have no chronic criterion and an acute criterion of 750 ug/l or greater.[2]

Based on a survey of the states surrounding West Virginia and the EPA Region III states (collectively, Pennsylvania, Ohio, Kentucky, Virginia, Maryland, Delaware, and Washington, D.C.), only Pennsylvania and Delaware have adopted aluminum criteria. Delaware has adopted criteria of 87 $\mu g/l$ total aluminum for chronic exposures and 750 $\mu g/l$ for acute exposures. Pennsylvania has adopted a criterion of 750 $\mu g/l$ for chronic exposures.

Importantly, Pennsylvania formally rejected the chronic criterion of 87 $\mu g/l$ in 1999 because of the flawed science on which it is based. In 2001, EPA accepted Pennsylvania's rejection of the chronic criterion, stating specifically:

> Aluminum is considered a non-priority pollutant by EPA, and on that basis and the basis that EPA Region III recognizes the uncertainty surrounding the chronic aquatic life criteria, we will not recommend to the Administrator that she use her discretionary authority and promulgate the chronic aluminum aquatic life criterion at this time.

Copies of Pennsylvania's rationale for rejecting the chronic criterion and EPA's letter approving Pennsylvania's action are provided in Attachment C.

V. STREAM DATA

As mentioned previously, DEP's 2004 Draft Section 303(d) List includes 166 waters, comprising 2,090 stream miles, that are considered impaired pursuant to the chronic aluminum criteria. As presented to the Board in its past consideration of the aluminum criteria, many of the listed streams have thriving aquatic communities and have no physical signs of impairment.

The North Fork of the Cherry River, Cranberry River, Williams River, Cacapon River, Cheat River, Greenbrier River, and Opequon River are all listed on the draft 303(d) list because the dissolved aluminum concentrations exceed the chronic aluminum criterion. Yet all of these streams have a dissolved aluminum concentration below the 292 $\mu g/l$ concentration determined to not cause toxicity in the cited brook trout or striped bass studies.

These streams have thriving aquatic communities. DEP has extensive benthic studies demonstrating the health of the aquatic systems. In addition, detailed fish studies have been performed on the Cheat River watershed. This data shows little correlation

---

[2] The number of states with dissolved criteria is an approximation, because it was not clear in some circumstances whether the standards were based on dissolved or total recoverable concentrations.

between aluminum concentration and fish population. *See* Attachment D, which is a scatter diagram prepared by Dr. Todd Petty, Assistant Professor of Fisheries, WVU, based on Index of Biologic Integrity ("IBI") scores and dissolved aluminum data for streams in the Cheat River watershed. As stated previously, this 303(d) listing will require DEP to prepare a TMDL for these streams, despite their thriving aquatic communities. Clearly, this will detract from DEP's ability to use its limited resources for developing TMDLs on streams with actual impairment.

Importantly, the majority of streams in the State have much higher calcium concentrations and hardness than used in the toxicity studies for brook trout and striped bass. Calcium and hardness have been demonstrated to ameliorate the effect of aluminum in low pH waters. Calcium has been demonstrated to reduce the loss of other salts which are essential to maintaining sodium and potassium levels in fish. Sodium and potassium are the most important salts in fish blood. They are integral to normal heart, nerve and muscle function. Many of the toxicity studies performed on brook trout and striped bass were performed in extremely soft water ($\leq$25 mg/l $CaCO_3$). DEP has collected extensive data for streams across the State as part of its monitoring network. A summary of data for streams with dissolved aluminum concentrations greater than 75 μg/l is provided in Attachment E.[3] The summary contains more than 350 streams which have at least one dissolved aluminum concentration above 87 μg/l. Only 48 of these streams on the summary list have calcium concentrations <10 mg/l or a calculated hardness less than 25 mg/l $CaCO_3$.

About half of the streams in the summary with dissolved aluminum concentrations above 87 μg/l are in compliance with West Virginia's pH criteria. The effect of aluminum is dependent on the pH of the stream. The recent toxicity studies on aluminum have demonstrated that aluminum exacerbates the stress of low pH on the aquatic environment. The streams with pH<6 are already out of compliance with the pH criteria and therefore must be considered for 303(d) listing regardless of the aluminum concentrations.

[3]The more thorough and extensive data review provided to the Board by DEP is incorporated herein by reference.

Importantly, the aluminum included in the dissolved aluminum measurement may not actually be dissolved. The EPA method for analysis of dissolved aluminum utilizes a 0.45 μm filter, while the brook trout study cited in the criteria document used a 0.1 um filter. Small suspended and colloidal particles are capable of passing through a 0.45 μm filter. While the Board has historically taken the position that compliance with water quality standards should be based upon an EPA-approved method, the difference in filter size clearly affects the comparability of sampling results in the toxicity studies cited in the EPA Rationale Document and the DEP stream sampling results used in the draft 303(d) list.

Extensive review of stream data was also performed as part of the 1999 review of the aluminum criteria. The data review indicated that streams with concentrations of dissolved aluminum above 750 μg/l tend to have impaired aquatic communities, and that **elevated dissolved aluminum concentrations above 750 μg/l were encountered exclusively in streams with pH<6 and which therefore violate the State's water quality criteria for pH.** Only 3% of the 204 total streams analyzed had dissolved aluminum concentrations in excess of 87 μg/l which could not be attributable to a low pH.

VI. CONCLUSION

Based on the comments received by the Board both in 2004 and in past triennial reviews, the Board believes that a modification of the aluminum criteria is appropriate in light of the questions regarding the scientific validity of the 87 ug/l chronic criterion proposed by US EPA, the stream data presented by the Department of Environmental Protection, and the disparity between the current chronic criterion and the aluminum criteria adopted by other states, in particular those states surrounding West Virginia.

The aluminum criteria remain as dissolved concentrations. In 1999, the Board established that studies conducted in both the laboratory and in the field clearly demonstrate that the dissolved aluminum fraction is the toxic portion and that the particulate associated forms of aluminum are regarded as nontoxic. Thus, the most scientifically defensible alternative is to regulate only the dissolved (bioavailable) form of aluminum by establishing dissolved criteria.

Importantly, the current criteria do not address any of the water quality characteristics which exist in many West Virginia streams which mitigate aluminum toxicity. In addition, the EPA-approved method for dissolved aluminum measurements utilizes a 0.45 μm filter, which allows a considerable amount of particulate aluminum to pass through and therefore be included in the dissolved aluminum measurement. Most toxicity tests which measure a dissolved aluminum concentration utilize a 0.1 μm filter, which is a smaller portion of the total aluminum concentration.

A critical component of the Board's consideration is the study which has been planned to develop scientifically sound aluminum criteria for West Virginia. The modification to the aluminum criteria will allow all interested parties, including EPA, DEP, WV Division of Natural Resources, and all other interested parties, to develop and implement scientific studies to evaluate aquatic life effects of aluminum in state waters. However, the study must be completed in a timely manner. If no new criteria are promulgated on or before July 4, 2007, the chronic criterion of 87 ug/l will be reinstated for all waters of the State.

References

Buckler, D.R., *et al.*, Influence of pH on the Toxicity of Aluminum and Other Inorganic Contaminants to East Coast Striped Bass. Water Air Soil Pollut. 35 97-106, 1987.

Cleveland, L., *et al.*, Interactive Toxicity of Aluminum and Acidity to Early Life Stages of Brook Trout. Transactions of the American Fisheries Society. 115:610-620, 1986.

Gensemer, R.W. and Playle, R.C. The Bioavailability and Toxicity of Aluminum in Aquatic Environments. Critical Reviews in Environmental Science and Technology. 29(4):315-450, 1999.

Gensemer, R.W., R.C. Playle, W.A. Stubblefield and J.R. Hockett. 1999. Aluminum Bioavailability and Toxicity to Freshwater Biota at Circumneutral and Higher pH. 20th Annual Meeting of Society of Environmental Chemistry and Toxicology. Philadelphia

Goenaga X, Williams DJA. 1988. Aluminum speciation in surface waters from a Welsh upland area. Environ. Pollut. 52:131-149.

Lyderson, E., S. Oxnevad, K. Ostybe, R.A. Anderson, F. Bjerkely, L. A. Vollestad and A.B.S. Poleo. 2002. The Effect of Ionic Strength on the Toxicity of Aluminum to Atlantic Salmon (*Salmo salar*) Under Non-Steady State Chemical Conditions. J. Linmology, 61(1): 69-76.

Martell A. E., Mortekaitis R.J. 1989. Coordination chemistry and speciation of Al (III) in aqueous solution. In: Lewis T.E. ed. Environmental chemistry and toxicology of aluminum. Chelsea, MI: Lewis Publishers, Inc.

Muniz, I.P. and Leivstad, H. 1980. Acidification – effects on freshwater fish. In: Ecological Impact of Acid Precipitation: Proceedings of an International Conference, Sandfjord, Norway, March 11-14, 1980, pp. 84-92.

National Acid Precipitation Assessment Program, State of Science and Technology, Vol. II, 1990.

US Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Aluminum, July 1999.

Wigington, P.J., Jr., et al. 1996. Episodic Acidification of Small Streams in the Northeastern United States: Episodic Response Project. Ecological Applications, 6(2):374-388, 1996.

1310298

eder associates
environmental scientists and engineers

OFFICES:
Locust Valley, NY
Madison, WI
Ann Arbor, MI
Augusta, GA
Jacksonville, FL
Trenton, NJ
Tampa, FL

June 6, 1995
File #670-15

Margaret Stasokowski, Director
Health and Ecological Criteria Division
Mail Code 4304
United States Environmental Protection Agency
Washington, D.C. 20460

Re: Comments on the USEPA Ambient Water Quality Criteria for Aluminum

Dear Ms. Stasokowski:

This letter discusses the technical basis for USEPA's Ambient Water Quality Criteria for aluminum and suggests revisions to improve the technical justification for the criteria and its acceptance by the regulated community.

A paper mill that produces specialty fine papers retained us to evaluate a draft of its proposed NPDES permit renewal which includes a very strict aluminum limit. This mill and others in the industry use alum as a process chemical to produce high quality paper. The current stage of papermaking technology does not allow paper mills to eliminate aluminum without severe adverse impacts on product quality.

The chronic aluminum criteria (87 μg/ℓ) were developed from the USEPA report, "Ambient Water Quality Criteria for Aluminum - 1988", which, in turn, used the data and results from the paper, "Influence of pH on the Toxicity of Aluminum and Other Inorganic Contaminants to East Coast Striped Bass".[1] EPA's 87 μg/ℓ chronic criteria is based on the following assumptions from the Bucker paper:

- 160-day-old striped bass
- A pH of 6.5
- Seven-day test duration
- No mortality value

[1] Bucker, D.N., P.M. Mehrle, L. Cleveland, and F.J. Dwyer. 1987. "Influence of pH on the Toxicity of Aluminum and Other Inorganic Contaminants to East Coast Striped Bass." *Water, Air, and Soil Pollution*, 35: 97-106.

Continued . . .

We reviewed this paper and noticed that the dilution water used for the test exhibited severe toxicity which, under reasonable scrutiny, would render the test results invalid, and that identical experiments yielded different toxicity results.

USEPA should reconsider and reevaluate the aluminum criteria and the technical basis used to develop the criteria, and how USEPA used the reports to justify the criteria. Papers published after the 1988 water quality criteria indicate the strong relationship between aluminum toxicity, pH, solids content, organic compounds, and hardness[2]. Many of these relationships were not taken into account and are not reflected in the criteria. USEPA should consider all relevant toxicity information, that aluminum is a very common and ubiquitous compound and that alum, an aluminum derivative, is a major industrial chemical, and review the aluminum toxicity issue to address the following:

- That its criteria are based on sound scientific data.
- That its criteria could be adjusted depending on site conditions.
- That the societal benefits derived from enforcing the criteria at least balance the cost burden.

The following aspects of our evaluation should be of interest to you:

- Table 1 shows the mortality of 11- and 13-day-old striped bass exposed to 0, 131, and 393 µg/ℓ of aluminum at pH values from 5.0 to 7.2. The dilution water itself caused a 28 percent mortality for 11-day-old fish at pH 7.2, and 100 percent mortality at pH 5.5. The dilution water also caused 20 percent mortality of 13-day-old fish at pH 7.2; 52 percent mortality at pH 6.5; and 100 percent mortality at pH 5.5.

---

2 Curtis, L.R., and Seim, W.K. 1992. "Calcium and Organic Acids as Determinants of Aluminum Toxicity at Alkaline and Neutral pH." Final Report for the Aluminum Association, Inc.

Gundersen, D.T., Bustaman, S., Seim, W.K., and Curtis, L.R. 1994. "pH, Hardness, and Humic Acid Influence Aluminum Toxicity to Rainbow Trout *(Oncorhynchus mykiss)* in Weakly Alkaline Waters." *Can. J. Fish. Aquat. Sci.*, 51: 1345-1355.

Continued . . .

These results indicate that the dilution water itself was very toxic to fish with the toxicity increasing at lower pH values without the addition of aluminum.

- Table 2 shows mortality data for 159- and 195-day-old striped bass exposed to 0 and 390 µg/ℓ of aluminum at pH values 5.5, 6.5, and 7.2. There were no fish mortalities at the 390 µg/ℓ concentration at pH values of 6.5 (the pH value used for the Water Quality Criteria) and 7.2. These conditions are similar to those used to develop the Water Quality Criteria, and show that an aluminum concentration as high as 390 µg/ℓ had no effect on fish mortality.

- Table 3 shows the mortality of 11-day-old striped bass exposed to a "logarithmic" series of aluminum concentrations. The dilution water itself, without aluminum, caused a 26 percent mortality at pH 7.2. Similar mortalities (approximately 26 percent) were observed at this pH at all aluminum concentrations from 0 to 179 µg/ℓ. The toxicity of the dilution water itself was confirmed at the lower pH-value tests.

  The test was also done on 160-day-old striped bass using the same dilution water. The dilution water did not cause any mortality at pH 7.2 and 6.5. At pH 6.5, an aluminum concentration of 174 µg/ℓ caused a 58 percent mortality, but a concentration of 87 µg/ℓ (the Water Quality Criteria value) caused 0 percent mortality. These results contradict the Table 2 results that show no mortality at a much higher aluminum concentration (390 µg/ℓ). The fact that the dilution water was not lethal to the older fish, notwithstanding, the test was effectively invalidated as a scientific method when the dilution water killed the juvenile fish.

- The dilution water used in the Bucker study was groundwater "purified" in a commercial water softener, then by reverse osmosis, and finally by an anionic, cationic, and mixed-bed ion exchange system. This water would be very soft and almost free of hardness, and can hardly characterize the general range of conditions in receiving waters. Recent tests show that hardness greatly affects aluminum toxicity, the lower the hardness, the higher the toxicity.

Continued . . .

USEPA used a questionable and perhaps invalid database to set the National Criteria because identical experiments by the same researcher using the same dilution water did not give similar results.

EPA's stated policy in deriving the aquatic life criteria[3] is as follows (underlined for emphasis):

> *"Questionable data, whether published or unpublished, should not be used. Examples would be data from tests that did not contain a control treatment, tests in which too many organisms in the control treatment died or showed signs of stress or disease, and tests in which distilled or deionized water was used as the dilution water without addition of additional salts."*

> *"Data should be rejected if obtained by using ... organisms that were previously exposed to substantial concentrations of the test material or other contaminants."*

> *"Questionable data, data on formulated mixtures and emulsified concentrations, and data obtained with nonresident species or previously exposed organisms may be used to provide auxiliary information but should not be used in the derivation of criteria."*

The conclusion to be drawn from USEPA's Criteria and Policy is that one invalidates the other. If the Policy stands, the Criteria cannot; if the Criteria stands, the Policy cannot.

Summary

- The Aluminum Water Quality Criteria must be based on representative receiving waters and the representative fish species. The dilution water must not be toxic.

---

[3] USEPA, 1994. "Appendix H: Derivation of the 1985 Aquatic Life Criteria." Water Quality Standards Handbook, Second Edition.

Continued . . .

- The pH in most U.S. receiving waters is in the range of near neutrality to basic. Aluminum toxicity depends on pH, and the criteria should be based on a neutral pH.

- In addition to pH, aluminum toxicity also depends on total suspended solids (TSS), total organic carbon (TOC), and hardness. Recent studies have shown that the higher the TSS, the TOC, and the hardness concentrations, the lower the aluminum toxicity. Aluminum adsorbs on solids, decreasing its availability in the dissolved fraction and only a part of the dissolved fraction is bioavailable. Studies at low pH values showed that calcium hardness can decrease the toxicity of aluminum. The tests used to set the National Criteria were conducted at low calcium hardness which increases the toxicity of aluminum. The aluminum criteria should be hardness dependent as are the other metals in the National Criteria.

- Metals toxicity relates to the dissolved fraction and EPA is issuing dissolved metals criteria using the dissolved metal concentrations measured during the same tests used to develop the National Criteria. Dissolved aluminum was not measured during these tests and a site-specific aluminum criterium cannot be developed applying the chemical translator ratio (CTR) used for other metals.

- The references cited in EPA's aluminum criteria document concluded that aluminum could be toxic to aquatic life. The regulated community does not object to discharge limits when they are based on sound scientific data that demonstrate the need for and benefit derived from the criteria. Establishing a criteria that does not provide any measurable environmental benefit, but raises compliance costs, cannot be justified. Alum, an aluminum-bearing chemical, is commonly used by municipalities to treat drinking water and by industry to treat process and effluent water. Establishing an unjustifiably low limit that cannot be achieved will surely have an adverse impact on the ability of the affected firms to survive in a competitive environment, especially when many firms operate at the brink of loss.

- In the absence of specific aluminum criteria, discharges must comply with acute and chronic toxicity limits. Since the toxicity tests would determine

Continued . . .

whether the effluent contains compounds toxic to aquatic life, the aluminum limit is effectively redundant. Chemicals may have synergistic, antagonistic, or additive effects which are indicated by toxicity tests. The effects of chemical-specific testing are generally unpredictable and the toxicity testing specified in permits should be the regulatory requirement.

I hope that these comments are useful in EPA's reevaluation of the aluminum criteria and in developing a criteria based on sound scientific evidence.

Please call if you have any questions or if you would like to discuss the aluminum criteria issues.

Very truly yours,

EDER ASSOCIATES

Kyriacos M. Pierides, Ph.D.
Project Engineer

KMP/bl

cc: C. Delos
B. Cleveland
L. Eder

BL1194

TABLE 1

MORTALITY (%) AND STANDARD DEVIATIONS, IN PARATHESES, OF STRIPED BASS EXPOSED TO Al AT VARIOUS pHs FOR SEVEN DAYS

Age and pH	Nominal Al Concentration, $\mu g/\ell^{(a)}$		
	0	300	100
11 day-old			
7.2	28 (16)	100[b] (0)	—
5.5	100[b] (0)	100[b] (0)	—
5.0	100[b] (0)	100[b] (0)	—
13 day-old			
7.2	20 (11)	—	75[b] (20)
6.5	52[b] (20)	—	97[b] (5)
5.5	100[b] (0)	—	100[b] (0)

NOTES:

(a) Measured values averaged 130.9 percent of nominal.

(b) Significantly greater than pH 7.2 control treatment ($p \leq 0.05$).

TABLE 2

MORTALITY (%) AND STANDARD DEVIATIONS, IN PARATHESES, OF STRIPED BASS EXPOSED TO Al AT VARIOUS pHs FOR SEVEN DAYS

Age (days)	Nominal Al concentration ($\mu g/\ell$)[a] and pH					
	pH 7.2		pH 6.5		pH 5.5	
	0	300	0	300	0	300
159	0 (0)	0 (0)	0 (0)	0 (0)	22[b] (11)	100[b] (0)
195	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	100[b] (0)

NOTES:

(a) Measured values averaged 130.1 percent of nominal.

(b) Significantly greater than pH 7.2 control treatment ($p \leq 0.05$).

TABLE 3

MORTALITY (%) AND STANDARD DEVIATIONS, IN PARATHESES, OF STRIPED BASS EXPOSED TO Al AT VARIOUS pHs FOR SEVEN DAYS

Age and pH	Nominal Al concentration, $\mu g/\ell^{(a)}$ 0	25	50	100	200	400
11 day-old						
7.2	26 (13)	16 (6)	20 (9)	14 (8)	26 (10)	96[(b)] (6)
6.5	21 (13)	58[(b)] (29)	80[(b)] 20	36[(b)] (12)	97[(b)] (7)	–
6.0	98[(b)] (4)	94[(b)] (15)	100[(b)] (0)	99[(b)] (2)	100[(b)] (0)	–
160 day-old						
7.2	0 (0)	0 (0)	0 (0)	0 (0)	2 (4)	100[(b)] (0)
6.5	0 (0)	8 (11)	0 (0)	0 (0)	58[(b)] (32)	–
6.0	2 (4)	0 (0)	38[(b)] (4)	98[(b)] (4)	100[(b)] (0)	–

NOTES:

(a) Measured values averaged 89.5 and 87.2 percent of nominal, for tests with 11- and 160-old fish, respectively.

(b) Significantly greater then pH 7.2 control treatment ($p \leq 0.05$).

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

RECEIVED AT EA MAY 21 1996

670-15

OFFICE OF WATER

MAY 10 1996

Kyriacos M. Pierides, Ph.D.
Eder Associates
Environmental Scientists and Engineers
480 Forest Avenue
P.O. Box 707
Locust Valley, NY 11560-0707

Dear Mr. Pierides:

Thank you for your letter of June 6, 1995, regarding the aquatic life criterion for aluminum. You have expressed concern about the appropriateness of the aluminum criterion, when applied to situations where the pH, hardness, and other water quality parameters differ from those occurring in toxicity tests used to set the criterion.

The basis for the aluminum criterion is presented in the "Ambient Water Quality Criteria for Aluminum - 1988" (EPA 440/5-86-008). If the Agency had relied on the toxicity tests tabulated in Tables 1 and 2 (and summarized in Table 3) of the document, the Final Chronic Value would have been 748 µg/L, as indicated on page 22. For the more sensitive species, all of the toxicity tests in Tables 1 and 2 were performed at hardness above 45 mg/L. A few of the tests were performed at pH 6.5-6.6. These test results, however, were averaged with other tests conducted at pH 7 or higher.

Table 6 of the document presents data from toxicity tests that were non-standard in some way, generally because the test duration, observed endpoint, or dilution water were unusual. As discussed on page 6 of the document, two sets of tests, by Cleveland et al. and by Buckler et al., using brook trout and striped bass, respectively, in very soft, acidic water (hardness <10-12, pH 6.5-6.6), indicated substantial toxicity occurring at concentrations around 170 µg/L, but little toxicity at 87 µg/L. To protect these recreationally or commercially important species, the Final Chronic Value was lowered to 87 µg/L, EPA's current chronic criterion.

Subsequent testing of rainbow trout by Don Mount, for the purpose of determining Water-Effect Ratios at certain sites, has tended to support the Cleveland et al. and Buckler et al. results, indicating substantially enhanced toxicity at very low hardness and pH. Consequently, we believe that the chronic criterion should ordinarily be appropriate for waters of such low hardness and pH, provided that the aluminum is not occluded in or sorbed by minerals, clays, or sand, or other particulate matter, as discussed on page 11 of the criteria document.

Available data indicate that aluminum is less toxic in waters having more typical hardness and neutral or higher pH, than in soft acidic waters. We are hoping to obtain sufficient data to rigorously account for this phenomenon. We have been talking with Donald Mount and Dominic DiToro, who represent a consortium of dischargers interested in generating data that EPA can use to revise its aluminum criterion. We are hopeful that through this cooperative effort we will be able to produce a criterion that can be applied with confidence across a wider range of hardness and pH, without need for major site-specific criteria adjustments. If sufficient data are available to account for other water quality parameters, such as organic carbon, we will consider this information as well.

During the course of this work, we intend to maintain an open process, through which the public and the states can communicate their concerns and submit additional data for consideration. We will thus keep you informed about future progress on the aluminum criterion. If you have questions, do not hesitate to continue calling Charles Delos of my staff at 202-260-7039.

Sincerely,

Margaret J. Stasikowski, Director
Health and Ecological Criteria Division

Summary of State Aluminum Criteria			
STATE	ALUMINUM		DESCRIPTION OR QUALIFIERS
	ACUTE (ug/l)	CHRONIC (ug/l)	
Region 1			
Connecticut	N/A	N/A	
Maine	N/A	N/A	
Massachusetts	N/A	N/A	
New Hampshire	750	87	
Rhode Island	750	87	for waters with pH between 6.5 and 9
Vermont	N/A	N/A	
Region 2			
New Jersey	750	87	for the Delaware River Estuary
New York	N/A	100	ionic (dissolved)
Region 3			
Delaware	750	87	
Maryland	N/A	N/A	
Pennsylvania	750	N/A	
Virginia	N/A	N/A	
Washington, DC	N/A	N/A	
West Virginia	750	87	dissolved
Region 4			
Alabama	N/A	N/A	
Florida	N/A	N/A	
Georgia	N/A	N/A	
Kentucky	N/A	N/A	
Mississippi	N/A	N/A	
North Carolina	N/A	N/A	
South Carolina	N/A	N/A	
Tennessee	N/A	N/A	
Region 5			
Illinois	N/A	N/A	
Indiana	N/A	N/A	
Michigan	N/A	N/A	
Minnesota	750	87	for Class 2A
	1072	125	for Class 2B
Ohio	N/A	N/A	
Wisconsin	N/A	N/A	
Region 6			
Arkansas	N/A	N/A	
Louisiana	N/A	N/A	
New Mexico	750	87	dissolved
Oklahoma	N/A	N/A	
Texas	991	N/A	dissolved
Region 7			
Iowa	1106	87	for coldwaters
	4539	388	for warmwaters
Kansas	N/A	N/A	
Missouri	750 ug/l	N/A	dissolved
Nebraska	750	87	dissolved

STATE	ALUMINUM		DESCRIPTION OR QUALIFIERS
	ACUTE	CHRONIC	
Region 8			
Colorado	750	87	dissolved
Montana	N/A	N/A	Has 3 temporary site specific WQS
North Dakota	N/A	N/A	
South Dakota	N/A	N/A	
Utah	750	87	dissolved; 87 ug/l will not apply when pH >1 and hardness > 50 ppm as CaCO3
Wyoming	750	87	87 ug/l will not apply when pH >7 and hardness > 50 ppm as CaCO3; proposed to convert to dissolved
Region 9			
Arizona	N/A	N/A	
California	N/A	N/A	has site specific site criteria
Hawaii	750	260	dissolved
Nevada	N/A	N/A	
Region 10			
Alaska	750	87	
Idaho	N/A	N/A	
Oregon	N/A	N/A	Not yet been approved by EPA
Washington	N/A	N/A	

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

AUG 0 2 2001

Honorable David E. Hess
Pennsylvania Department of Environmental Protection
Rachel Carson State Office Building
P. O. Box 2063
Harrisburg, PA 17105-2063

Dear Secretary Hess:

The Pennsylvania Department of Environmental Protection (PADEP) finalized new and revised water quality standards by publishing the revised regulation in the *Pennsylvania Bulletin* on November 18, 2000. Pennsylvania's Independent Regulatory Review Commission had approved the new regulations on August 24, 2000. The Department of Environmental Protection's Office of Chief Counsel certified on December 13, 2000, that these regulatory changes were adopted pursuant to the Commonwealth's legal procedures, and that the Office of Attorney General and the Governor's Office of General Counsel had also approved the final regulatory changes for form and legality. The revised water quality standards and supporting material were forwarded to the United States Environmental Protection Agency (EPA) for review in accordance with Clean Water Act (CWA) Section 303(c)(2)(A) on December 15, 2000. This package was received by EPA Region III on December 20, 2000.

EPA Region III has completed its review of Pennsylvania's new or revised water quality standards. EPA hereby approves the Pennsylvania WQS submission as consistent with the requirements of the CWA and 40 CFR Part 131. EPA is impressed with the scope of this submission, and would like to commend especially the Department for its revisions to address the way that ambient concentrations and natural background levels are considered with regard to water quality criteria. EPA also appreciates Pennsylvania's change in rounding so that criteria are now rounded to two significant digits. Enclosures 1 (Chapter 93) and 2 (Chapter 16) to this letter list all sections of the new and revised regulations that are being approved in accordance with CWA Section 303(c)(3) and 40 CFR Part 131. Enclosure 3 provides additional detail on several approved provisions.

At this time, EPA is approving Pennsylvania's revision to its bacteria criteria, which are more stringent than its previous bacteria criteria and, therefore, consistent with Section 303(c) of the CWA requirements. However, the Commonwealth should be aware that in 1986, EPA published the *Ambient Water Quality Criteria for Bacteria*, which recommended that *Escherichia coli (E. coli)* and enterococci are the best indicators to determine potential risk from acute gastrointestinal disease. EPA is pursuing a national effort to have states adopt these indicators. In addition, the new Beach Act amendment to the CWA requires states with coastal and Great

Lakes waters to adopt these indicators by 2004. We ask that Pennsylvania enter into a management agreement with EPA Region III to accomplish this goal as soon as possible.

With its triennial review, Pennsylvania submitted the new Chapter 96 (Water Quality Standards Implementation) for our reference and general information, rather than for EPA review. As this chapter was not submitted for our review, we will not be approving or disapproving specific provisions. However, we do have several comments on this chapter that EPA will be providing to the Commonwealth under a separate letter.

As part of EPA's obligation under the Endangered Species Act (ESA), EPA prepared a biological evaluation to determine if our approval of the new and revised sections of the water quality standards will adversely affect threatened and endangered species and their critical habitat in Pennsylvania. Our biological evaluation found that our approval action would not adversely affect threatened or endangered species. We have shared this biological evaluation with the Fish and Wildlife Service and the National Marine Fisheries Service and they concurred with our finding on May 21, 2001 and May 15, 2001, respectively. We are enclosing a copy of the evaluation (Enclosure 4) for your information. The completion of the biological evaluation and concurrence from the Services fulfills our obligation under Section 7 of the ESA on this federal action.

We are looking forward to working with you and your staff on the management agreement regarding Pennsylvania's revisions to its bacteria criteria and on the Commonwealth's next triennial review. If you have any questions, please feel free to contact me or have your staff contact Cynthia Yu-Robinson at (215) 814-5557.

Sincerely,

Rebecca W. Hammer

Rebecca W. Hammer, Director
Water Protection Division

Enclosures (4)

cc: Larry Tropea (PADEP)
Terry Fabian (PADEP)
Fred Marrocco (PADEP) ✓
Edward Brezina (PADEP)
Carol Young (PADEP)
David Densmore (US FWS)
Tim Goodger (NMFS)

EPA has decided to approve the Pennsylvania adoption of the aquatic life criterion for mercury as inorganic. The main basis for our decision is that, regardless of the form of the criterion that is specified, at this time all EPA-approved methods for monitoring mercury measure for total mercury. According to a March 16, 2001, letter from the Commonwealth, no translator procedures or other methodology is used to reduce the analytical monitoring results in any way. Therefore, EPA finds that Pennsylvania will be applying its mercury criterion in a protective manner.

We would like to continue discussions with Pennsylvania on this topic, and will pass along information as to the toxic effects of methyl mercury as it becomes available. Should additional methods become available which allow for distinguishing between total and inorganic mercury, EPA would revisit this approval.

Aquatic Life Aluminum

In 1994, EPA disapproved Pennsylvania's aluminum criteria. In order to address that disapproval, Pennsylvania adopted EPA's recommended aquatic life criterion for protection from acute exposures. EPA had requested that the Commonwealth adopt the chronic number as well, or provide a rationale as to why it did not. The Commonwealth did not adopt the chronic criterion, and in response expressed their discomfort with the EPA chronic recommendation, citing the chronic toxicity test results that showed inconsistencies within tests and between studies. Pennsylvania also objected to the lowering of the final chronic value based on the protection of brook trout and striped bass, noting that EPA had previously asserted that these data should not be used in the criterion development.

Aluminum is considered a non-priority pollutant by EPA, and on that basis and the basis that EPA Region III recognizes the uncertainty surrounding the chronic aquatic life criteria, we will not recommend to the Administrator that she use her discretionary authority and promulgate the chronic aluminum aquatic life criterion at this time. However, should additional information become available, or if there are indications that aquatic species in the Commonwealth are being impacted by chronic levels of aluminum, EPA Region III may reconsider this position.

Appendix A: Water Quality Criteria for Toxic Substances

With the exception of a few parameters noted below, this biological evaluation will not address the appropriateness of aquatic life criteria established based on EPA recommendations. All of these parameters will be considered under the national consultation on water quality criteria called for under the recent ESA MOA. As stated in the ESA MOA, separate consultation on criteria that are identical to or more stringent than the existing 304(a) criteria, will not be necessary, subject to requirements related to reinitiation of consultation under 50 CFR 402.16. EPA's approval action on these criteria is subject to revision based on the results of the consultation.

Aluminum

This criterion had been previously disapproved by EPA when it was located in Chapter 93. In order to address the disapproval, Pennsylvania adopted EPA's acute aquatic life recommendation in Chapter 16. Pennsylvania adopted the EPA recommendation for the protection of aquatic life from acute exposures (the appropriateness of the acute criterion will be addressed under the national consultation), but did not adopt EPA's chronic recommendation. The Department believes that the federal aluminum chronic criterion of 87ug/l should not be adopted because it is based on chronic toxicity test results that show inconsistencies within tests and between studies, and it question the supporting data on which the chronic criterion has been based. Pennsylvania indicates that the chronic studies described in the 1988 Ambient Water Quality Criteria for Aluminum do not reveal a consistent pattern of toxicological response to the different exposure concentrations within and/or between the various tests described, and that the final chronic value should be equal to the Criterion Maximum Concentration (CMC) since, based on available acute-chronic ratios, the final FACR should be 0.9958. According to EPA's criteria development guidance, the FACR cannot be less than two so that a final chronic value cannot exceed the CMC. However, EPA lowered the final chronic value to 87 ug/l, saying it was necessary to protect brook trout and striped bass.

The issues surrounding the chronic aluminum criterion are not new, and EPA Region III is not taking issue with Pennsylvania's lack of a criterion at this time. We do not believe that the absence of the chronic criterion will be adversely affect threatened and endangered species in Pennsylvania. Our reasoning is that the two specific species that the chronic criterion was lowered to protect, brook trout and striped bass, are not threatened or endangered. Also, if Pennsylvania finds that other species are being adversely effected by chronic exposures to aluminum, they could use the general criteria to develop a protective criterion.

Mercury

Pennsylvania has adopted EPA recommendations to protect aquatic life from mercury. EPA specifies in its *National Recommended Water Quality Criteria-Correction* (April 1999) that while the mercury criterion was developed based upon data for only inorganic mercury, it should be applied to total mercury. If not, depending upon the amount of organic mercury in the water

The Pennsylvania

RULES AND REGULATIONS

Title 25--ENVIRONMENTAL PROTECTION

ENVIRONMENTAL QUALITY BOARD

[25 PA. CODE CHS. 92, 93 AND 95--97]

Water Quality

[30 Pa.B. 6059]

The Environmental Quality Board (Board) is amending Chapters 92, 93, 95 and 97, and adding new Chapter 96, as set forth in Annex A. This notice is given under Board order at its meeting of June 20, 2000.

A. *Effective Date*

These amendments will be effective upon publication in the *Pennsylvania Bulletin* as final rulemaking.

B. *Contact Persons*

For further information on Chapters 92 and 97 (relating to National Pollutant Discharge Elimination System; and industrial wastes), contact Milton Lauch, Chief, Division of Wastewater Management, Bureau of Water Quality Management, 11th Floor, Rachel Carson State Office Building, P. O. Box 8465, Harrisburg, PA 17105-8465, (717) 787-8184, or William J. Gerlach and William S. Cummings, Jr., Assistant Counsels, Bureau of Regulatory Counsel, 9th Floor, Rachel Carson State Office Building, P. O. Box 8464, Harrisburg, PA 17105-8464, (717) 787-7060.

For further information on Chapters 93, 95 and 96 (relating to water quality standards; wastewater treatment requirements; and water quality standards implementation), contact Edward R. Brezina, Chief, Division of Water Quality Assessment and Standards, Bureau of Watershed Conservation, 10th Floor, Rachel Carson State Office Building, P. O. Box 8555, Harrisburg, PA 17105-8555, (717) 787-9637 or William J. Gerlach, Assistant Counsel, Bureau of Regulatory Counsel, 9th Floor, Rachel Carson State Office Building, P. O. Box 8464, Harrisburg, PA 17105-8464, (717) 787-7060.

Persons with a disability may use the AT&T Relay Service by calling (800) 654-5984 (TDD users) or (800) 654-5988 (voice users) and request that the call be relayed. These final-form regulations are available electronically through the Department of Environmental

Protection's (Department) website (http://www.dep.state.pa.us).

C. *Statutory Authority*

These amendments are made under the authority of the following acts: sections 5(b)(1) and 402 of The Clean Streams Law (35 P. S. §§ 691.5(b)(1) and 691.402) and section 1920-A of The Administrative Code of 1929 (71 P. S. § 510- 20), which grant to the Board the authority to develop and adopt rules and regulations to implement the provisions of The Clean Streams Law (35 P. S. §§ 691.1--691.1001).

D. *Background and Summary*

This final rulemaking revises water quality management regulations including Chapters 92, 93, 95 and 97, and creates a new Chapter 96 to incorporate Total Maximum Daily Loads (TMDLs) into the regulatory calculus, all as part of the Regulatory Basics Initiative (RBI). The RBI is a multistep process to evaluate regulations considering several factors including whether requirements are more stringent than Federal regulations without good reason; impose economic costs disproportionate to the environmental benefit; are prescriptive rather than performance-based; inhibit green technology and pollution prevention strategies; are obsolete or redundant; lack clarity; or are written in a way that causes significant noncompliance.

These regulatory revisions streamline and clarify regulatory requirements, update the regulations to be consistent with Federal regulatory changes where indicated, consolidate certain chapters, and preserve Pennsylvania-specific requirements to serve the citizens of this Commonwealth. These final-form regulations may affect persons who discharge wastewater into surface waters of this Commonwealth or otherwise conduct activities which may impact these waters.

The Air and Water Quality Technical Advisory Committee (AWQTAC) and its successor committee, the Water Resources Advisory Committee (WRAC), provided input on the proposed amendments. The proposal was adopted by the Board as proposed rulemaking at its June 16, 1998, meeting. The proposal appeared at 28 Pa.B. 4431 (August 29, 1998), with provisions for a 60-day public comment period and three public hearings. The public comment period concluded on October 28, 1998. In response to the public comments received on the proposal, the Department revised the proposal in the form of an Advance Notice of Final Rulemaking (ANFR) proposal. Notice of the availability of the ANFR appeared at 29 Pa.B. 4872 (September 18, 1999) with provisions for a public comment period open until November 17, 1999, and three public meetings/hearings. The Department received approximately 1,500 public comments on the ANFR. The comments received on the proposed regulations and on the draft final regulations are summarized in Section E of the Preamble.

The Board has considered all of the public comments received on both its proposed rulemaking and the Department's ANFR in preparing these final-form regulations. Those portions of the draft final-form regulations that would potentially affect agriculture were presented to the Agricultural Advisory Board (AAB) on February 16, 2000. Following the meeting, the AAB sent a letter to Secretary Seif in opposition to the existing regulatory requirements concerning public hearings for individual NPDES permit applications for existing concentrated animal feeding operations (CAFOs) in High Quality and Exceptional

Value Waters. The draft final-form regulations were discussed with and approved by WRAC on March 8, 2000. WRAC also submitted minutes of its meeting to document its comments on the regulations. The valuable input from the public and the collective knowledge and experience drawn from advisory committees and others on these proposals has been utilized to develop a regulation which carefully balances the needs of citizens and the regulated community in assuring the protection of this Commonwealth's waters.

E. *Summary of Comments and Responses on the Proposed Rulemaking and the ANFR*

These regulatory revisions streamline, clarify and consolidate the regulatory requirements. Specifically, Chapter 92 has been modified to incorporate portions from other chapters to address the permitting of wastewater discharges into surface waters. The water quality standards implementation provisions in Chapter 93 and portions of Chapter 95 are moved to Chapters 96 and 92, as appropriate. Chapter 96 incorporates existing and modified provisions of Chapters 93, 95 and 97, and includes language describing TMDLs and individual water quality-based effluent limitations. The provisions of Chapter 97 have been relocated to Chapters 92, 95 and 96.

The preamble to the proposed rulemaking asked for comment on three specific issues. 1) A few comments were received on the question of additional public participation for NPDES permitting. The comments were split on the issue, and no change has been made to the current requirements. 2) The question of whether or not the potable water supply use should continue to be a Statewide use, or if it should be changed so that applicable water quality criteria are only applied at existing or planned potable water supply intakes, received several comments on both sides. Some comments stated that additional burdens were placed on dischargers to meet criteria more stringent than necessary, and other comments believed that protection of human health and water supplies were the most important factors in the decision. Based on an analysis of public comments and on the basis that the potable water supply use has been protected Statewide for many years and will impose no new requirements on dischargers, no change is being made to the potable water supply use, and the current language is retained. 3) No one commented on the request seeking alternative methods of analysis for color.

Because portions of this regulatory package constitute the Triennial Review of Water Quality Standards mandated by Envirnomental Protection Agency (EPA) regulations in 40 CFR Part 131 (relating to water quality standards), the following considerations were made. Part of the review requires that states reexamine waterbody segments that do not meet the fishable or swimmable uses specified in section 101(a)(2) of the Federal Clean Water Act (33 U.S.C.A. § 1251(a)(2)). The Department evaluated the two waterbodies where the uses are not met: (1) the Harbor Basin and entrance channel to Outer Erie Harbor/ Presque Isle Bay and (2) several zones in the Delaware Estuary.

The swimmable use designation was deleted from the Harbor Basin and entrance channel demarcated by United States Coast Guard buoys and channel markers on Outer Erie Harbor/Presque Isle Bay because boat and shipping traffic pose a serious safety hazard in this area. This decision was based on a use attainability study in 1985. Because the same conditions exist today, no change to the designated use for Outer Erie Harbor/Presque Isle Bay is made.

The Department cooperated with the Delaware River Basin Commission (DRBC), EPA and other DRBC signatory states on a comprehensive use attainability study in the lower

Delaware River and Delaware Estuary. This study resulted in appropriate recommendations relating to the swimmable use, which the DRBC included in water use classifications and water quality criteria for portions of the tidal Delaware River in May 1991. Criteria for enterococcus and changes in application to the fecal coliform criteria in this area reflect the use. The changes were incorporated into §§ 93.9e and 93.9g (relating to Drainage Lists E and G) in 1994. The primary water contact use remains excluded from the designated uses for river miles 108.4 to 81.8 because of continuing significant impacts from combined sewer overflows.

The Department is also incorporating §§ 92.8a(c), 92.13(b), 92.21(b)(5) and 92.55 into its water quality standards. This clarifies the Department's ability to incorporate schedules of compliance in NPDES permits when a Federal statutory deadline has passed pursuant to the decision in *In the Matter of Star-Kist Caribe, Inc.*, NPDES Appeal No. 88-5, 1990 NPDES LEXIS 4 (April 16, 1990).

In addition, an error in § 93.9p (relating to Drainage List P) for Tunungwant Creek in McKean County, which states that the water contact sport use (WC) should be deleted for the main stem portion from the confluence of the East and West Branches to the PA-NY State border, has been corrected. The Department conducted a use attainability study for Tunungwant Creek in 1985 and concluded that, while there were existing land use and man-made activities adversely affecting the quality of water and limiting recreational uses in the stream, these man-induced conditions were not considered irretrievable. Accordingly, the water contact sports use was added as a designated use to Tunungwant Creek at the November 15, 1988, Board meeting, and this final-form rulemaking was published at 17 Pa.B. 968 (March 11, 1989). This regulatory revision was not, however, incorporated into the *Pennsylvania Code* until now.

A detailed description of the revisions to the proposal by chapter and section follows:

General

Many comments objected that the proposal weakened water quality protection in this Commonwealth and that the comment period was insufficient to address the wide scope of changes. In response, the Department prepared an ANFR and offered an additional comment period and a series of three public informational meetings and public hearings. The change of most concern in Chapter 92 was § 92.81(a)(5) (relating to toxic or hazardous pollutants and general NPDES permits). In response to comments, the current language of the section, prohibiting the use of general NPDES permits in High Quality and Exceptional Value Waters, is retained.

Other comments suggested that the Department should make its water quality standards more stringent than Federal regulations or as stringent as practicable. The RBI only allows for more stringent standards when a compelling state interest is established.

A commentator stated that State regulations cannot become effective until receipt of EPA approval, based on a Federal case in Alaska. First, this case applied only to water quality standards, and not other State regulations which regulate water quality in some way, such as implementation regulations. Moreover, the Commonwealth has the duty and obligation under State statutes to promulgate and implement regulations, including water quality standards regulations, to protect this Commonwealth's water quality regardless of Federal action, delay or inaction. The revisions to the Federal regulations which became final on April 27, 2000 (64 Fed. Reg. 37072) only apply to water quality standards "for Clean Water Act" (CWA) purposes. The Commonwealth will continue to issue NPDES permits based on the best available scientific information in its water quality standards, which may or may not be included in a water quality standards regulation approved by the EPA for CWA purposes. The Department, not the EPA, must defend the permits it issues in this Commonwealth, and has an obligation to apply applicable State water quality standards regulations in issuing the permits. The EPA has the legal right to object to an NPDES permit if they believe the state water quality standard used as a basis for the permit limit is insufficient for CWA purposes.

Concern was expressed that the public comment period was insufficient. The Department provided an additional 60-day public comment period following the 30-day comment period to obtain additional input on the regulations. Over 300 commentators took advantage of the extended comment period.

Chapter 92. National Pollutant Discharge Elimination System

The provisions of this chapter incorporate by reference portions of Federal regulations. This was done to limit the verbatim transfer of lengthy Federal regulations into this chapter. For this reason, it may be necessary for permittees to refer to Chapter 92 and 40 CFR Parts 122, 124 and 125 (relating to EPA administered permit programs: the National Pollutant Discharge Elimination System; procedures for decisionmaking; and criteria and standards for the National Pollutant Discharge Elimination System) to determine applicable requirements.

§ 92.1. Definitions.

The following definitions contained in the proposal were deleted in the final-form regulations: "average annual discharge limitation," "average monthly discharge limitation," "average weekly discharge limitation," "bypass," "complete application," "LA-Load allocation," "loading capacity," "major facility," "natural quality," "operator," "owner," "separate storm sewer overflow," "TMDL" and "WLA-Wasteload allocation." Deletions were based on comments received regarding the need for or clarity of these definitions.

Definitions for "agricultural operation," "AEU--animal equivalent unit (AEU)," "CAO--concentrated animal operation," "indirect discharger," "intermittent stream," "perennial stream" and "small municipal separate storm sewer system" were added and the proposed definition of "CAFO--concentrated animal feeding operation" was modified based on comments recommending that the Department's CAFO Strategy be incorporated in the final-form regulations.

Commentators recommended that a number of definitions be modified to be more consistent with Federal definitions. A number of definitions were modified in the final rule as follows:

The definition of "BAT--Best available technology" was modified to make the definition more consistent with the Federal definition.

The definition of "BMPs--Best Management Practices" was modified by deleting the phrase "pollution prevention measures; source reduction procedures; water conservation practices; erosion and sedimentation control plans, stormwater management measures; and" to be more consistent with the Federal definition.

The definition of "conventional pollutant" has been modified by deleting "nitrites, nitrate nitrogen and phosphorous" to make the definition consistent with the Federal definition.

The term "facility or activity" is modified to be consistent with the Federal definition.

The word "used" has been deleted from the definition of "effluent limitation guideline" to make the definition consistent with the Federal definition.

The eight permit categories listed within the definition of "point source" were deleted to simplify the definition. The word "or" was deleted and "and" inserted in lieu thereof to make the definition more consistent with the Federal definition.

Commentators proposed revisions to definitions for clarity. The following changes were made to definitions in the final-form regulations:

The definition of "CCW--Contact cooling water" was amended by deleting the phrase ", or which otherwise has the potential to become contaminated" because it was unclear.

The definition of "CSO--Combined sewer overflow" was amended to make it clear that these overflows occur "prior to reaching the headworks of the sewage treatment facility."

Definitions for "intermittent stream" and "perennial stream" were added because these terms are used in the definition of surface waters.

The definition of "NPDES reporting form" is clarified by deleting "which includes" from the definition and adding "and" in lieu thereof.

The last sentence in the definition of "process wastewater" was deleted as unnecessary.

The definition of "stormwater discharges associated with construction activities" was revised to provide consistency with the definition of "NPDES permit for stormwater discharges associated with construction activities" in § 102.1 (relating to definitions).

Recommended changes to the definitions of "best available technology," "applicable effluent limitations" and "toxic pollutant" were not made because the definitions are based on Federal definitions.

§ 92.2. Incorporation of Federal regulations by reference.

A commentator stated that incorporation of Federal regulations by reference violates State law. This practice is not a violation of any State law and has been done before.

In response to comments requesting clarity, the last sentence of § 92.2(a) (relating to incorporation of Federal regulations by reference) has been deleted and new language added to clarify that if there is a conflict among Federal and State regulatory provisions, the provision in Chapter 92 shall be used unless the Federal provision is more stringent.

A typographical error was corrected by changing "(h)(1)" to "(h), (i)(2), (j), (k), (l)" in subsection (b)(5).

In response to comments received, subsection (b)(6) was deleted in the final-form regulations to incorporate the Department's CAFO Strategy into the regulations. The Federal references are inconsistent with the strategy.

Several commentators suggested sections of the Federal regulations that should have been incorporated by reference because they are not addressed in Chapter 92. Subsection (b)(19), (22) and (23) was added in the final-form regulations to identify these additional Federal provisions incorporated by reference.

Commentators questioned the meaning of the qualifying term "substantive and procedural." Subsection (c) was amended in the final-form regulations by deleting the words "substantive or procedural" to make the section more clear.

§ 92.2a. Treatment requirements.

Subsection (a) was modified in the final-form regulations by deleting the last sentence limiting treatment requirements and effluent limits to those established under the Federal Clean Water Act (33 U.S.C.A. §§ 1251--1376).

Commentators questioned the protection of threatened species not yet listed in the Pennsylvania Natural Diversity Inventory but included on Federal listings. The reference to the "Pennsylvania Natural Diversity Inventory" (PNDI) in subsection (c) has been deleted to allow for consideration of threatened species not yet included on that list, but established as threatened when someone identifies and documents the presence of these to the Department. The PNDI will still be used as the source of information for threatened species in this Commonwealth.

§ 92.2b. Pollution prevention.

The proposed pollution prevention amendments were deleted based on comments questioning the inclusion of guidelines that are not regulatory requirements, and the potential for these recommendations to take on regulatory meaning. This section was revised to provide that the Department will encourage pollution prevention and provide assistance to permittees in the consideration of pollution prevention measures. Comments were received opposing this change during the ANFR comment period. Commentators stated that the change weakened the regulations. The changes to this section proposed during the ANFR were retained in the final-form regulations. The Department believes that the regulations should place the burden of encouraging pollution prevention on the Department and that this program functions best when a voluntary approach is used. Recommendations related to pollution prevention activities for permittees are not appropriate for regulation. The language in this section is based on language in recent revisions to Chapter 91 that became effective on January 29, 2000. See 30 Pa.B. 521 (January 29, 2000).

§ 92.2c. Minimum Sewage and Industrial Waste Treatment Requirement.

Subsection (a) was modified to specify that secondary treatment is applicable to all sewage discharges, except sanitary sewer overflows (SSOs) which are prohibited in accordance with § 92.73(8), and combined sewer overflows (CSOs), which need not attain secondary treatment if they implement Department-approved nine minimum controls (NMCs) and a long-term control plan (LTCP).

The phrase "after direct application or encouragement of pollution prevention approaches, including in-process recycling and reuse" was deleted in subsection (b)(4) to be consistent with the changes to § 92.2b, relating to pollution prevention. Additionally, subsection (b)(4) was changed to reference and clarify the applicability of provisions for quality standards and oil-bearing wastewater to NPDES discharges.

A new subsection (c), providing a cross reference to § 95.2 (relating to quality standards and oil-bearing wastewaters) has been added to the final-form regulations. This change was not included in the proposed rulemaking.

§ 92.2d. Technology-based standards.

Paragraph (3)(i)(C) is modified in the final-form regulations by deleting the phrase "other pollution prevention approaches" to be consistent with the changes made to § 92.2b discussed previously.

Some commentators supported the retention of 0.5 mg/l effluent limitation for discharges of total residual chlorine while others felt the regulations were too stringent and suggested a lesser residual chlorine limit. Others objected to the dechlorination provisions in paragraph (3)(iii) in special protection waters. These provisions were modified in the final-form regulations as a result of terminology changes in the Department's antidegradation regulations in § 93.4c(b)(1)(iii).

There were objections to the transfer of provisions from Chapter 97 to Chapter 92 regarding oils creating a sheen. These provisions were determined to apply to both NPDES and non-NPDES discharges and were consequently moved to Chapter 95 in the final-form regulations. A reference to § 95.2 was added to paragraph (4) of the final-form regulations. Comments were received in support of this change.

§ 92.4. Exclusions from Permit Requirements.

There was a request that natural gas and oil producing activities receive a permit exemption because it was asserted that these operations are similar to agricultural and silviculture activities that have such a permit exemption. The exemptions are based on Federal regulations and they do not include oil and gas producing activities. The change was not made.

A commentator objected to the proposed pollution prevention language in subsection (a)(6). The phrase was deleted for reasons described in a response related to § 92.2b. Other clarifying changes were also made to this provision.

§ 92.5a. Concentrated animal feeding operations.

As proposed, this section would have authorized a "permit by rule" for CAFOs meeting certain requirements. The Department issued a "Final Strategy for Meeting Federal

Requirements for Controlling the Water Quality Impacts of Concentrated Animal Feeding Operations" in March 1999. A notice of the availability of that strategy was published at 29 Pa.B. 1439 (March 13, 1999). The strategy does not provide for coverage under a permit by rule. Commentators recommended incorporation of the final strategy into the regulations. Accordingly, the proposed language of § 92.5a was deleted and replaced in the final-form regulations with regulations consistent with the published strategy.

§ 92.6a. Persons required to apply.

The proposed language was supported by one commentator, while another recommended it be changed to require the person with financial control over the operation to be the permittee. This entire provision was deleted in the final-form regulations as unnecessary. The Department will continue to permit persons with point source discharges, which includes owners, operators and others, as appropriate, as it has done for many years.

§ 92.7. New or increased discharges or change of wastestreams.

The final-form regulations replace the word "director" with the word "Department" for clarity. Commentators objected to the lack of clarity of the phrase "or which would include any new pollutant not covered by the NPDES permit" at the end of the last sentence in the section as part of the ANFR. The language has been amended in the final-form regulations to more clearly limit this requirement to those pollutants not identified in a previous permit application.

§ 92.8a. Changes in treatment requirements.

The proposed pollution prevention language in the last sentences of subsections (a) and (b) has been deleted to be consistent with the changes made to § 92.2b.

A commentator asserted that the provisions of subsection (a) are violations of due process protections, more stringent than Federal regulations and beyond the power of the Department. This provision was transferred intact from two other chapters that were previously approved as to form and legality by the Office of the Attorney General. Actions taken under these provisions may be appealable to the Environmental Hearing Board (EHB). The provisions were retained in the final-form regulations.

Commentators expressed concern regarding the proposed 90-day time period to complete an extensive report. They suggested 180 days and opposed the language allowing the Department to unilaterally shorten the time frame without any regulatory restraints or procedures. Subsection (b) has been modified in the final-form regulations rule to increase the time allowed for submission of the required report from 90 to 180 days. In addition, the phrase "or within a lesser period as the Department may specify" was deleted. The last part of the following sentence was also changed to ensure consistency with a previous reference in the sentence to water quality standards by inserting the word "standards" following the phrase "water quality."

A commentator was concerned that this section did not include authority to impose permit modifications with compliance schedules. Subsection (c) was modified in the final-form regulations to add a phrase that provides the option of imposing permit modifications with compliance schedules to achieve compliance.

§ 92.11. Duration of standards for certain new sources.

A commentator suggested the more stringent standard of performance be for the lesser of 10 years or during the depreciation period. This suggested change was not made because this regulation is based on Federal regulatory requirements.

Proposed rulemaking included a deletion of the phrase "standards of performance shall" and insertion of the phrase "requirements will" in lieu thereof. The final-form regulations reestablishes the original language based on comments opposing the new language as unclear.

§ 92.13. Reissuance or renewal of permits.

With respect to subsection (a), commentators expressed concern that the Department's Money-Back Guarantee time limits are inconsistent with the regulatory permit review limits. The Money-Back Guarantee does not influence the Department's ability to process permits in a shorter time frame. No changes were made to this section.

Some commentators suggested that recent case law would require incorporation of a broad compliance review for all permitting activities. The scope of the compliance evaluation in subsection (b)(1) was expanded in the final-form regulations to include all Department issued permits, regulations and orders. A reference to other appropriate regulations was included at the end of the subsection to allow consideration of compliance schedules outside of the requirements of Chapter 92.

§ 92.21. Applications.

Some commentators requested the reinsertion of the phrase "not less than" in the final-form regulations to eliminate a perception that the proposed language required submittal at exactly 180 days. The recommended phrase has been reinserted in the final rule to provide clarity. Other commentators expressed concern that the time limits in the regulation were inconsistent with Department's Money-Back Guarantee. No change was made because the Money-Back Guarantee does not impact the Department's ability to process applications in a shorter period of time.

Based on comments received, a new paragraph (5) is added in the final-form regulations which includes a requirement for documentation that the applicant is in compliance with all existing Department permits, regulations, orders and schedules of compliance, consistent with similar changes made in § 92.13 (relating to reissuance or renewal of permits). Commentators suggested requiring the newspaper publication in subsection (b)(3) only for major modifications of the facility. No change was made because The Clean Streams Law requires this.

Subsection (c)(2) was deleted in the final-form regulations to be consistent with the revisions made to § 92.2b (relating to pollution prevention).

Comments on subsection (c) stated that some of the required information for a new facility application is generally available only after the commencement of a discharge, not when an application for a facility is being prepared. Accordingly, the provisions of subsection (c)(3)--(5) were transferred to a new subsection (d) which states that the

Department may require an applicant for a modification, renewal or reissuance of a permit under § 92.13, or when required under 40 CFR Part 122 to provide this information. In addition, proposed subsection (c)(6) is renumbered as subsection (c)(2) and proposed subsections (d)--(f) are renumbered as subsections (e)--(g).

§ 92.21a. Additional application requirements for classes of discharges.

A commentator requested that the provisions related to the determination that aquatic communities are excluded be clarified. Subsection (e) has been modified in the final-form regulations to state that water quality data confirming a lack of improvement will be the measure of the exclusion of aquatic communities.

Subsection (d) is clarified to cross reference the requirements in Chapter 102 for stormwater dischargers associated with construction activities.

Subsection (e)(2)(iii) is revised by providing a cross reference to the definition of "TMDL" in § 96.1 to provide clarity.

Proposed language in subsection (f) relating to discharges with approved pretreatment programs was deleted in the final rule. Subsections (g) and (h) of the proposal were renumbered as subsections (f) and (g) respectively.

Commentators stated that the elimination of CSOs is impossible, that the time required is too extensive to make this requirement a prerequisite to a permit renewal, that identifying all points of influent is impossible, and that elimination should only be required where the discharge will not meet water quality based effluent limitations. Subsection (f) of the final-form regulations includes provisions to allow for submitting a long-term control plan to "minimize" or "eliminate" CSO discharges. These changes are consistent with Department's published CSO Strategy. Additional revisions delete proposed subsections (g)(3)(i)--(v) and, in lieu thereof, reference a Federal publication rather than listing its content in summary in the regulations. Subparagrah (vi) was renumbered (ii) and a requirement for an implementation schedule was added to the final-form regulations (third element of an approvable CSO program). The provisions relating to the identification of points of inflow into combined sewers is retained in the final-form regulations. This activity is a necessary part of compliance with the nine minimum controls related to the minimization or elimination of CSOs.

Editorial changes were made to subsection (h) (now (g)) in the final-form regulations.

§ 92.22. Application fees.

A new subsection (f) was added to provide an exemption from permit fees for certain CAFOs consistent with the Department's CAFO Strategy. Existing subsection (f) was renumbered as (g).

§ 92.25. Incomplete applications or notice of intent.

A minor editorial change to the proposal is made. The proposal references a notice of intent "to participate in" an NPDES general permit. The phrase "participate in" is replaced with "be covered by" since that is a more accurate description of the general permit process.

§ 92.31. Effluent limitations or standards.

An editorial change was made to subsection (a). Subsection (a)(9) was added to cross reference water quality protection requirements in Chapter 96 and subsection (a)(10) was added to cross reference antidegradation requirements.

§ 92.41. Monitoring.

A number of commentators objected to the addition of proposed subsection (b), asserting that the provisions allow arbitrary requirements and time limits to be set by the Department. The proposed subsection was proposed for deletion in the ANFR. After reconsideration, this language was rewritten to eliminate those portions of the provision on which objections were received. References to requests for additional information by the Department, which were perceived as arbitrary were deleted, and provisions retained which establish monitoring and reporting requirements to be incorporated in permit documents. The last two sentences of proposed subsection (b) (relating to monitoring pollutants not limited in the permit) are deleted in the final-form regulations. Commentators asserted that these provisions were overly broad, inconsistent with Federal requirements or not in the spirit of the RBI.

The amendments to subsections (c) and (g) make it clear that the monitoring requirements of subsection (g) also apply to stormwater discharges associated with construction activities and that subsection (c) is not applicable to stormwater discharges associated with industrial activity. No comments were received on this change. The proposed change is retained in the final-form regulations.

§ 92.51. Standard conditions in permits.

Some commentators suggested that the language in proposed paragraph (6) was confusing and should be simplified to say that compliance with all water quality standards is required. The proposed subsection was clarified in the ANFR by breaking it up into two sentences. Additional comments were received asserting that the changes made the provisions less clear. The final-form regulations incorporate the provisions into a single sentence and retains language that is consistent with the intent of the original regulation. A new paragraph (7) was added to the final-form regulations in response to comments to clearly state that dischargers must comply with applicable water quality standards.

§ 92.52a. Site specific permit conditions.

The final-form regulations delete the last sentence proposing pollution prevention measures. This change is consistent with the position described in response to comments made on § 92.2b. Commentators stated that the proposed provisions were too broad and that BMPs should be established through the regulatory process. The final-form regulations includes a provision that requires permittees to identify BMPs reasonably necessary to achieve effluent limitations and standards or to carry out the purpose and intent of the Federal Act (the Clean Water Act) and to implement toxic reduction activities, effluent limitations based on WETT and other measures which eliminate or substantially reduce pollutants at their source. These final-form regulations provide the permittee with the opportunity to take an active role in establishing sufficient BMPs to achieve protection of surface waters.

§ 92.61. Public notice of permit application and public hearing.

WRAC recommended that the Department seek public comment on the need for an additional public notice when an NPDES application is renewed or when an applicant intends to apply for an NPDES permit, before an application is completed. Comments on this issue ranged from support for the notice of intent to support for no additional public notice. The Department believes the existing requirements for public notice are sufficient and no change has been made in the final-form regulations.

A new subsection (a)(9) was added to cross reference regulations promulgated at 29 Pa.B. 3720 (July 17, 1999) which provide that the notice shall include the antidegradation classification of the receiving surface water.

§ 92.71a. Transfer of permit.

Based on comments received regarding the need to include compliance evaluations as a part of permit actions, a new paragraph (4) has been added to the final-form regulations that requires compliance with all Department permits prior to approval of permit transfers.

§ 92.72a. Cessation of discharge.

Commentators stated that the 180-day notice should be reduced to 90 days to be consistent with State mandated notification requirements. The final-form regulations establishes the 90-day notification requirement.

§ 92.73. Prohibition of certain discharges.

This section is revised to provide that a permit will not be issued, modified, renewed or reissued under any of the conditions enumerated.

Paragraph (8) of the proposal provided that a permit will not be issued to a "discharger with a sanitary sewer overflow unless the discharger can demonstrate that it is taking measures to eliminate any overflows as soon as practicable, including, but not limited to a complete evaluation of the sanitary sewer system, the reduction of infiltration and inflow into the sanitary sewer system, the elimination of illegal hookups to the system, the institution of a ban or prohibition on sewer hookups to the sanitary sewer, and any other measures which will eliminate the overflows." The quoted portion of this subsection was deleted in the final rule because it is inconsistent with applicable State and Federal policy. The final-form regulations states that a permit will not be issued for a sanitary sewer overflow, except as provided for in the Federal regulations.

§ 92.81. General NPDES permits.

A large number of commentators objected to the proposed revisions to subsection (a)(5) because of a perception that this provision would allow discharge of toxic substances under a general permit. While the Department had no such intent when these amendments were drafted, the existing language prohibiting issuance of an NPDES general permit for the discharges has been reinstated in the final-form regulations.

Subsection (a)(8) of the proposal would have authorized issuance of a general permit for discharges to High Quality Waters, but not to Exceptional Value Waters. A large number of commentators objected to this provision at proposed rulemaking. Accordingly, as part of the ANFR it was proposed to reinstate existing language that prohibits the issuance of general NPDES permits for activities in High Quality Waters. In response to the ANFR, the Department received a very large number of comments on both sides of this issue. The final-form regulations retain the reinstated (or existing) language prohibiting the issuance of general permits in High Quality Waters. This provision supports the Department's overriding State interest in the protection of High Quality Waters and in the provision of a broad opportunity for public comment when permit applications are received for facilities proposed in these watersheds. In addition, a recently developed individual NPDES permit for existing CAFOs in High Quality Waters clearly demonstrates the ability to create a simplified permit application process under the individual NPDES regulations while protecting the environment. A conforming change was made in § 92.83(b)(9) (relating to denial of coverage under a general NPDES permit).

The Board received comments objecting to the proposed deletion of a provision that general NPDES permits are to comply with of §§ 92.59 and 92.83(a)(1) (relating to documentation of permit conditions; and inclusion of individual discharges in general NPDES permits) that dischargers "certify" rather than "demonstrate" that the discharge will not result in a violation of an applicable water quality standard. Accordingly, the reference to § 92.59 was reinstated in § 92.81(b) and the existing term "demonstrate" reinserted in lieu of "certify" in § 92.83(a)(1) in the final-form regulations.

Some commentators opposed the proposed revisions to subsections (c) and (d) because they believed some of the options eliminated the opportunity for public comment. Two subsections proposed the inclusion of language from the Federal regulations that would have allowed discharges to commence: (1) on a date specified in the general permit; and (2) upon receipt of the notice of intent by the Department. These proposals have been deleted in the final-form regulations because they create circumstances that would make it impossible for the Department to keep a record of these discharges and they would have provided no opportunity for public comment. In addition, the proposal provided that a discharge under a general NPDES permit would be authorized after a waiting period specified in the general permit. This provision is retained, but clarifying language is added stating that the discharge may only commence following receipt of a Notice of Intent (NOI) by the Department. In addition, the provision authorizing the commencement of discharges "upon receipt of the notification of inclusion by the Department" is revised in the final rule to provide that the discharge may commence upon receipt of notification of approval of coverage under the general NPDES permit from the Department. Subsection (d) of the proposal relating to when an NOI would not be required was deleted in the final-form regulations for the same reasons outlined. Proposed subsection (e) was renumbered as subsection (d).

Commentators questioned the need for proposed subsection (e). This section was modified as subsection (d) in the final-from regulations to provide that the Department "will" notify a discharger that it is "or is not" covered under a general NPDES permit. In addition, the clause, "even if the discharger has not submitted a notice of intent to be covered" was deleted.

§ 92.83. Inclusion of individual dischargers in general NPDES permits.

Subsection (a)(3)(iii) has been deleted because it would have, consistent with the approach allowed under the Federal regulations, authorized the Department to provide no public notice of applications for general permits or approvals of coverage. This provision was not carried forward in the final-form regulations because it did not allow for sufficient public notice. Subsection (a)(1) was amended to clarify applicable requirements for NOIs.

A number of commentators commented that the EHB recently issued a ruling stating that compliance history review is not limited to prior NPDES permits, but to all permits issued by the Department. A commentator also asserted that the list of items to be considered was inconsistent with The Clean Streams Law. Accordingly, subsection (b) was revised to include violations of Department-issued permit as grounds for denial of the general permit coverage and to reference the entire list of items to be considered under The Clean Streams Law. The remainder of the subsection was renumbered.

§ 92.92. Method of seeking civil penalty.

A commentator objected to the regulation on the basis that it removes a right to a prehearing for alleged violations. A discussion of the due process protections provided by the procedures established in the regulation is provided in the comment and response document.

§ 92.93. Procedure for civil penalty assessments.

There were several comments requesting clarifying language regarding delivery of notices, the specifics of the hearing procedure, the scheduling of hearings, posting notice, and provision of notice from the Department concerning EHB rules of practice. A change was made in the final rule to subsection (c) regarding the posting of notice. An explanation is provided in the comment and response document regarding the remaining comments.

Also in subsection (c), a clause is added clarifying that a person requesting a hearing has a right to be represented by counsel, and a change is made providing that the Department need not make a decision at the hearing.

§ 92.94. Disbursement of funds pending resolution of appeal.

Subsection (a) of the final-form regulations has been modified to replace the word "law" with "section 605 of The Clean Streams Law (35 P. S. § 691.605)."

A commentator stated that preclusion of permit issuance should only be imposed on a specific facility when a company has more than one facility in this Commonwealth. This provision is not mandatory and would be imposed only when there is a continued pattern of failure to pay final assessments. No change was made in the final-form regulations.

Chapter 93. Water Quality Standards

Section 93.4. Statewide water uses.

WWF (warm water fishes) has been reinserted in Table 2 as the default aquatic life protection because several comments made the point that there would be no default aquatic life protection of waters inadvertently not listed in the chapter.

Many comments addressed the question of retaining the Statewide potable water supply use, some offering distinct reasons why it should be eliminated, but many others expressing support for keeping it. The use is retained without change.

A few comments suggested that the aesthetic water quality criteria for manganese and dissolved iron be applied at the point of potable water intake, as are other aesthetic criteria, under § 96.3 (relating to general water quality). The Department will analyze the impacts/benefits of this issue as part of its next triennial review of water quality standards.

A few comments were directed toward the Department adopting amended wildlife protection and protection of hydrologic regimes and habitat. At this time, there is no National guidance to assist the Department in moving forward with changes to wildlife protection. The Department is working with the Fish and Boat Commission on new habitat and stream flow criteria development, but it is premature to make changes at this time. These issues are all likely to be considered in future water quality standards reviews.

Section 93.7. Specific water quality criteria.

Comments concerning Table 3 included the following:

Alkalinity--The site-specific exception to the alkalinity criterion was reinserted because it was noted that many of this Commonwealth's streams may naturally violate the criterion, and without the exception, there would have to be regulation changes made for a very large number of site-specific criteria to amend the listings in §§ 93.9a--93.9z if the language were removed.

Aluminum--In the proposal, the aluminum criterion was amended and moved to Table 1, Chapter 16--Water Quality Toxics Management Strategy--Statement of Policy, where other water quality criteria for toxics are listed. The EPA and others commented that there was not adequate justification for the Commonwealth to not also adopt the chronic criterion. The Department believes that the chronic criterion of 87 μg/l should not be adopted because it is based on chronic toxicity test results that show inconsistencies within tests and between studies. The chronic studies described in the EPA's 1988 Ambient Water Quality Criteria for Aluminum document do not show a consistent pattern of toxicological response to the different exposure concentrations within or between the various tests described. The final chronic value developed following the EPA's procedures and based on available acute-chronic ratios is 750 μg/l, the same value as the acute criterion. However, the EPA then lowered the final chronic value to 87 μg/l, claiming it to be necessary to protect brook trout and striped bass. The EPA's justification for this adjustment was data derived from studies that the EPA later described as data that should not be used in the criteria development. The EPA staff have agreed that the aluminum toxicity is very complex due, in part, to the complexity of its chemistry and interactions with local water quality conditions and biological community. The EPA also agrees that the studies that were used in driving the derivation of the chronic criterion are limited in their application and should receive additional review. The Department cannot adopt the flawed chronic criterion for use in this Commonwealth without better justification. As recently as December 1999, the EPA reiterated that aluminum criteria issues are not a priority for the agency. Therefore, the Department believes that aluminum toxicity to fish and aquatic life will be adequately managed using the acute criterion of 750 μg/l. The Department will also continue to monitor the scientific literature and the EPA's evaluations of aluminum toxicity and amend the criterion or add a chronic criterion, if indicated. The criterion is unchanged from the proposal.

Ammonia--The ammonia criteria is not changed to match the new the EPA criteria finalized in December 1999, but will be considered in the next Triennial Review.

Bacteria--In response to an EPA comment, language is added to Bac1 which limits to no more than 10% the samples that may exceed 400 fecal coliform per 100 ml in a 30-day period for the criteria to be attained.

DO (dissolved oxygen)--The language for DO_3 (for trout stocking fishes (TSF)) is clarified to state that the criteria for lakes, ponds and impoundments apply to the epilimnion in response to a comment.

Phenolics--To respond to comments expressing concern for protecting water supplies, the Statewide criterion for phenolics (Phen - 0.005 mg/l) is retained. This criterion is applied under new § 96.3(d).

Temperature--Language inadvertently struck from the new listing of temperature criteria in the proposal was reinserted to assure protection of aquatic life. The language states that in addition to the temperature criteria, wastes may not cause more than a 2°F rise in temperature in any 1-hour period.

Subsection (e), which was proposed to be deleted, is reinserted as (b) and the accompanying table is renamed Table 4 in response to comments that pointed out that the Table provides a ready reference to the criteria applicable to aquatic life uses, including High Quality and Exceptional Value Waters. The table has been modified to acknowledge the removal of the list of Statewide criteria (former Table 4) and the numbering change to DO criteria.

Accordingly, numbering changes are made to the remaining subsections. Subsection (c) is amended to the original language that provides that additional criteria will (not may as proposed) be developed using best scientific information. New subsection (d) is clarified to state that when the Department determines that the natural quality of a surface water is lower than the applicable aquatic life water quality criterion, the natural quality will become the aquatic life criterion for that segment following public notice and comment.

Section 93.9. Designated water uses and water quality criteria.

Section 93.9e (relating to Drainage List E) is modified to correct the turbidity criteria symbols from Tur 3 and 4 to Tur 1 and 2. The change is not substantive.

In § 93.9o (relating to Drainage List O), several comments on the proposal and ANFR addressed the issue of the color criterion for the Codorus Creek in York County. Some comments gave lengthy reasons why 50 pcu was the appropriate criterion and should remain in place, and others questioned the scientific basis for that criterion, stating the Statewide criterion should apply. Following consideration of all the comments, the site-specific color criterion for the Main Stem, Codorus Creek in York County is removed and the Statewide color criterion (75 platinum cobalt units) will apply to the stream. When it is achieved, the criterion will enhance water quality in the stream.

In § 93.9p (relating to Drainage List P), an error for Tunungwant Creek in McKean County, which deleted the water contact sport use (WC) for the main stem from the confluence of the East and West Branches to the PA-NY State border, has been corrected. The Department conducted a use attainability study in 1985 which supported the correction and the water contact sports use was added as a designated use at the November 15, 1988, Board meeting, and published at 17 Pa.B. 968 (March 11, 1989). This regulatory revision was not, however, incorporated into the *Pennsylvania Code* until now.

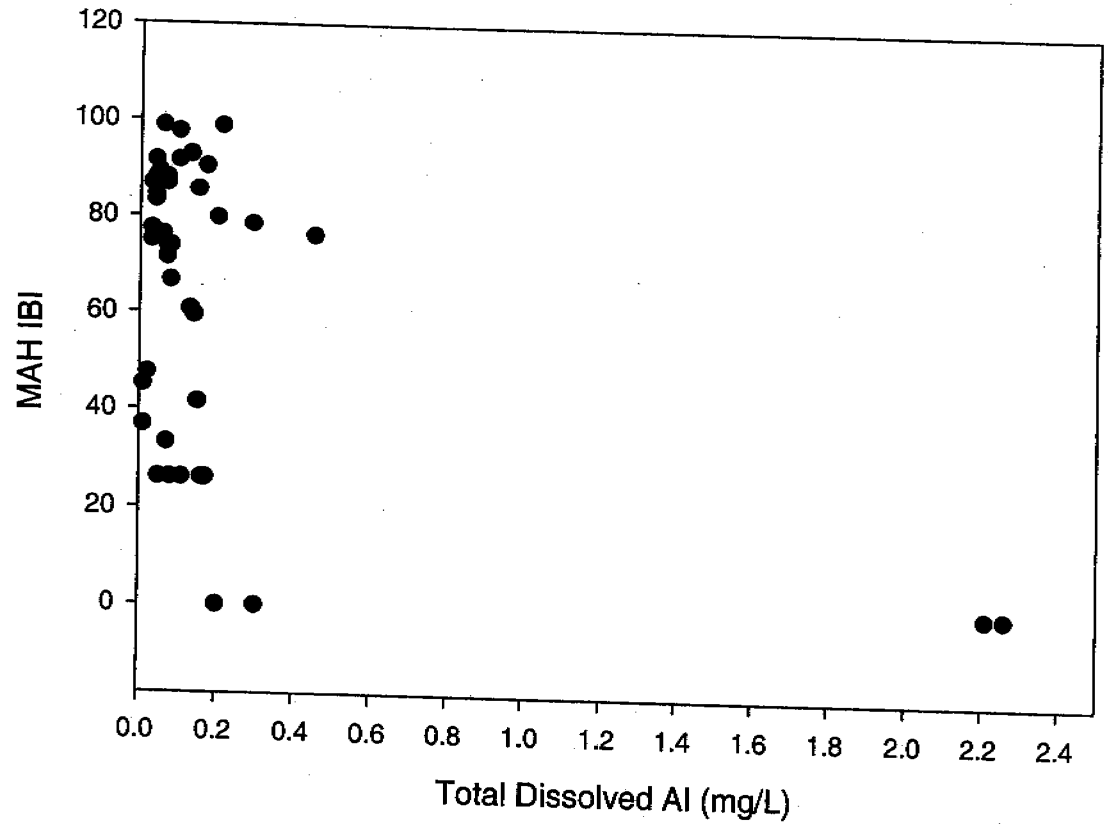
Chapter 95. Wastewater Treatment Requirements

Section 95.1 (relating to special protections), which has recently been amended at 29 Pa.B. 3720 (July 17, 1999) is deleted as unnecessary in light of the inclusion of the language in § 92.2a(a).

Commentators objected to the incorporation of provisions in § 97.15 into § 95.2 of the final-from regulations. These provisions incorporate quality standards for industrial wastes including the prohibition of discharges that are acid, a pH requirement and an iron limit of no more than 7 milligrams per liter of dissolved iron. These provisions were retained in the final-form regulations as necessary to protect water quality from pollutants not regulated as point sources under the NPDES regulations.

Commentators objected to the elimination of §§ 95.4 and 95.5 from proposed rulemaking. This error occurred at the Legislative Reference Bureau, and was corrected at 28 Pa.B. 577 (November 7, 1998).

[Continued on next Web Page]



MAH IBI is a fish based index of biotic integrity for the Mid-Atlantic Highlands region.

Data are from 48 streams scattered throughout the Cheat River watershed.

Relationship between Al and fish is poor primarily because there are many bad streams with almost no Al in them. These streams received mine effluent, but pH is high enough for the Al to precipitate. A good reason why field based relationships should not be used to set water quality criteria. Also evidence that water quality criteria alone do not ensure ecological integrity.

All Wapbase samples with Dissolved Al > 0.087 (n=1454)

AN Code	Mile Point	Stream Name	Date	Total Al	Diss Al	pH	Q		Q		Q	TSS	Watershed	WVSCI
WVMC-60-D-2.5	0.2	Lindy Run	5/15/01	0.47	0.49	3.91		0.4		0.18		1	Cheat	71.33
WVKG-34-H-11.5	0	Carpenter Run	9/23/03	0.45	0.44	3.91		0.53			<	3	Gauley	
WVKG-34-H-11.5	0	Carpenter Run	9/9/03	0.399	0.394	4.31		0.56			<	3	Gauley	
WVMC-60-F-3	1.2	Moore Run/Otter Creek	5/15/01	0.3	0.4	4.04		0.57		0.27		1	Cheat	66.69
WVKG-34-H-8	0	Windy Run	9/23/03	0.32	0.33	4.19		0.58				3	Gauley	
WVMC-60-D-7	0.2	Yellow Creek	6/12/01	0.21	0.34	3.51		0.59		0.29		1	Cheat	58.35
WVKG-34-H-9	0	Armstrong Run	9/23/03	0.32	0.33	4.12		0.67			<	3	Gauley	
WVKG-34-H-11.5	0	Carpenter Run	1/13/04	0.48	0.46	4.34		0.7			<	3	Gauley	
WVKG-34-H-9	0	Armstrong Run	9/9/03	0.32	0.38	4.43		0.7			<	3	Gauley	
WVMC-60-O-5	0.6	Little Stonecoal Run	6/3/03	0.28	0.29	4.15		0.7		0.4	<	3	Cheat	79.67
WVKG-34-H-11.5	0	Carpenter Run	3/4/04	0.65	0.72	3.42		0.71				4	Gauley	
WVKG-34-H-11.5	0	Carpenter Run	11/18/03	0.42	0.44	4.00		0.73			<	3	Gauley	
WVKG-34-H-8	0	Windy Run	3/4/04	0.52	0.58	3.84		0.73			<	3	Gauley	
WVKG-34-H-8	0	Windy Run	11/18/03	0.34	0.36	4.30		0.75			<	3	Gauley	
WVKG-34-H-9	0	Armstrong Run	11/18/03	0.39	0.39	4.30		0.8			<	3	Gauley	
WVKG-34-H-9	0	Armstrong Run	1/31/04	0.4	0.4	4.82		0.8			<	3	Gauley	
WVMCS-35		Fall Run	5/9/01	0.31	0.32	3.92		0.8	<	0.5	<	5	Cheat	62.37
WVMC-60-F-7		Yellow Creek/Otter Creek	4/30/01	0.39	0.64	4.12		0.82		0.36		2	Cheat	67.47
WVKG-34-H-9	0	Armstrong Run	12/15/03	0.39	0.39	4.20		0.84			<	3	Gauley	
WVKG-34-H-9	0	Armstrong Run	3/4/04	0.52	0.57	3.72		0.86			<	3	Gauley	
WVPC-7-L	0.1	Meadow Run	6/21/00	0.13	0.25	4.86		0.87		0.61		18	Cacapon	64.2
WVKG-34-H-8	0	Windy Run	4/7/04	0.38	0.42	4.76		0.88			<	3	Gauley	
WVMCS-36		Red Run	5/9/01	0.24	0.3	4.17		0.9		0.5	<	5	Cheat	70.83
WVKG-34-H-8	0	Windy Run	1/13/04	0.34	0.34	4.81		0.97			<	3	Gauley	
WVKG-34-H-9	0	Armstrong Run	4/7/04	0.39	0.42	4.75		0.97			<	3	Gauley	
WVMC-60-D-5-H	0	UNT/Beaver Creek RM 11.0	6/11/02	0.14	0.2	4.83		1.06		0.5	<	3	Cheat	60.14
WVMT-42-E	0.6	UNT/Roaring Creek RM 11.0	6/11/02	0.19	0.23	4.68		1.09		0.5	<	3	Tygart Valley	73.37
WVMC-60-O	7.5	Red Creek/Dry Fork	6/5/01	0.24	0.36	3.79		1.43		0.41		1	Cheat	54.53
WVMTB-32-I-1		Phillips Camp Run	9/15/97	0.132	0.098	5.10		1.6		0.5	<	5	Tygart Valley	79.63
WVMC-18-A	0.2	Lick Run/Roaring Creek	5/22/01	0.64	0.78	4.35		1.61		0.76		1	Cheat	66.36
WVMC-60-O-4		South Fork/Red Creek	6/5/01	0.36	0.51	3.63		1.68		0.51	<	1	Cheat	80.53
WVMC-17	10.2	Muddy Creek	6/26/01	0.097	0.234		<	1.763		1.75	<	3.143	Cheat	83.26
WVPSB-1.9	0.2	UNT/South Branch Potomac RM	6/26/01	0.098	0.203	7.44	<	1.763		9.14		11	South Branch	58.11
WVMC-60-F-8		Condon Run	4/30/01	0.33	0.74	4.46		2.18		0.64		2	Cheat	75.58
WVMT	98.9	Tygart Valley River	10/14/02	0.11	0.35	7.41		2.26		14		5	Tygart Valley	
WVMT-64	12.7	Mill Creek	5/20/03	0.0954	0.123	7.19		2.39	<	0.1		1	Tygart Valley	81.44
WVMC-12-A-1	2.2	Little Laurel Run	5/23/01	0.2	0.34	4.66		2.44		1.31		2	Cheat	70.31
WVMC-17-B	0	Jump Rock Run	5/16/01	0.38	0.54	5.09		2.48		0.69		1	Cheat	73.19
WVMCS-50		First Fork/Shavers Fork	4/2/01	0.1	0.14	7.09		2.6		0.62	<	5	Cheat	81.71
WVMC-6-A-2	0	UNT/Clay Run RM 1.0	5/22/01	0.11	0.16	5.40		2.83		1.5		2	Cheat	74.12

[illegible]	Mile Point	Stream Name	Date	Dis Al (mg/l)	Total Al mg/l	pH	[illegible]	[illegible]	[illegible]	Watershed	WVSCI
WVKGC-23	1	South Fork/Cranberry River	5/28/03	0.11	0.33	6.68	3.1	0.7	6	Gauley	81.31
WVMC-12-B-5-C	0.9	UNT/Cherry Run	5/8/01	0.11	0.29	4.66	3.11	1.46	2	Cheat	68.21
WVPSB-28-EE	4	Big Run/North Fork	7/11/01	0.12	0.23	7.14	3.34	0.82	<5	South Branch	90.04
WVPSB-21-E	1.3	Stump Run/South Fork/South	6/21/01	0.15	0.32	6.44	3.4	2.3	<5	South Branch	82.9
WVMC-6-A	1.8	Clay Run	5/21/01	0.09	0.18	5.29	3.44	1.73	1	Cheat	81.65
WVPSB-21-E	1.3	Stump Run/South Fork/South	6/21/01	0.17	0.32		3.5	2.4	<5	South Branch	92.24
WVMC-60-D-3-C	1.2	Snyder Run	6/11/01	0.18	0.42	6.36	4	0.72	2	Cheat	61.19
WVMT	75.9	Tygart Valley River	10/14/02	0.13	0.38	7.51	4.31	16.7	8	Tygart Valley	
WVKGC	15.2	Cranberry River	5/28/03	0.11	0.16	6.96	4.4	0.6	<3	Gauley	92.6
WVM-8-B.2	0.7	UNT/Deckers Creek RM 8.8	7/9/03	0.16	0.77	5.82	4.63	0.93	6	Monongahela	65.4
WVOG-137-C	0.7	Wiley Spring Branch	9/11/00	0.24	0.28	7.23	4.65	2.32	1	Upper	80.73
WVMT	65.1	Tygart Valley River	10/14/02	0.18	0.41	7.65	4.74	18.6	5	Tygart Valley	
WVMT-41	1	Grassy Run	9/15/97	14.246	0.05	3.10	5.9	1.5	<5	Tygart Valley	
WVMC-60-D-3-C	0	Snyder Run	6/6/01	0.13	0.306	7.56	6.1	1.3	5	Cheat	90.71
WVKE-6	5.6	Mill Creek	7/3/97	0.16	0.55	6.90	6.6	2.5	6	Elk	69.09
WVOG-137-B	0.5	Bluff Fork/Devils Creek	9/11/00	0.26	0.29	7.10	7.2	5.26	2	Upper	73.76
WVMW-13-I-2		Cherrycamp Run	3/21/01	0.133	5.74	7.24	7.5	2.78	145	West Fork	
WVMTB-7-C	0.32	UNT/Sand Run	9/4/97	0.089	0.14	7.60	7.7	1.9	6	Tygart Valley	78.87
WVOGC-16-J-1	0.6	Tom Bailey Branch	8/29/00	0.13	0.22	7.68	7.82	3.13	3	Upper	54.63
WVMW-13-I-3		Patterson Fork	3/21/01	0.129	6.07	7.19	7.92	2.82	121	West Fork	
WVOG-134-E		Old Slab Fork	8/30/00	0.13	0.2	7.50	8.1	2.82	5	Upper	75.97
WVMW-13-F-1		Little Rockcamp Run	3/21/01	0.095	6.49	7.38	8.83	2.99	137.6	West Fork	
WVMW-13-F	0.1	Rockcamp Run	3/21/01	0.089	10.2	7.39	8.94	3.52	238	West Fork	
WVMC	41.4	Cheat River	6/18/01	0.13	0.33	7.35	9.08	1.51	2	Cheat	
WVMW-36-D	0	Right Fork/Freeman Creek	3/21/01	0.121	2.86	7.14	9.45	2.51	364	West Fork	
WVMC-12-C-5	0.2	5th UNT/Hazel Run	5/15/01	0.09	0.12	7.43	9.57	1.91	1	Cheat	72.12
WVMC	72.6	Cheat River	6/18/01	0.16	0.22	7.40	9.83	1.55	1	Cheat	
WVKE	107	Elk River	7/8/02	0.19	0.2	7.79	10.6	3.32	<3	Elk	
WVKE	89.5	Elk River	11/4/02	0.15	0.18	7.32	11	2.88	<3	Elk	
WVMC	32.9	Cheat River	6/18/01	0.09	0.68	7.27	11.1	2.24	2	Cheat	
WVKE	89.5	Elk River	7/8/02	0.21	0.26	7.75	11.2	3.5	<3	Elk	
WVKE	56.3	Elk River	11/6/02	0.25	0.53	7.33	11.5	0.2	8	Elk	
WVKN-22-K	5.3	Mill Creek	4/22/02	0.28	0.44	4.29	11.5	7.11	8.8	Lower New	57.58
WVKE	56.3	Elk River	8/6/02	0.16	0.16	7.79	11.6	4.12	<3	Elk	
WVKE	107	Elk River	11/4/02	0.16	0.18	7.27	12.3	3.2	<3	Elk	
WVKE	107	Elk River	9/3/02	0.14	0.22	7.42	12.3	3.58	<3	Elk	
WVKE	107	Elk River	8/5/02	0.14	0.17	7.62	12.4	3.51	<3	Elk	
WVKE	56.3	Elk River	10/8/02	0.13	0.15	7.83	12.4	3.97	<3	Elk	
WVKE	89.5	Elk River	9/3/02	0.17	0.22	7.73	12.5	3.78	<3	Elk	
WVOG-134	7.8	Slab Fork	9/6/00	0.095	0.414	7.24	12.6	6.74	25	Upper	67.01
WVKE	27.2	Elk River	11/6/02	0.24	0.43	7.18	12.8	0.28	3	Elk	
WVMC	20.9	Cheat River	6/18/01	0.12	0.5	7.44	13	2.61	3	Cheat	
WVMTM	2.8	Middle Fork River	7/23/02	0.12	0.15	7.74	13	1.46	<3	Tygart Valley	

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	pH	[illegible]	[illegible]		TSS (mg/l)	Watershed	WVSCI
WVKE	27.2	Elk River	8/6/02	0.16	0.24	7.57	13.2	5.8	<	3	Elk	
WVMTM	2.8	Middle Fork River	8/12/02	0.17	0.33	7.90	13.2	2.56	<	3	Tygart Valley	
WVOGC-16-C	0.1	Cabin Branch/Laurel Fork	8/29/00	0.12	0.22	7.62	13.5	5.52		5	Upper	48.15
WVMTB-18	11.2	French Creek	9/3/97	0.147	0.15	7.40	14	2.8		10	Tygart Valley	60.07
WVO-2-Q-8-A	2.8	Left Fork/Camp Creek	4/24/02	0.09	0.26	7.37	14.1	3.69	<	3	Twelvepole	78.12
WVMW-13-N		Coburn Fork	3/21/01	0.177	16	7.48	15.1	5.2		492	West Fork	
WVKE	56.3	Elk River	9/4/02	0.21	0.24	7.91	15.5	4.53	<	3	Elk	
WVMT	98.9	Tygart Valley River	9/6/02	0.17	0.2	7.56	15.5	2.4	<	3	Tygart Valley	
WVMC-60-D	0.8	Blackwater River	6/13/01	0.43	1.48	7.52	15.6	3.4	<	5	Cheat	67.5
WVKE	27.2	Elk River	9/4/02	0.2	0.28	7.48	15.7	6.62	<	3	Elk	
WVKE-76	11.9	Birch River	11/4/02	0.12	0.24	7.48	16.2	8	<	3	Elk	
WVMT	98.9	Tygart Valley River	7/24/02	0.25	0.33	7.50	16.7	2.17		3	Tygart Valley	
WVMT	6.5	Tygart Valley River	8/12/02	0.25	0.26	8.28	17	3.74	<	3	Tygart Valley	
WVKE	4.4	Elk River	9/4/02	0.14	0.18	7.53	17.1	7.2	<	3	Elk	
WVMW-13-N-1		Shaw Run	3/21/01	0.143	52.3	7.45	17.1	10.3		1732	West Fork	
WVMC-60-D	8.2	Blackwater River	6/12/02	0.13	0.27	7.67	17.4	2.5	<	3	Cheat	75.4
WVMT	6.5	Tygart Valley River	9/5/02	0.25	0.25	7.68	17.4	3.42	<	3	Tygart Valley	
WVKE-23	0.9	Big Sandy Creek	11/6/02	0.14	1.77	7.35	17.8	0.31		40	Elk	
WVOG-134	0.3	Slab Fork	9/5/00	0.165	0.868	7.56	17.9	8.23		12	Upper	60.19
WVO-2	9.6	Twelvepole Creek	4/17/00	0.12	2.2	7.05	18	5		50	Twelvepole	
WVMT	98.9	Tygart Valley River	8/13/02	0.18	0.11	7.58	18.3	2.86	<	3	Tygart Valley	
WVMT	75.9	Tygart Valley River	7/24/02	0.13	0.23	7.68	18.3	2.6	<	3	Tygart Valley	
WVKC-31-B.4	0.8	UNT/Laurel Fork RM 3.6	4/24/03	1.88	1.88	4.34	18.6	27.2	<	3	Coal	70.87
WVMT	6.5	Tygart Valley River	7/23/02	0.13	0.16	8.02	18.9	3.38	<	3	Tygart Valley	
WVKE	4.4	Elk River	10/9/02	0.14	0.21	7.55	19.2	7.13	<	3	Elk	
WVOG-131	5.2	Barkers Creek	9/6/00	0.16	0.19	7.75	19.35	7.29		3	Upper	55.58
WVMTM	2.8	Middle Fork River	9/5/02	0.21	0.26	7.87	19.7	3.78	<	3	Tygart Valley	
WVK-49-B	1.6	Spring Fork	7/19/01	0.13	0.72	7.26	20.9	10.5		22	Upper Kanawha	
WVMC	35.6	Cheat River	5/1/01	4.76	5.67	3.24	21	5.3	<	1	Cheat	
WVK	1.5	Kanawha River	10/23/02	0.14	0.28	7.43	21.1	7.75	<	3	Lower Kanawha	
WVKC-10-U-7	4.3	West Fork	9/18/97	0.3	0.38	8.50	22	12	<	5	Coal	50.98
WVK	44	Kanawha River	10/23/02	0.15	0.24	7.55	22.3	6.29		8	Lower Kanawha	
WVMT	65.1	Tygart Valley River	7/24/02	0.19	0.32	7.71	22.3	5.18	<	3	Tygart Valley	
WVKC-10-U-7	2.3	West Fork	4/30/03	0.17	0.22	8.53	22.5	13.9	<	3	Coal	66.26
WVKE-23	0.9	Big Sandy Creek	7/9/02	0.17	0.18	7.59	22.7	5.52	<	3	Elk	
WVMC-60-D-3-A		Long Run/North Fork/Blackwater	6/12/01	6.91	8.37	3.14	22.7	5.62		2	Cheat	27.86
WVMT	47.7	Tygart Valley River	7/23/02	0.19	0.21	7.63	23.2	2.82	<	3	Tygart Valley	
WVMT	75.9	Tygart Valley River	8/13/02	0.25	1.09	6.88	23.3	4.79	<	3	Tygart Valley	
WVMT	47.7	Tygart Valley River	8/12/02	0.28	0.3	7.51	23.7	4.31	<	3	Tygart Valley	
WVKE-26-A	0.16	Left Fork/Morris Creek	7/9/97	8.26	7.3	3.50	24	12	<	5	Elk	
WVKP	5.2	Pocatalico River	8/7/02	0.14	0.22	7.69	24.2	4.94		14	Lower Kanawha	
WVKE-23	0.9	Big Sandy Creek	8/6/02	0.25	0.31	7.51	24.8	5.67		4	Elk	
WVOG	126	Guyandotte River	8/28/00	0.1	0.11	6.84	24.9	10.98		6	Upper	

AN Code	Mile Point	Stream Name	Date	[illegible] mg/L	[illegible] mg/L	pH	Total Ca mg/L	Total Mg mg/L		TSS mg/L	Watershed	WVSCI
WVO-2-Q-8-A		Left Fork/Camp Creek	5/3/00	2.7	5.9	4.80	25	11			Twelvepole	81.3
WVMT	65.1	Tygart Valley River	8/13/02	0.3	0.38	7.67	25.2	5.44	<	3	Tygart Valley	
WVKP	45	Pocatalico River	8/21/02	0.15	0.88	6.97	25.5	4.9		30	Lower Kanawha	68.95
WVOG-131	0.6	Barkers Creek	9/6/00	0.12	0.15	7.89	25.8	8.97		4	Upper	56.33
WVMW-23	4.1	Browns Creek	3/21/01	0.093	2.86	7.66	26.4	5.81		43	West Fork	
WVKE-23	0.9	Big Sandy Creek	9/4/02	0.23	0.27	7.41	26.9	6.96		5	Elk	
WVM-1	21.4	Dunkard Creek	6/6/00	0.09	3.86	7.72	26.9	6.14		96	Dunkard	
WVMT-42	7.7	Roaring Creek	9/16/97	1.866	1.8		27	13	<	3	Tygart Valley	50.18
WVM-1-A	3.5	Dolls Run	5/30/00	0.1	0.11	7.72	27.4	6.54		20	Dunkard	77.65
WVMT	75.9	Tygart Valley River	9/6/02	0.28	1.99	6.44	27.8	6.11		5	Tygart Valley	
WVOG	142	Guyandotte River	9/7/00	0.13	0.26	8.14	27.9	12.1		4	Upper	
WVKE-50	0.7	Buffalo Creek	11/6/02	0.2	0.35	7.30	28.2	1.25		6	Elk	
WVMT	65.1	Tygart Valley River	9/6/02	0.3	0.33	7.54	28.2	6.08	<	3	Tygart Valley	
WVOG	120	Guyandotte River	9/6/00	0.2	0.25	8.38	28.2	13.5		5	Upper	
WVMTB	0.7	Buckhannon River	8/12/02	0.13	0.14	7.76	28.6	3.91	<	3	Tygart Valley	
WVMT	47.7	Tygart Valley River	9/5/02	0.3	0.32	7.74	28.8	5.55	<	3	Tygart Valley	
WVKN-22-G	3.36	White Oak Creek	4/1/02	2.45	3.15	5.05	29.9			13.2	Lower New	
WVMW-31-B		West Run/Hackers Creek	3/19/01	0.108	0.347	7.67	30	6.42		12.5	West Fork	
WVO-2-Q-8		Camp Creek	5/3/00	0.83	3.8	4.98	30	11			Twelvepole	63.93
WVOG	138	Guyandotte River	9/7/00	0.1	0.26	8.14	30.15	12.04		3	Upper	
WVK-73	2.7	Armstrong Creek	5/2/03	0.09	0.36	7.74	32	20.9	<	3	Upper Kanawha	69.08
WVMC-17	3.36	Muddy Creek	6/18/01	1.19	2.6	4.62	32	11.6		14	Cheat	76.6
WVOG-138-E		Mullens Branch/Winding Gulf	9/11/00	0.93	1.2	8.21	32	17		10	Upper	53.18
WVMTB	0.7	Buckhannon River	7/23/02	0.15	0.23	8.23	32.2	3.13	<	3	Tygart Valley	
WVKE-76	11.9	Birch River	7/8/02	0.25	0.29	7.88	33	11.5	<	3	Elk	
WVKE-50	0.7	Buffalo Creek	8/6/02	0.17	0.32	7.60	33.4	19.4	<	3	Elk	
WVKE-76	11.9	Birch River	8/5/02	0.15	0.22	8.14	33.4	15.1	<	3	Elk	
WVOG-131-C		Mill Branch/Barkers Creek	9/6/00	0.17	0.34	7.56	33.9	14.92		5	Upper	54.16
WVOG-138	0.7	Winding Gulf	9/6/00	0.175	0.354	8.12	34.2	16.6		16	Upper	62.14
WVOG-131-F		Gooney Otter Creek	9/5/00	0.19	0.38	8.13	34.8	11.46		3	Upper	64.93
WVOG-131-B		Hickory Branch/Barkers Creek	9/6/00	0.15	0.23	7.61	35.7	17.14		7	Upper	68.8
WVMT-18-E	0.4	Little Sandy Creek	9/4/97	10.06	10	3.53	36	9.5	<	5	Tygart Valley	45.23
WVMT-37	2.8	Beaver Creek	9/15/97	0.318	0.44	5.10	36	11		8	Tygart Valley	67.76
WVBST-24	13.5	Pigeon Creek	5/7/03	0.1	0.23	8.25	38.3	19.2		4	Tug Fork	46.9
WVMTB	0.7	Buckhannon River	9/5/02	0.24	0.25	7.99	39	6.13	<	3	Tygart Valley	
WVMW-2	0.2	Booths Creek	3/19/01	0.096	0.256	7.56	39.4	10.1		2.8	West Fork	
WVKE-76	11.9	Birch River	9/3/02	0.2	0.27	7.85	40.6	18.2	<	3	Elk	
WVKG-19-V-4	0	Cutlip Branch	7/24/03	0.12	1.27	7.53	44.1			10	Gauley	
WVPNB-17-B		Mill Run	8/13/97	0.1	0.05	7.80	45		<	5	North Branch	84.13
WVKE-50	15.7	Buffalo Creek	9/11/02	0.75	0.78	4.82	49.1	25.9	<	3	Elk	43.42
WVKE-50	15.7	Buffalo Creek	9/11/02	0.75	0.78		50.6	26.2	<	3	Elk	33.47
WVMT-12	10.2	Three Fork Creek	9/2/97	3.836	7.3	4.30	51	16	<	5	Tygart Valley	36.66
WVK-61-J-5	0.6	UNT/Cane Fork RM 1.5	5/17/02	7.63	7.63	3.79	52.6	33.6	<	3	Upper Kanawha	63.17

AUCode	Mile Point	Stream Name	Date	DS Al (mg/l)	Total Al (mg/L)	pH	Q	Total Ca (mg/L)	Q	Total Mg (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVKG-19-V-4	0	Cutlip Branch	10/20/03	0.12	1.98	7.60		52.8				10	Gauley	
WVKE-50	0.7	Buffalo Creek	10/8/02	0.13	0.13	7.58		53.6		36.7	<	3	Elk	
WVMW-15-H		Jerry Run	3/19/01	0.146	0.24	8.51		55.4		14.7		1.4	West Fork	
WVPNB-16-A	0.8	Emory Run	8/14/97	1.812	1.8	4.70		59		28	<	5	North Branch	55.73
WVMW-7-B		Long Run	8/2/00	0.13	0.41	8.21		59.8		16.1		1	West Fork	60.41
WVK-75	0.9	Jarrett Branch	6/17/02	0.12	0.39	9.25		60.4		28.9		14	Upper Kanawha	47.61
WVPNB-16-C		Laurel Run	8/19/97	5.657	5.4	4.70	#	62	#	32		10	North Branch	54.09
WVMW-9.5		UNT/West Fork RM 13.9	3/22/01	0.122	1.38	7.04		62.4		18.3		11	West Fork	
WVMC-17-A-1	1	Glade Run	5/24/01	11.9	14.8	3.53		62.8		33.1		2	Cheat	15.57
WVPNB-16	18.1	Abrams Creek	8/18/97	1.064	0.82	3.90		63		24	<	5	North Branch	46.89
WVKC-35	3	White Oak Creek	10/8/97	0.13	0.26	7.80		66		53	<	5	Coal	51.08
WVKN-22-G-{3.6}-Discharge		Refuse Pile Discharge into White Oak Creek	4/1/02	10.3	11.3	4.21		67				8.4	Lower New	
WVPNB	52	North Branch Potomac River	8/27/97	0.206	0.44	7.50		67		13		15	North Branch	26
WVKG-19-V-4	0	Cutlip Branch	11/3/03	0.13	1.81	7.54		68.7				6	Gauley	
WVMW-24		Coburns Creek	3/21/01	0.094	13.3	7.60		70.8		16		384	West Fork	
WVMW-13-E		Katys Lick Creek	3/21/01	0.135	1.85	7.95		73.7		18.6		46	West Fork	
WVPNB-16	5.4	Abrams Creek	8/14/97	0.601	0.71	5.10		75		23	<	5	North Branch	41.5
WVKE-50	0.7	Buffalo Creek	9/4/02	0.16	0.18	7.68		77.1		52	<	3	Elk	
WVMC-17	0	Muddy Creek	6/25/01	9.27	10.2	3.44		77.2		29.8		5	Cheat	
WVKG-19-V-4	0	Cutlip Branch	9/3/03	0.17	1.48	7.60		78.6				7	Gauley	
WVMW-22		Davisson Run/West Fork	3/21/01	0.158	30	7.65		80.1		17.6		1168	West Fork	
WVMW-15	6.6	Simpson Creek	3/20/01	0.089	0.466	8.10		81		21.9		5.7	West Fork	
WVMC-17-A-0.5	3	Fickey Run	5/1/01	15.1	17.7	2.95		82.3		21.8	<	1	Cheat	41.41
WVMW-15	0.4	Simpson Creek	3/20/01	0.149	0.463	8.07		85.1		22.9		1.7	West Fork	
WVMW-7.1		UNT/West Fork River RM 11.44	3/22/01	0.098	1.26	7.01		86.7		31.9		10.5	West Fork	
WVMW-11-F		6th UNT/Shinns Run	3/20/01	7.08	7.25	3.51		93.3		29.3		9.8	West Fork	
WVMW-2-C		Sweep Run	3/21/01	0.122	4.86	7.41		94.7		27.4		72	West Fork	
WVMC-17	2	Muddy Creek	7/1/03	11.2	13.4	4.38		97.6		37.2		34	Cheat	36.58
WVMW-15	17.2	Simpson Creek	3/19/01	0.089	1.15	7.44		100.2		28		12.5	West Fork	
WVOG-75-L		Middle Fork/Buffalo Creek	8/28/00	0.95	6.68	4.99		113.4		58.16		5	Upper	38.81
WVMW-11	3.8	Shinns Run	3/19/01	3.57	5.48	4.05		118.4		32.4		21	West Fork	
WVMW-15-J.5		UNT/Simpson Creek RM 21.92	3/20/01	0.088	0.736	7.98		119.5		40.1		18	West Fork	
WVMW-15	25.4	Simpson Creek	3/19/01	0.121	2.42	7.84		122.7		33		36	West Fork	
WVMW-15-K.7		UNT/Simpson Creek RM 23.1	8/8/00	0.11	0.18	7.45		124		37.7		2	West Fork	52.95
WVMW-15-L		West Branch/Simpson Creek	3/20/01	0.138	1.53	7.78		125		34.6		16	West Fork	
WVMW-11	3	Shinns Run	3/19/01	0.873	4.5	5.43		127.8		35.7		29.5	West Fork	
WVMW-11	6.07	Shinns Run	7/31/00	1.41	5.25	4.63		128		34.4		32	West Fork	
WVMW-11	6.06	Shinns Run	3/20/01	6.47	7.04	4.25		135.7		40.6		29	West Fork	
WVMW-15-N		UNT/Simpson Creek RM 26.94	3/19/01	0.144	0.916	7.76		139.9		42.6		19.5	West Fork	
WVMW-11	5.5	Shinns Run	3/20/01	0.154	3.33	5.86		140.6		38.8		19	West Fork	
WVMW-15	0.4	Simpson Creek	8/1/00	0.27	0.54	8.20		142		39.9	<	1	West Fork	38.5
WVMW-11	3.8	Shinns Run	7/31/00	1.73	5.15	4.78		143		50.6		19	West Fork	20.58

[illegible]	[illegible]	Stream Name	Date	[illegible]	[illegible]	pH	Q	Total Ca mg/L	Q	Total Mg mg/L	Q	TSS mg/L	Watershed	WVSCI
WVMW-15-L		West Branch/Simpson Creek	8/8/00	0.13	0.66	7.93		148		40.1		10	West Fork	56.45
WVMW-11	6.06	Shinns Run	7/31/00	0.48	3.32	5.82		157		45.3		24	West Fork	51.62
WVMT-42-B-1	1.3	UNT/Flatbush Fork	8/25/97	19.604	0.42	3.30		160		27	<	5	Tygart Valley	35.08
WVMW-11-E-{0.1}-Mine		Mine Discharge into Nixon Run	3/20/01	11.7	12.1	3.33		163.8		42.6		2	West Fork	
WVMW-11-D.5		UNT/Shinns Run	3/19/01	14.3	15.1	3.65		173.9		56.9		4	West Fork	
WVMW-11-D.5		UNT/Shinns Run	7/31/00	14.6	16.3	3.18		179		60.6	<	1	West Fork	
WVMW-21-E		Turkey Run/Elk Creek	3/20/01	0.096	0.212	7.96		179.9		39.7		16.3	West Fork	
WVMW-15-0.5A		UNT/Simpson Creek RM 1.23	8/1/00	4.57	5.03	4.60		189		53.2		4	West Fork	25.76
WVMW-15-0.5A		UNT/Simpson Creek RM 1.23	3/20/01	5.53	5.91	4.55		192.9		55.8		8.2	West Fork	
WVMW-31	24.2	Hackers Creek	3/19/01	0.127	0.287	7.94		193.3		50.2		11.8	West Fork	
WVMW-21-Q		Isaacs Run	3/20/01	0.089	0.109	7.95		196.6		62.9	<	1	West Fork	
WVMW-11-E	0.1	Nixon Run	8/2/00	11.8	13.9	2.91		201		51.8		2	West Fork	14.59
WVMW-11	6.43	Shinns Run	3/20/01	27.4	27.7	3.04		202.2		70.3		12	West Fork	
WVMW-15-J-0.3		UNT/Right Fork RM 1.97/Simpson	3/20/01	13	13	3.48		202.4		52.2		2.4	West Fork	
WVMC-17-A	2.4	Martin Creek	6/20/01	3.33	3.92	4.02		203		74.4		2	Cheat	
WVMW-15-B		Smith Run/Simpson Creek	3/20/01	3.95	7.88	5.24		208.4		57.2		48	West Fork	
WVPNB	88.9	North Branch Potomac River	8/11/97	0.14	0.05	7.80		210		34		8	North Branch	53.97
WVMW-12	2.6	Robinson Run	3/20/01	0.092	0.506	7.74		217.7		48.1		11	West Fork	
WVMW-16-B	0.1	UNT/Lambert Run RM 2.8	8/15/00	0.27	3.09	6.92		219		61		23	West Fork	49.82
WVMW-15-J-0.3		UNT/Right Fork RM 1.97/Simpson	8/8/00	14.8	15.5	3.35		222		56.3		1	West Fork	33.25
WVMW-13-0.5A		Jack Run/Tenmile Creek	8/1/00	0.09	1.45	7.36		224		44.9		24	West Fork	43.06
WVMW-15-J-1		Buck Run	8/7/00	0.16	3.82	6.65		230		69.2		1	West Fork	48.77
WVMW-11-F		6th UNT/Shinns Run	8/3/00	13.3	14.1	2.84		231		62.5		8	West Fork	24.45
WVMW-11-E	0.1	Nixon Run	3/20/01	32.8	34.3	2.82		233.1		75		2	West Fork	
WVMW-11-{6.06}-Mine		Mine Discharge into Shinns Run	7/31/00	0.35	0.69	4.09		239		80.5		13	West Fork	
WVMW-9.5		UNT/West Fork RM 13.9	8/1/00	0.53	5.12	5.39		242		55.8		27	West Fork	43.04
WVMW-11	6.43	Shinns Run	8/2/00	18.7	22.1	3.06		254		75.6		62	West Fork	
WVMW-15-B		Smith Run/Simpson Creek	8/1/00	2.21	4.63	4.92		259		76.7		18	West Fork	24.52
WVMW-15-N		UNT/Simpson Creek RM 26.94	8/8/00	5.85	6.56	4.51		281		66.4		3	West Fork	43.72
WVPNB-17-D-{13.2}-Discharge		Laurel Run Mine Pond Discharge	8/18/03	0.196	0.27	8.25		282		52.1		3	North Branch Potomac	
WVPNB-17-D-{13.2}-Discharge		Laurel Run Mine Pond Discharge	8/22/03	0.169	0.274	8.09		283		51.2		9	North Branch Potomac	
WVMW-15-N		UNT/Simpson Creek RM 26.94	8/8/00	5.66	6.55			300		66.8		4	West Fork	44.3
WVMW-21-A	0.7	Murphy Run	6/26/02	8.65	8.65	4.65		318		66.3		21.2	West Fork	46.56
WVO-91		Harrison Run	7/19/00	0.31	0.47	7.98		410		97			Upper Ohio	27.86
WVMC-17-A-{2.2}-Mine	0.2	Mine Channel into Martin Creek	6/20/01	10.6	11.5	3.39		427		265	<	1	Cheat	
WVBST-24	16.8	Pigeon Creek	9/22/03	0.15	0.2	8.47						5	Tug Fork	54.55
WVBST-24	21.8	Pigeon Creek	9/16/03	0.16	0.21	8.52					<	3	Tug Fork	55.96
WVBST-24	21.8	Pigeon Creek	9/16/03	0.16	0.196	8.52						4	Tug Fork	58.66
WVBST-24	23.4	Pigeon Creek	3/30/04	0.12	1.05	8.54						37	Tug Fork	
WVBST-24	23.4	Pigeon Creek	3/15/04	0.15	0.22	8.63						3	Tug Fork	
WVBST-24	23.4	Pigeon Creek	4/29/04	0.15	0.28	9.00						4	Tug Fork	

AN Code	Mile Point	Stream Name	Date	Dis Al (mg/L)	Total Al (mg/L)	pH	Q	Total Ca (mg/L)	Q	Total Mg (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVBST-40	3.5	Mate Creek	9/24/03	0.1	0.15	7.86						3	Tug Fork	59.54
WVBST-40	3.2	Mate Creek	4/1/04	0.09	0.44	8.13						5	Tug Fork	
WVBST-40	3.2	Mate Creek	4/27/04	0.1	0.33	8.34					<	3	Tug Fork	
WVK	54.4	Kanawha River	1/21/03	0.16	0.2	7.39					<	3	Lower Kanawha	
WVK	32.2	Kanawha River	4/22/03	0.1	0.63	7.45						11	Lower Kanawha	
WVK-41	3.4	Twomile Creek	4/2/03	0.16	0.31	7.70						5	Lower Kanawha	
WVK-41	3.4	Twomile Creek	5/13/03	0.12	0.28	8.44					<	3	Lower Kanawha	
WVK-41-D.5	1	Rich Fork	2/26/03	13.2	13.6	3.58						4	Lower Kanawha	
WVK-41-D.5	1	Rich Fork	4/2/03	9.1	9.4	4.32					<	3	Lower Kanawha	
WVK-41-D.5	1	Rich Fork	5/14/03	9.24	10.2	4.36						3	Lower Kanawha	
WVK-41-D.5	1	Rich Fork	4/18/03	8.67	8.81	4.61						15	Lower Kanawha	
WVK-41-D.5	1	Rich Fork	12/18/02	5.67	6.11	4.61						6	Lower Kanawha	
WVK-41-D.5	1	Rich Fork	1/21/03	7.02	7.05	4.87					<	3	Lower Kanawha	
WVK-41-D.5	1	Rich Fork	11/21/02	3.44	3.73	4.96						9	Lower Kanawha	
WVK-41-D.5	0	Rich Fork	2/26/03	5.14	5.97	5.04						17	Lower Kanawha	
WVK-41-D.5	1	Rich Fork	10/16/02	1.14	3.24	5.22						30	Lower Kanawha	
WVK-41-D.5	1	Rich Fork	11/6/02	1.06	3.61	5.40						33	Lower Kanawha	
WVK-41-D.5	0	Rich Fork	12/16/02	0.3	1.9	7.20						18	Lower Kanawha	
WVK-41-D.5	0	Rich Fork	10/16/02	0.09	1.94	7.42						49	Lower Kanawha	
WVK-41-D.5-3	0	UNT/Rich Fork RM 1.0	2/26/03	4.69	5.21	5.00						15	Lower Kanawha	
WVK-49	10.2	Campbells Creek	7/30/01	0.13	1.1	6.95						29	Upper Kanawha	
WVK-49	0.2	Campbells Creek	9/24/01	0.174	0.289	7.56					<	5	Upper Kanawha	
WVK-49	5.4	Campbells Creek	9/26/01	0.093	0.178	7.71					<	5	Upper Kanawha	
WVK-49	3	Campbells Creek	9/25/01	0.118	0.175	7.87					<	5	Upper Kanawha	
WVK-49-A	0	Dry Branch	8/1/01	0.11	0.54	7.12						8	Upper Kanawha	
WVK-49-A	0.1	Dry Branch	12/6/01	7.58	9.56	7.28					<	5	Upper Kanawha	
WVK-49-A	0	Dry Branch	9/24/01	0.213	0.328	7.79						7	Upper Kanawha	
WVK-49-A-{0.1}-Mine		Mine Discharge into Dry Branch	9/24/01	0.165	0.23	7.22					<	5	Upper Kanawha	
WVK-49-B	0.2	Spring Fork	8/1/01	0.11	0.26	7.35						8	Upper Kanawha	
WVK-49-B	1.6	Spring Fork	9/24/01	0.192	2.88	7.47						43	Upper Kanawha	
WVK-49-B	0.2	Spring Fork	9/24/01	0.201	0.834	7.93						8	Upper Kanawha	
WVK-49-B-2-A	0	UNT/Left Fork RM 0.2/Spring Fork	9/25/01	0.105	0.605	7.14						17	Upper Kanawha	
WVK-49-F	1.2	Pointlick Fork	9/25/01	0.117	0.161	7.26					<	5	Upper Kanawha	
WVK-49-F	2.3	Pointlick Fork	9/25/01	0.12	0.12	7.28						7	Upper Kanawha	
WVK-49-F	0	Pointlick Fork	9/25/01	0.136	0.136	7.54					<	5	Upper Kanawha	
WVK-49-F-4	0	UNT/Pointlick Fork RM 2.4	9/25/01	0.16	0.846	7.64						29	Upper Kanawha	
WVK-49-I	0	Rattlesnake Hollow	9/26/01	0.14	0.16	7.45					<	5	Upper Kanawha	
WVK-49-J	0	UNT/Campbells Creek RM 7.5	7/30/01	0.11	1.34	7.09						35	Upper Kanawha	
WVK-53	3.8	Lens Creek	10/10/01	0.163	0.164	8.11						5	Upper Kanawha	
WVK-53-A	0	Left Fork/Lens Creek	10/10/01	0.113	0.113	8.05					<	5	Upper Kanawha	
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	6/3/02	27.3	27.3	3.23					<	3	Upper Kanawha	
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	9/6/01	10.4	10.4	3.29					<	5	Upper Kanawha	

AN Code	Mile Point	Stream Name	Date	Fe Diss (mg/l)	Fe Tot (mg/l)	pH	Q	Total Ca (mg/l)	Q	Total Mg (mg/l)	Q	TSS (mg/L)	Watershed	WVSCI
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	8/14/01	7.81	7.87	3.79					<	5	Upper Kanawha	
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	10/15/01	4.5	5.72	4.12					<	5	Upper Kanawha	
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	12/5/01	2.5	3.16	4.26						27	Upper Kanawha	
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	11/19/01	3.04	3.89	4.40					<	5	Upper Kanawha	
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	3/29/02	3.62	4	4.64						5.2	Upper Kanawha	
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	3/13/02	2	2.19	4.87					<	3	Upper Kanawha	
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	2/20/02	2.77	2.95	4.98					<	3	Upper Kanawha	
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	1/23/02	0.268	1.41	5.93						32.4	Upper Kanawha	
WVK-57	5.1	Witcher Creek	7/30/01	0.4	0.94	4.61					<	5	Upper Kanawha	
WVK-57	5.1	Witcher Creek	7/18/01	0.6	0.67	4.91						5	Upper Kanawha	
WVK-57	5.1	Witcher Creek	5/7/02	0.32	0.95	5.33						17.6	Upper Kanawha	
WVK-57	5.1	Witcher Creek	2/26/02	0.63	0.68	5.71					<	3	Upper Kanawha	
WVK-57	5.1	Witcher Creek	3/6/02	0.46	0.49	5.73					<	3	Upper Kanawha	
WVK-57	5.1	Witcher Creek	4/8/02	0.34	0.42	5.94					<	3	Upper Kanawha	
WVK-57	5.1	Witcher Creek	12/20/01	0.517	0.656	6.10					<	5	Upper Kanawha	
WVK-57	5.1	Witcher Creek	1/24/02	0.3	1.12	6.11						26.4	Upper Kanawha	
WVK-57	0.7	Witcher Creek	7/30/01	0.12	1	6.91						21	Upper Kanawha	
WVK-57	0.7	Witcher Creek	9/24/01	0.144	0.217	7.53					<	5	Upper Kanawha	
WVK-57-A	0	Dry Branch	7/30/01	0.13	0.59	6.99						9	Upper Kanawha	
WVK-57-A	0	Dry Branch	9/24/01	0.15	0.232	7.82					<	5	Upper Kanawha	
WVK-57-C	0	Left Fork/Witcher Creek	7/30/01	0.14	1.09	5.79						15	Upper Kanawha	
WVK-57-D.5	0	UNT/Witcher Creek RM 5.2	7/30/01	0.34	0.98	4.87						19	Upper Kanawha	
WVK-57-D.5	0	UNT/Witcher Creek RM 5.2	7/18/01	0.14	0.42	5.15						6	Upper Kanawha	
WVK-58	0.2	Fields Creek	3/15/02	0.1	0.26	6.93					<	3	Upper Kanawha	
WVK-58	0.2	Fields Creek	2/25/02	0.31	0.4	6.97						3.2	Upper Kanawha	
WVK-58	0.2	Fields Creek	6/12/02	0.1	0.14	7.72					<	3	Upper Kanawha	
WVK-58	5.9	Fields Creek	10/10/01	0.09	0.103	8.35					<	5	Upper Kanawha	
WVK-58	3.5	Fields Creek	10/10/01	0.12	0.12	8.76					<	5	Upper Kanawha	
WVK-58	1.5	Fields Creek	10/10/01	0.111	0.216	9.21					<	5	Upper Kanawha	
WVK-58	0.2	Fields Creek	2/25/02	0.33	0.53						<	3	Upper Kanawha	
WVK-58	0.2	Fields Creek	6/12/02	0.11	0.13						<	3	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	9/5/01	11.3	11.5	4.09					<	5	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	1/29/02	6.52	6.54	4.25					<	3	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	12/14/01	15.1	19.4	4.25						28	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	6/12/02	13.3	13.3	4.29					<	3	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	8/15/01	9.6	10	4.36					<	5	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	7/18/01	11	10.7	4.52					<	5	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	11/14/01	14.2	18.9	4.61						6	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	4/8/02	3.59	3.68	4.72					<	3	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	5/1/02	2.46	2.46	4.77					<	3	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	2/25/02	11.9	12.3	4.93					<	3	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	3/15/02	11.2	11.3	5.26					<	3	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	10/10/01	11.2	13	5.52					<	5	Upper Kanawha	

AnCode	Mile Point	Stream Name	Date	Diss Fe (mg/l)	Tot Fe (mg/l)	pH	Q	Total Ca (mg/l)	Q	Total Mg (mg/l)	Q	TSS (mg/l)	Watershed	WVSCI
WVK-58-B.8	0	Mill Branch	6/12/02	0.1	0.33	7.80						13.2	Upper Kanawha	
WVK-58-B.8	0	Mill Branch	10/10/01	0.089	0.127	8.34						10	Upper Kanawha	
WVK-59	1.6	Carroll Branch	6/3/02	10.4	10.4	3.26						3	Upper Kanawha	
WVK-59	1.6	Carroll Branch	7/30/01	5.7	5.7	3.27					<	5	Upper Kanawha	
WVK-59	1.6	Carroll Branch	5/6/02	8.98	8.98	3.34						18.4	Upper Kanawha	
WVK-59	1.6	Carroll Branch	9/4/01	7.17	7.52	3.49						5	Upper Kanawha	
WVK-59	1.6	Carroll Branch	12/6/01	7.58	9.56	3.53					<	5	Upper Kanawha	
WVK-59	1.6	Carroll Branch	7/18/01	5.63	5.69	3.56					<	5	Upper Kanawha	
WVK-59	1.6	Carroll Branch	3/15/02	7.83	7.96	3.60					<	3	Upper Kanawha	
WVK-59	1.6	Carroll Branch	4/1/02	4.36	4.48	3.60						8.4	Upper Kanawha	
WVK-59	1.6	Carroll Branch	1/22/02	7.5	7.763	3.61					<	3	Upper Kanawha	
WVK-59	1.6	Carroll Branch	2/19/02	8.13	8.15	3.76					<	3	Upper Kanawha	
WVK-59	1.6	Carroll Branch	11/13/01	7.46	10.3	3.86					<	5	Upper Kanawha	
WVK-59	0.1	Carroll Branch	6/13/02	4.8	5.5	4.69						7.6	Upper Kanawha	
WVK-59	0.1	Carroll Branch	5/6/02	4.16	4.33	4.77						4.4	Upper Kanawha	
WVK-59	1.6	Carroll Branch	10/11/01	8.01	8.98	5.01						13	Upper Kanawha	
WVK-59	0.1	Carroll Branch	4/1/02	0.2	1.62	5.71						25.6	Upper Kanawha	
WVK-59	0.1	Carroll Branch	7/18/01	0.11	2.77	5.81						20	Upper Kanawha	
WVK-59	0.1	Carroll Branch	7/30/01	0.1	2.02	6.22						35	Upper Kanawha	
WVK-59	0.1	Carroll Branch	2/19/02	0.09	1.55	6.91						3.2	Upper Kanawha	
WVK-59	0.1	Carroll Branch	10/11/01	0.19	9.22	8.68						1217	Upper Kanawha	
WVK-59	0.1	Carroll Branch	4/1/02	0.19	1.59							30.8	Upper Kanawha	
WVK-60	4.3	Slaughter Creek	10/10/01	0.136	0.244	6.58					<	5	Upper Kanawha	
WVK-60	3	Slaughter Creek	10/9/01	0.091	0.091	7.05					<	5	Upper Kanawha	
WVK-60	0.3	Slaughter Creek	6/13/02	0.11	0.17	7.07					<	3	Upper Kanawha	
WVK-60	3	Slaughter Creek	6/13/02	0.09	0.57	7.07					<	3	Upper Kanawha	
WVK-60	0.3	Slaughter Creek	10/10/01	0.107	0.167	7.97						7	Upper Kanawha	
WVK-60-A	0	Little Creek	3/14/02	1.07	5.9	4.89						23.6	Upper Kanawha	
WVK-60-A	0.8	Little Creek	5/1/02	1.57	1.84	5.07					<	3	Upper Kanawha	
WVK-60-A	0	Little Creek	4/2/02	1.04	1.61	5.13						9.2	Upper Kanawha	
WVK-60-A	0	Little Creek	5/1/02	3.86	3.86	5.14					<	3	Upper Kanawha	
WVK-60-A	0.8	Little Creek	4/4/02	1.44	1.79	5.18						3.2	Upper Kanawha	
WVK-60-A	0	Little Creek	2/25/02	1.5	2.98	5.18						8.4	Upper Kanawha	
WVK-60-A	0	Little Creek	1/28/02	1.45	2.09	5.20						6	Upper Kanawha	
WVK-60-A	0.8	Little Creek	1/28/02	0.901	1.45	5.41					<	3	Upper Kanawha	
WVK-60-A	0.8	Little Creek	3/14/02	0.18	1.68	5.87						4.8	Upper Kanawha	
WVK-60-A	0.8	Little Creek	2/25/02	0.33	1.68	6.34						6.4	Upper Kanawha	
WVK-60-A	0	Little Creek	6/13/02	0.12	0.58	6.99					<	3	Upper Kanawha	
WVK-60-A	0.8	Little Creek	10/9/01	0.227	0.273	7.65					<	5	Upper Kanawha	
WVK-60-A	0	Little Creek	10/9/01	0.205	0.352	7.85					<	5	Upper Kanawha	
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	3/14/02	11.7	11.8	4.04					<	3	Upper Kanawha	

AN Code	Mile Point	Stream Name	Date	Dis Al (mg/L)	Total Al (mg/L)	pH	Q	Total Ca (mg/L)	Q	Total Mg (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	9/4/01	22.1	21.1	4.11					<	5	Upper Kanawha	
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	6/13/02	13.6	14.2	4.29					<	3	Upper Kanawha	
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	1/28/02	6.71	6.79	4.33						5.6	Upper Kanawha	
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	2/25/02	12	12.2	4.38					<	3	Upper Kanawha	
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	12/13/01	21.1	26.8	4.39					<	5	Upper Kanawha	
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	11/13/01	34.3	34.7	4.40						10	Upper Kanawha	
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	10/9/01	12.5	26.2	4.43						10	Upper Kanawha	
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	5/1/02	1.26	1.91	4.44					<	3	Upper Kanawha	
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	4/2/02	2.72	3.43	4.50					<	3	Upper Kanawha	
WVK-60-B	0	Bradley Fork	3/14/02	0.88	1.14	4.95					<	3	Upper Kanawha	
WVK-60-B	0	Bradley Fork	2/21/02	1.11	1.22	5.30					<	3	Upper Kanawha	
WVK-60-B	0	Bradley Fork	1/28/02	0.79	1.08	5.34					<	3	Upper Kanawha	
WVK-60-B	0	Bradley Fork	4/2/02	0.18	0.76	5.58						8	Upper Kanawha	
WVK-60-B	0	Bradley Fork	12/12/01	0.158	0.31	5.96					<	5	Upper Kanawha	
WVK-60-B	0	Bradley Fork	10/9/01	0.095	0.287	6.76						5	Upper Kanawha	
WVK-60-B	0	Bradley Fork	6/12/02	0.13	1.3	7.12						4.8	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	9/6/01	6.16	6.47	4.12					<	5	Upper Kanawha	
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	9/6/01	5.64	8.25	4.24					<	5	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	3/14/02	10.9	11	4.25					<	3	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	6/13/02	18.9	18.9	4.26					<	3	Upper Kanawha	
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	3/14/02	10.8	11.7	4.28					<	3	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	8/7/01	14	14.7	4.32					<	5	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	10/10/01	18.6	23	4.41					<	5	Upper Kanawha	
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	10/10/01	17.3	22.1	4.41					<	5	Upper Kanawha	
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	7/25/01	19.3	20.4	4.43					<	5	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	4/2/02	9.29	9.38	4.44					<	3	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	12/12/01	11.1	16.4	4.44					<	5	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	5/1/02	13.9	14.6	4.46					<	3	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	11/26/01	12.1	14.7	4.48					<	5	Upper Kanawha	
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	11/26/01	11.3	14.8	4.49					<	5	Upper Kanawha	
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	12/12/01	12.1	16	4.55					<	5	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	1/28/02	8.65	9.26	4.57					<	3	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	2/21/02	8.64	9.11	4.59						3.2	Upper Kanawha	
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	2/21/02	7.94	8.24	4.68					<	3	Upper Kanawha	
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	1/28/02	8.4	8.92	4.70					<	3	Upper Kanawha	

AN Code	Mile Point	Stream Name	Date	[illegible]	[illegible]	pH		[illegible]		[illegible]		TSS (mg/L)	Watershed	WVSCI
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	4/2/02	1.98	8.92	4.71						19.6	Upper Kanawha	
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	8/7/01	0.79	17.8	8.72						79	Upper Kanawha	
WVK-60-C	0	Dotson Fork	4/2/02	0.15	0.8	5.79						14	Upper Kanawha	
WVK-61	14.1	Cabin Creek	9/13/01	0.22	3.71	6.02						38	Upper Kanawha	
WVK-61	10.1	Cabin Creek	6/5/02	0.11	2.12	6.57						16.8	Upper Kanawha	
WVK-61	7.3	Cabin Creek	9/13/01	0.13	0.54	6.89						6	Upper Kanawha	
WVK-61	9.9	Cabin Creek	9/13/01	0.17	1.51	7.13						12	Upper Kanawha	
WVK-61	17.5	Cabin Creek	10/10/01	0.217	6.06	7.26						33	Upper Kanawha	
WVK-61	10.1	Cabin Creek	9/13/01	0.3	1.3	7.28						15	Upper Kanawha	
WVK-61	6.4	Cabin Creek	9/13/01	0.19	0.46	7.35						10	Upper Kanawha	
WVK-61	15.2	Cabin Creek	10/10/01	0.101	4.36	7.35						40	Upper Kanawha	
WVK-61	14.1	Cabin Creek	10/10/01	0.126	3.36	7.38						35	Upper Kanawha	
WVK-61	9.9	Cabin Creek	6/5/02	0.12	2.1	7.41						17.6	Upper Kanawha	
WVK-61	10.1	Cabin Creek	10/10/01	0.143	1.02	7.57						16	Upper Kanawha	
WVK-61	12.7	Cabin Creek	9/13/01	0.22	1.99	7.58						16	Upper Kanawha	
WVK-61	12.7	Cabin Creek	10/10/01	0.112	1.63	7.61						20	Upper Kanawha	
WVK-61	9.9	Cabin Creek	10/11/01	0.128	1.07	7.65					<	5	Upper Kanawha	
WVK-61	12.7	Cabin Creek	5/1/02	0.09	1.38	7.71						20.4	Upper Kanawha	
WVK-61	12.7	Cabin Creek	6/7/02	0.1	1.85	7.71						30	Upper Kanawha	
WVK-61	19.8	Cabin Creek	10/11/01	0.111	0.132	7.75						7	Upper Kanawha	
WVK-61	7.3	Cabin Creek	6/5/02	0.13	1.36	7.78						12	Upper Kanawha	
WVK-61	4.7	Cabin Creek	10/10/01	0.099	0.179	7.80					<	5	Upper Kanawha	
WVK-61	0.9	Cabin Creek	10/10/01	0.197	0.275	7.82					<	5	Upper Kanawha	
WVK-61	6.4	Cabin Creek	10/9/01	0.108	0.29	7.83						5	Upper Kanawha	
WVK-61	7.3	Cabin Creek	10/9/01	0.145	0.427	7.84						7	Upper Kanawha	
WVK-61	6.4	Cabin Creek	6/5/02	0.14	1.13	7.85						8.4	Upper Kanawha	
WVK-61	17.8	Cabin Creek	10/10/01	0.112	0.112	7.88					<	5	Upper Kanawha	
WVK-61	2.6	Cabin Creek	10/10/01	0.122	0.181	8.06						5	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	9/4/01	14.8	15.5	3.97						21	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	7/31/01	15	18	4.37						27	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	12/13/01	16.3	20.6	4.45						11	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	12/13/01	16.3	20.6	4.45						11	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	7/17/01	13.2	14.5	4.50						20	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	4/8/02	12.5	13.7	4.62						49.2	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	11/13/01	13	19.3	4.67						89	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	4/30/02	8.51	11.5	4.73						16.8	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	3/12/02	5.86	11.9	5.11						91.6	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	10/11/01	15.4	19.8	5.53						36	Upper Kanawha	
WVK-61-B	0	Dry Branch	6/7/02	0.11	0.26	7.73						4.8	Upper Kanawha	
WVK-61-B-1	0	UNT/Dry Branch RM 0.7 (Coalburg Branch)	6/7/02	1.06	1.92	5.17						20.4	Upper Kanawha	
WVK-61-B-1	0	UNT/Dry Branch RM 0.7 (Coalburg Branch)	5/7/02	0.82	2.52	5.20						80.4	Upper Kanawha	

Stream Code	Mile Point	Stream Name	Date	Dis Fe (mg/l)	Total Fe (mg/l)	pH	Q	Total Ca (mg/l)	Q	Total Mg (mg/l)	Q	TSS (mg/L)	Watershed	WVSCI
WVK-61-B-1	0	UNT/Dry Branch RM 0.7 (Coalburg Branch)	3/28/02	1.04	1.2	5.28						6.4	Upper Kanawha	
WVK-61-B-1	0	UNT/Dry Branch RM 0.7 (Coalburg Branch)	2/28/02	0.24	0.61	7.18						4.8	Upper Kanawha	
WVK-61-B-1	0	UNT/Dry Branch RM 0.7 (Coalburg Branch)	1/23/02	0.255	0.694	7.41						12.4	Upper Kanawha	
WVK-61-B-1	0	UNT/Dry Branch RM 0.7 (Coalburg Branch)	3/5/02	0.22	0.4	7.92						4	Upper Kanawha	
WVK-61-E	0	Paint Branch	10/9/01	0.1	0.119	7.82					<	5	Upper Kanawha	
WVK-61-F	0	Longbottom Creek	10/9/01	0.1	0.1	7.76					<	5	Upper Kanawha	
WVK-61-F	0.8	Longbottom Creek	10/9/01	0.093	0.05	7.78					<	5	Upper Kanawha	
WVK-61-G	0	Greens Branch	10/9/01	0.153	0.479	7.74					<	5	Upper Kanawha	
WVK-61-H	4.8	Coal Fork	10/2/01	0.192	0.338	6.61					<	5	Upper Kanawha	
WVK-61-H	0	Coal Fork	10/9/01	0.123	0.123	7.33					<	5	Upper Kanawha	56.6
WVK-61-H	0	Coal Fork	9/24/01	0.29	0.666	7.34					<	5	Upper Kanawha	
WVK-61-H-1	0	Laurel Fork/Coal Fork	10/9/01	0.141	0.164	7.14						12	Upper Kanawha	
WVK-61-H-1	0	Laurel Fork/Coal Fork	9/24/01	0.231	0.527	7.38					<	5	Upper Kanawha	
WVK-61-H-3	0	UNT/Coal Fork RM 4.6	5/1/02	0.68	3.13	5.43						25	Upper Kanawha	
WVK-61-H-3	0	UNT/Coal Fork RM 4.6	10/1/01	0.139	0.492	6.83						34	Upper Kanawha	
WVK-61-H-3	0	UNT/Coal Fork RM 4.6	6/5/02	0.11	0.18	7.66						10	Upper Kanawha	
WVK-61-I	0.1	Bear Hollow	1/22/02	0.552	0.819	5.28						4.8	Upper Kanawha	
WVK-61-I	0.1	Bear Hollow	12/18/01	0.597	0.888	5.32						4	Upper Kanawha	
WVK-61-I	0.1	Bear Hollow	2/25/02	0.4	0.67	5.35					<	5	Upper Kanawha	
WVK-61-I	0.1	Bear Hollow	3/12/02	0.47	0.74	5.58					<	3	Upper Kanawha	
WVK-61-I	0.1	Bear Hollow	3/29/02	0.37	0.57	5.68					<	3	Upper Kanawha	
WVK-61-I	0.1	Bear Hollow	5/2/02	0.1	0.37	5.98					<	3	Upper Kanawha	
WVK-61-I-1	0	UNT/Bear Hollow RM 0.3	12/18/01	2.47	3.44	4.86						8	Upper Kanawha	
WVK-61-I-1	0	UNT/Bear Hollow RM 0.3	3/13/02	2.15	2.58	4.91					<	5	Upper Kanawha	
WVK-61-I-1	0	UNT/Bear Hollow RM 0.3	2/25/02	2.08	2.71	4.93						3.2	Upper Kanawha	
WVK-61-I-1	0	UNT/Bear Hollow RM 0.3	5/2/02	0.29	0.6	5.18					<	3	Upper Kanawha	
WVK-61-I-1	0	UNT/Bear Hollow RM 0.3	1/22/02	2.13	2.43	5.47						6	Upper Kanawha	
WVK-61-I-1	0	UNT/Bear Hollow RM 0.3	11/26/01	0.236	0.332	5.95						8	Upper Kanawha	
WVK-61-I-1	0	UNT/Bear Hollow RM 0.3	4/4/02	0.38	0.56	6.16					<	5	Upper Kanawha	
WVK-61-I-1	0	UNT/Bear Hollow RM 0.3	3/13/02	2.23	2.56							3.2	Upper Kanawha	
WVK-61-J	0	Cane Fork	8/9/01	13.4	13.2	3.03					<	3	Upper Kanawha	
WVK-61-J	0.4	Cane Fork	8/9/01	20.9	21.2	3.15					<	5	Upper Kanawha	
WVK-61-J	0	Cane Fork	4/4/02	23.5	23.6	3.24						5	Upper Kanawha	
WVK-61-J	0	Cane Fork	9/13/01	6.69	7.28	3.31						16.4	Upper Kanawha	
WVK-61-J	0.4	Cane Fork	9/13/01	6.31	6.61	3.36					<	5	Upper Kanawha	
WVK-61-J	0	Cane Fork	4/30/02	8.8	9.15	3.46						6	Upper Kanawha	
WVK-61-J	0	Cane Fork	7/19/01	6.49	6.73	3.54						8	Upper Kanawha	
WVK-61-J	0	Cane Fork	6/5/02	7.53	7.53	3.54						8	Upper Kanawha	
WVK-61-J	0	Cane Fork	2/20/02	7.93	8.58	3.56						4.4	Upper Kanawha	
												5.6	Upper Kanawha	

AN Code	Mile Point	Stream Name	Date	[illegible] (mg/L)	[illegible] (mg/L)	pH	Q	Total Fe (mg/L)	Q	Total Mn (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVK-61-J	0	Cane Fork	3/8/02	9.13	9.75	3.67					<	3	Upper Kanawha	
WVK-61-J	0	Cane Fork	10/11/01	5.83	7	3.69					<	5	Upper Kanawha	
WVK-61-J	0	Cane Fork	11/26/01	5.06	6.44	3.78					<	5	Upper Kanawha	
WVK-61-J	0	Cane Fork	1/22/02	5.13	5.62	3.80					<	3	Upper Kanawha	
WVK-61-J	0	Cane Fork	12/18/01	2.54	3.1	4.40					<	5	Upper Kanawha	
WVK-61-J-1	0	UNT/Cane Fork RM 0.4	8/9/01	11.5	11.7	2.97					<	5	Upper Kanawha	
WVK-61-J-5	0	UNT/Cane Fork RM 1.5	7/19/01	1.48	3.31	5.18						7	Upper Kanawha	
WVK-61-K	0	Toms Fork	11/2/01	11.3	14.8	7.55					<	5	Upper Kanawha	
WVK-61-K	0	Toms Fork	10/11/01	0.104	0.234	7.71					<	5	Upper Kanawha	
WVK-61-L	0	Tenmile Fork	1/17/02	0.093	0.419	7.76						10	Upper Kanawha	
WVK-61-L	2.5	Tenmile Fork	4/2/02	0.1	0.65	7.79						26.8	Upper Kanawha	
WVK-61-L	0	Tenmile Fork	12/18/01	0.0893	0.984	7.85						49	Upper Kanawha	
WVK-61-L	2.5	Tenmile Fork	5/1/02	0.19	1.01	7.97						20.8	Upper Kanawha	
WVK-61-L	0	Tenmile Fork	7/19/01	0.13	0.6	7.97						26	Upper Kanawha	
WVK-61-L	0	Tenmile Fork	5/1/02	0.09	0.19	7.99						16	Upper Kanawha	
WVK-61-L	4.7	Tenmile Fork	10/10/01	0.148	0.208	8.05					<	5	Upper Kanawha	
WVK-61-L	0	Tenmile Fork	2/25/02	0.13	0.32	8.08					<	3	Upper Kanawha	
WVK-61-L	0	Tenmile Fork	10/11/01	0.275	0.457	8.11						5	Upper Kanawha	
WVK-61-L	0	Tenmile Fork	6/4/02	0.25	0.62	8.12						10.8	Upper Kanawha	
WVK-61-L	2.5	Tenmile Fork	9/10/01	0.103	0.49	8.13						10	Upper Kanawha	
WVK-61-L	0	Tenmile Fork	3/12/02	0.12	0.38	8.13						9.6	Upper Kanawha	
WVK-61-L	2.5	Tenmile Fork	6/4/02	0.28	0.72	8.15						12	Upper Kanawha	
WVK-61-L	2.5	Tenmile Fork	2/25/02	0.13	0.49	8.17					<	3	Upper Kanawha	
WVK-61-L	2.5	Tenmile Fork	7/19/01	0.22	0.78	8.18						40	Upper Kanawha	
WVK-61-L	2.5	Tenmile Fork	3/12/02	0.11	0.39	8.22						7.2	Upper Kanawha	
WVK-61-L	2.5	Tenmile Fork	10/10/01	0.19	0.456	8.23						9	Upper Kanawha	
WVK-61-L	0	Tenmile Fork	11/20/01	0.097	0.209	8.24					<	5	Upper Kanawha	
WVK-61-L	2.5	Tenmile Fork	2/25/02	0.12	0.49							3.6	Upper Kanawha	
WVK-61-L-0.5	0	UNT/Tenmile Fork RM 1.2	10/10/01	0.211	0.466	7.58						12	Upper Kanawha	
WVK-61-L-0.5	0	UNT/Tenmile Fork RM 1.2	10/4/01	0.33	0.58	7.60						17	Upper Kanawha	39.93
WVK-61-L-0.5	0	UNT/Tenmile Fork RM 1.2	3/8/02	0.1	0.34	7.95						3.2	Upper Kanawha	
WVK-61-L-0.5	0	UNT/Tenmile Fork RM 1.2	6/4/02	0.09	0.2	7.98					<	3	Upper Kanawha	
WVK-61-O	0.2	Fifteenmile Fork	12/17/01	0.427	9.04	5.09						36	Upper Kanawha	
WVK-61-O	0.2	Fifteenmile Fork	10/11/01	2.77	10.3	5.21						44	Upper Kanawha	
WVK-61-O	0.2	Fifteenmile Fork	11/15/01	1.3	8.28	5.30						47	Upper Kanawha	
WVK-61-O	0.2	Fifteenmile Fork	9/11/01	0.173	7.98	5.86						38	Upper Kanawha	
WVK-61-O	2.9	Fifteenmile Fork	2/19/02	0.1	7.27	7.70						26.4	Upper Kanawha	
WVK-61-O	1.3	Fifteenmile Fork	4/30/02	0.12	2.92	7.76						16.4	Upper Kanawha	
WVK-61-O	1.3	Fifteenmile Fork	4/4/02	0.11	1.4	7.78						14	Upper Kanawha	
WVK-61-O-1	0	Abbott Creek	12/17/01	9.2	10.8	3.27					<	5	Upper Kanawha	
WVK-61-O-1	0	Abbott Creek	11/14/01	8.07	10.3	3.40					<	5	Upper Kanawha	
WVK-61-O-1	0	Abbott Creek	10/11/01	1.82	4.66	5.50						21	Upper Kanawha	
WVK-61-O-1	0	Abbott Creek	1/16/02	2.2	3.3	6.06					<	5	Upper Kanawha	

AnCode	Mile Point	Stream Name	Date	Dis Al (mg/L)	Tot Al (mg/L)	pH	Q	Total Ca (mg/L)	Q	Total Mg (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVK-62	0	Watson Branch	7/31/01	3.15	3.2	3.57					<	5	Upper Kanawha	
WVK-62	0	Watson Branch	4/8/02	13.1	13.2	3.60					<	3	Upper Kanawha	
WVK-62	0	Watson Branch	4/30/02	8.97	9.58	3.65					<	3	Upper Kanawha	
WVK-62	0	Watson Branch	2/21/02	5.75	6.63	4.69					<	3	Upper Kanawha	
WVK-62	0	Watson Branch	1/24/02	2.09	2.75	4.99						29.6	Upper Kanawha	
WVK-63	0	Mile Branch	7/31/01	0.142	0.83	6.07					<	5	Upper Kanawha	
WVK-63	0	Mile Branch	4/8/02	0.12	1.37	7.48						6	Upper Kanawha	
WVK-63	0	Mile Branch	6/12/02	0.09	0.38	8.15					<	3	Upper Kanawha	
WVK-70	2.4	Morris Creek	11/16/01	0.906	1.65	4.40						10	Upper Kanawha	
WVK-70	0.2	Morris Creek	11/13/01	0.208	0.619	5.99						6	Upper Kanawha	
WVK-70	3.3	Morris Creek	8/1/01	0.11	0.44	6.64						10	Upper Kanawha	
WVK-70-A	0	Schuyler Fork	9/4/01	1.01	1.47	4.91					<	5	Upper Kanawha	
WVK-70-A	0	Schuyler Fork	7/31/01	0.36	0.87	4.97						6	Upper Kanawha	
WVK-70-A	0	Schuyler Fork	7/16/01	0.88	1.44	5.06					<	5	Upper Kanawha	
WVK-70-A	0	Schuyler Fork	6/14/02	0.31	0.93	5.20						5.6	Upper Kanawha	
WVK-70-A	0	Schuyler Fork	4/4/02	0.39	0.74	5.58						4.8	Upper Kanawha	
WVK-70-A	0	Schuyler Fork	10/17/01	2.71	3.58	5.65					<	5	Upper Kanawha	
WVK-70-A	0	Schuyler Fork	2/19/02	0.09	0.34	6.77					<	3	Upper Kanawha	
WVK-70-A	0	Schuyler Fork	5/1/02	0.16	0.63	7.07						4.4	Upper Kanawha	
WVK-71	0	Staten Run	10/11/01	0.191	0.211	8.26						16	Upper Kanawha	
WVK-72	0	Smithers Creek	9/13/01	0.27	0.64	6.80					<	5	Upper Kanawha	
WVK-72	1.7	Smithers Creek	9/13/01	0.1	0.19	7.28					<	5	Upper Kanawha	
WVK-72	1.7	Smithers Creek	10/10/01	0.108	0.108	7.87					<	5	Upper Kanawha	
WVK-72	0	Smithers Creek	11/19/01	0.107	0.281	7.96					<	5	Upper Kanawha	
WVK-72	0	Smithers Creek	2/21/02	0.1	0.17	8.13					<	3	Upper Kanawha	
WVK-72	0	Smithers Creek	12/10/01	0.102	0.23	8.16					<	5	Upper Kanawha	
WVK-72	0	Smithers Creek	3/14/02	0.13	0.21	8.18						5.2	Upper Kanawha	
WVK-72	0	Smithers Creek	10/11/01	0.163	0.683	8.31					<	5	Upper Kanawha	
WVK-72-A	0	Blake Branch	10/11/01	0.162	0.22	7.56						5	Upper Kanawha	
WVK-72-A	0	Blake Branch	9/12/01	0.25	0.252	7.59					<	5	Upper Kanawha	
WVK-72-A	0	Blake Branch	2/21/02	0.12	0.26	7.87					<	3	Upper Kanawha	
WVK-72-A	0	Blake Branch	6/11/02	0.13	0.4	7.93						48.4	Upper Kanawha	
WVK-72-A	0	Blake Branch	3/14/02	0.19	0.31	8.04					<	3	Upper Kanawha	
WVK-72-A	1.2	Blake Branch	9/13/01	0.2	0.23	8.12						10	Upper Kanawha	
WVK-72-A-{0.9}-Mine		Mine Discharge into Blake Branch	8/15/01	1.88	1.95	4.90					<	5	Upper Kanawha	
WVK-72-A-{0.9}-Mine		Mine Discharge into Blake Branch	6/11/02	0.63	1.62	5.17						18.4	Upper Kanawha	
WVK-72-A-{0.9}-Mine		Mine Discharge into Blake Branch	4/30/02	0.66	1.14	5.34						8.8	Upper Kanawha	
WVK-72-A-{0.9}-Mine		Mine Discharge into Blake Branch	9/13/01	0.21	0.22	6.12					<	5	Upper Kanawha	
WVK-72-A-{0.9}-Mine		Mine Discharge into Blake Branch	10/11/01	1.32	1.59	6.40						9	Upper Kanawha	
WVK-72-A-{0.9}-Mine		Mine Discharge into Blake Branch	11/20/01	0.633	0.991	6.88						8	Upper Kanawha	
WVK-72-A-{0.9}-Mine		Mine Discharge into Blake Branch	4/3/02	0.1	1.13	7.18						42	Upper Kanawha	
WVK-72-A-{0.9}-Mine		Mine Discharge into Blake Branch	12/10/01	0.161	0.242	7.82					<	5	Upper Kanawha	
WVK-72-A-1	0	Fishhook Fork	1/24/02	4.24	6.3	4.90						132	Upper Kanawha	

AN Code	Mile Point	Stream Name	Date	Dis Al (mg/L)	Total Al (mg/L)	pH	Q	Total Ca (mg/L)	Q	Total Mg (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVK-72-A-1	0	Fishhook Fork	6/11/02	0.11	0.24	8.12					<	3	Upper Kanawha	
WVK-72-A-1	0	Fishhook Fork	9/13/01	0.12	0.12	8.34						5	Upper Kanawha	
WVK-72-A-1	0	Fishhook Fork	10/11/01	0.163	0.168	9.04					<	5	Upper Kanawha	
WVK-72-B	0	Bullpush Fork	9/13/01	0.22	0.22	6.85					<	5	Upper Kanawha	
WVK-72-B	0	Bullpush Fork	10/10/01	0.104	0.134	7.42						7	Upper Kanawha	
WVK-72-B	1.4	Bullpush Fork	10/9/01	0.102	0.219	8.31						5	Upper Kanawha	
WVK-72-B-2	0	Burnett Hollow	10/10/01	0.123	0.181	7.76					<	5	Upper Kanawha	
WVK-72-B-2	0	Burnett Hollow	9/12/01	0.19	0.8	8.03					<	5	Upper Kanawha	
WVK-73	8.6	Armstrong Creek	9/24/01	0.196	5.2	5.60						247	Upper Kanawha	
WVK-73	3.3	Armstrong Creek	3/7/02	0.09	0.35	6.28						3.6	Upper Kanawha	
WVK-73	4.4	Armstrong Creek	4/30/02	0.09	0.28	6.54						5.2	Upper Kanawha	
WVK-73	1.6	Armstrong Creek	4/30/02	0.09	0.56	6.71						10	Upper Kanawha	
WVK-73	5.9	Armstrong Creek	4/30/02	0.1	0.44	6.89						9.6	Upper Kanawha	
WVK-73	3.3	Armstrong Creek	4/30/02	0.09	0.62	6.96						12	Upper Kanawha	
WVK-73	0.3	Armstrong Creek	8/6/01	0.13	1.23	7.16						30	Upper Kanawha	
WVK-73	0.3	Armstrong Creek	7/24/01	0.64	0.67	7.60						25	Upper Kanawha	
WVK-73	3.3	Armstrong Creek	7/19/01	0.1	0.43	7.61						20	Upper Kanawha	
WVK-73	4.4	Armstrong Creek	8/6/01	0.1	0.71	7.63						22	Upper Kanawha	
WVK-73	0.3	Armstrong Creek	6/14/02	0.22	0.29	7.77						4.4	Upper Kanawha	
WVK-73	3.3	Armstrong Creek	6/11/02	0.22	0.32	8.04					<	3	Upper Kanawha	
WVK-73	5.9	Armstrong Creek	6/11/02	0.11	0.2	8.17					<	3	Upper Kanawha	
WVK-73	1.6	Armstrong Creek	6/11/02	0.24	0.3	8.24					<	3	Upper Kanawha	
WVK-73-A	0	Tucker Hollow	2/19/02	0.91	1.16	5.22					<	3	Upper Kanawha	
WVK-73-A	0	Tucker Hollow	3/7/02	1.35	1.5	5.25						4	Upper Kanawha	
WVK-73-A	0	Tucker Hollow	1/14/02	0.786	1.05	5.32					<	5	Upper Kanawha	
WVK-73-A	0	Tucker Hollow	4/3/02	0.22	0.45	5.71					<	3	Upper Kanawha	
WVK-73-A	0	Tucker Hollow	4/30/02	0.14	0.46	6.15					<	3	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	8/1/01	4.3	4.8	4.05					<	5	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	9/6/01	2.4	3.07	4.58					<	5	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	6/12/02	3.51	3.51	4.65					<	3	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	2/19/02	1.67	1.88	4.79					<	3	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	4/30/02	1.19	1.95	4.86						14	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	11/14/01	5.97	6.03	4.91					<	5	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	12/6/01	5.42	6.99	4.92					<	5	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	1/15/02	1.92	2.44	4.96						5	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	3/7/02	1.71	2.29	4.99						5.6	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	4/3/02	1.36	1.93	5.02						18.8	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	7/19/01	0.44	1.36	5.28						21	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	10/17/01	2.97	3.82	6.15					<	5	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	8/1/01	2.9	3.2	3.81						7	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	9/6/01	5.96	7.68	3.91					<	5	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	6/12/02	6.35	6.35	3.97					<	3	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	3/7/02	3.24	3.33	4.06					<	3	Upper Kanawha	

[illegible]	Mile Point	Stream Name	Date	Diss Al (mg/L)	Tot Al (mg/L)	pH	Q	Total Se (mg/L)	Q	Total Hg (mg/L)	Q	TSS mg/L	Watershed	WVSCI
WVK-73-D-1	0	Craig Hollow	1/14/02	3.35	4.26	4.06					<	5	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	12/11/01	13.2	16.1	4.07					<	5	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	2/19/02	2.65	2.65	4.11					<	3	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	7/19/01	2.38	2.77	4.19						34	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	11/14/01	11.6	15.2	4.21					<	5	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	4/30/02	1.84	2.17	4.52						5.2	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	10/17/01	9.56	11.8	4.53					<	5	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	4/4/02	1.9	2.09	4.63						7.2	Upper Kanawha	
WVK-73-E	0.4	Powellton Fork	12/6/01	0.0889	0.238	7.00					<	5	Upper Kanawha	
WVK-73-E	0.4	Powellton Fork	8/6/01	0.14	0.7	7.35						7	Upper Kanawha	
WVK-73-E	2.6	Powellton Fork	8/6/01	0.1	0.5	7.37					<	5	Upper Kanawha	
WVK-73-E	0.4	Powellton Fork	6/14/02	0.14	0.28	7.58					<	3	Upper Kanawha	
WVK-73-E	0.4	Powellton Fork	9/5/01	0.115	0.301	7.60						11	Upper Kanawha	
WVK-73-E.9	0	Laurel Branch/Armstrong Creek	9/24/01	0.158	0.188	6.48					<	5	Upper Kanawha	
WVK-73-E-2	0	Woodrum Branch	4/1/02	2.26	4.64	4.74						105	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	1/16/02	6.17	7.14	4.30					<	5	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	2/19/02	4.56	4.68	4.42					<	3	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	6/12/02	4.5	4.5	4.45					<	3	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	7/23/01	1.72	1.77	4.48					<	5	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	3/11/02	3.76	4.77	4.65					<	3	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	12/11/01	2.71	3.5	4.70					<	5	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	4/4/02	1.46	1.58	4.72					<	3	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	10/15/01	2.14	2.69	4.73					<	5	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	4/30/02	1.03	1.21	4.77						5.6	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	8/7/01	1.3	1.42	4.82					<	5	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	11/13/01	2.4	3	4.91					<	5	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	9/24/01	2.21	2.55	5.07					<	5	Upper Kanawha	
WVK-73-G	0	Left Fork/Armstrong Creek	9/24/01	0.13	7.84	6.64						420	Upper Kanawha	
WVK-74	0.7	Boomer Branch	9/12/01	0.13	0.18	7.91					<	5	Upper Kanawha	
WVK-74	0.7	Boomer Branch	6/10/02	0.13	0.21	7.93					<	3	Upper Kanawha	
WVK-74	0.7	Boomer Branch	4/29/02	0.26	1.71	7.94						30.8	Upper Kanawha	
WVK-74	0.1	Boomer Branch	9/12/01	0.17	0.28	8.00					<	5	Upper Kanawha	
WVK-74	0.1	Boomer Branch	4/29/02	0.3	1.66	8.03						22	Upper Kanawha	
WVK-74	0.1	Boomer Branch	6/10/02	0.25	0.35	8.11					<	3	Upper Kanawha	
WVK-74	0.1	Boomer Branch	3/14/02	0.1	0.14	8.20					<	3	Upper Kanawha	
WVK-74	0.7	Boomer Branch	2/20/02	0.09	0.13	8.29					<	3	Upper Kanawha	
WVK-74	0.7	Boomer Branch	10/9/01	0.211	0.23	8.41					<	5	Upper Kanawha	
WVK-74	0.1	Boomer Branch	10/9/01	0.257	0.439	8.65					<	5	Upper Kanawha	
WVK-75	1.3	Jarrett Branch	10/9/01	0.153	0.163	6.72					<	5	Upper Kanawha	
WVK-75	0.3	Jarrett Branch	4/29/02	0.23	2.12	8.85						35.2	Upper Kanawha	
WVK-75	0.3	Jarrett Branch	10/9/01	0.092	0.159	9.84						24	Upper Kanawha	
WVK-75-A	0	UNT/Jarrett Branch RM 1.1	8/14/01	12.4	12.4	4.47						5	Upper Kanawha	
WVK-75-A	0	UNT/Jarrett Branch RM 1.1	6/10/02	5.85	6.45	4.61					<	3	Upper Kanawha	

AltCode	Mile Point	Stream Name	Date	Dis Al (mg/L)	Total Al (mg/L)	pH	Q	Total Ca (mg/L)	Q	Total Mg (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVK-75-A	0	UNT/Jarrett Branch RM 1.1	10/9/01	0.123	0.294	6.80						6	Upper Kanawha	
WVK-75-A	0	UNT/Jarrett Branch RM 1.1	9/12/01	0.13	0.6	8.20						25	Upper Kanawha	
WVK-76-C-1	0	Dempsey Branch	9/26/01	0.209	0.209	7.56					<	5	Upper Kanawha	
WVK-76-C-1-A	0	Coleman Branch	9/26/01	0.095	0.102	7.53						34	Upper Kanawha	
WVK-76-D	0	Beards Fork	3/6/02	0.1	0.15	7.38					<	3	Upper Kanawha	
WVK-76-D	0	Beards Fork	9/27/01	0.11	0.11	7.59					<	5	Upper Kanawha	
WVK-76-D	0	Beards Fork	6/11/02	0.14	0.18	8.44					<	3	Upper Kanawha	
WVK-76-J	0	Camp Branch	9/25/01	0.163	1.09	8.55						16	Upper Kanawha	
WVK-76-K	0.6	Ingram Branch	9/3/02	0.9	0.99	4.71					<	3	Upper Kanawha	69.25
WVK-76-K	0	Ingram Branch	8/8/01	0.77	1.12	4.96					<	5	Upper Kanawha	
WVK-76-K	0	Ingram Branch	9/3/02	0.36	0.39	5.17					<	3	Upper Kanawha	27.41
WVK-76-K	0.6	Ingram Branch	10/16/01	0.551	0.703	5.19					<	5	Upper Kanawha	
WVK-76-K	0	Ingram Branch	12/13/01	0.499	0.648	5.20					<	5	Upper Kanawha	
WVK-76-K	0	Ingram Branch	11/15/01	0.64	0.893	5.25					<	5	Upper Kanawha	
WVK-76-K	0	Ingram Branch	3/26/02	0.36	0.78	5.26						6	Upper Kanawha	
WVK-76-K	0	Ingram Branch	2/13/02	0.61	0.668	5.31					<	3	Upper Kanawha	
WVK-76-K	0	Ingram Branch	6/10/02	2.07	2.07	5.32					<	3	Upper Kanawha	
WVK-76-K	0	Ingram Branch	1/14/02	0.529	1.75	5.33					<	5	Upper Kanawha	
WVK-76-K	0	Ingram Branch	10/16/01	0.755	0.945	5.36					<	5	Upper Kanawha	
WVK-76-K	0.6	Ingram Branch	11/14/01	0.576	1.56	5.45						12	Upper Kanawha	
WVK-76-K	0.6	Ingram Branch	12/13/01	0.403	0.69	5.46					<	5	Upper Kanawha	
WVK-76-K	0	Ingram Branch	3/6/02	0.63	0.68	5.87					<	3	Upper Kanawha	
WVK-76-K	0.6	Ingram Branch	1/22/02	0.096	0.362	5.89						5.2	Upper Kanawha	
WVK-76-K	0.6	Ingram Branch	9/25/01	0.238	0.701	5.94						5	Upper Kanawha	
WVK-76-K	0.6	Ingram Branch	3/26/02	0.11	0.74	6.13						5.6	Upper Kanawha	
WVK-76-K	0.6	Ingram Branch	2/13/02	0.118	0.457	6.27						4	Upper Kanawha	
WVK-76-K	0.6	Ingram Branch	3/6/02	0.12	0.54	6.36						5.6	Upper Kanawha	
WVK-76-K	0	Ingram Branch	9/25/01	1.36	1.89	6.50					<	5	Upper Kanawha	
WVK-76-K	0.6	Ingram Branch	6/10/02	0.56	0.86	7.11						4.4	Upper Kanawha	
WVK-76-M	0	Open Fork	9/26/01	0.12	0.134	6.74					<	5	Upper Kanawha	
WVKC-10-H	0.3	Little Hewitt Creek	4/28/03	0.1	1.31	5.68						44	Coal	
WVKC-10-H	0.3	Little Hewitt Creek	3/13/03	0.22	0.26	5.73					<	3	Coal	
WVKC-10-H	0.3	Little Hewitt Creek	4/15/03	0.16	0.24	5.91					<	3	Coal	
WVKC-10-I-8	0	Rich Hollow	10/16/02	0.22	0.5	8.72						13	Coal	
WVKC-10-J	2.5	Little Horse Creek	2/4/03	0.27	0.32	7.29						6	Coal	
WVKC-10-T	4.6	Spruce Fork	3/19/03	0.12	0.19	7.18					<	3	Coal	
WVKC-10-T	18.1	Spruce Fork	3/17/03	0.1	0.34	7.59					<	3	Coal	
WVKC-10-T	4.6	Spruce Fork	4/17/03	0.1	0.19	8.00					<	3	Coal	
WVKC-10-T	0.3	Spruce Fork	3/18/03	0.11	0.19	8.19					<	3	Coal	
WVKC-10-T	4.6	Spruce Fork	8/28/02	0.15	0.18	8.27					<	3	Coal	
WVKC-10-T	0.3	Spruce Fork	8/31/02	0.1	0.11	8.28					<	3	Coal	
WVKC-10-T	0.3	Spruce Fork	8/31/02	0.09	0.1							3.6	Coal	
WVKC-10-T-11	3.5	Spruce Laurel Fork	3/19/03	0.11	0.16	7.78					<	3	Coal	

AN Code	Mile Point	Stream Name	Date	Dis Al mg/L	Total Al mg/L	pH	Q	Total Ca mg/L	Q	Total Mg mg/L	Q	TSS mg/L	Watershed	WVSCI
WVKC-10-T-11	3.5	Spruce Laurel Fork	10/30/02	0.09	0.8	7.94						44	Coal	
WVKC-10-T-11	0.2	Spruce Laurel Fork	6/2/03	0.09	0.26	8.22					<	3	Coal	
WVKC-10-T-11	3.5	Spruce Laurel Fork	4/16/03	0.11	0.47	8.26						5.6	Coal	
WVKC-10-T-11	3.5	Spruce Laurel Fork	12/9/02	0.09	0.24	8.38						6	Coal	
WVKC-10-T-11	0.2	Spruce Laurel Fork	4/16/03	0.1	0.28	8.38						5.2	Coal	
WVKC-10-T-11	0.2	Spruce Laurel Fork	6/2/03	0.09	0.27							8	Coal	
WVKC-10-T-22.5	0	Little White Oak Branch	2/24/03	0.12	0.21	8.66						4	Coal	
WVKC-10-T-25	0	Laurel Fork	8/26/02	0.25	1.27	5.71						13	Coal	
WVKC-10-T-5	0.1	Hunters Branch	4/17/03	0.57	1.16	5.19						5	Coal	
WVKC-10-T-5	0.1	Hunters Branch	2/26/03	1	1.15	5.42						6	Coal	
WVKC-10-T-5	0.1	Hunters Branch	1/30/03	0.37	0.88	6.57						6	Coal	
WVKC-10-T-5	0.1	Hunters Branch	3/19/03	0.28	1	6.94						5.6	Coal	
WVKC-10-T-9	0	Hewett Creek	8/28/02	2.46	9.86	5.24						56.8	Coal	
WVKC-10-T-9	0	Hewett Creek	7/16/02	0.24	0.42	7.94					<	3	Coal	
WVKC-10-T-9	0	Hewett Creek	8/28/02	2.49	9.67							60.8	Coal	
WVKC-10-T-9-B	0	Missouri Fork	10/8/02	0.09	0.1	8.37					<	3	Coal	
WVKC-10-U	0.3	Pond Fork	4/18/03	0.09	0.21	7.87					<	3	Coal	
WVKC-10-U	32.3	Pond Fork	7/8/02	0.09	0.52	7.89						5.2	Coal	
WVKC-10-U	6.3	Pond Fork	5/8/03	0.09	0.11	8.03					<	3	Coal	
WVKC-10-U	15.8	Pond Fork	3/18/03	0.16	1.52	8.04						4.4	Coal	
WVKC-10-U	6.3	Pond Fork	4/18/03	0.11	0.29	8.05						4	Coal	
WVKC-10-U	6.3	Pond Fork	11/20/02	0.12	0.22	8.16						4	Coal	
WVKC-10-U	0.3	Pond Fork	11/4/02	0.11	0.14	8.26					<	3	Coal	
WVKC-10-U	6.3	Pond Fork	3/17/03	0.13	0.19	8.37					<	3	Coal	
WVKC-10-U	0.3	Pond Fork	3/18/03	0.12	0.17	8.37					<	3	Coal	
WVKC-10-U	6.3	Pond Fork	8/31/02	0.09	0.1	8.44					<	3	Coal	
WVKC-10-U-12	0	Cow Creek	2/14/03	0.1	0.65	8.35						24	Coal	
WVKC-10-U-21	0	Lacey Branch	10/16/02	0.17	0.99	7.61						186	Coal	
WVKC-10-U-3	0	Robinson Creek	5/8/03	0.09	0.26	7.57					<	3	Coal	
WVKC-10-U-3	0	Robinson Creek	4/18/03	0.09	0.49	7.70						8	Coal	
WVKC-10-U-3	0	Robinson Creek	7/17/02	0.12	0.13	8.11					<	3	Coal	
WVKC-10-U-3	0	Robinson Creek	8/31/02	0.22	0.23	8.37						4	Coal	
WVKC-10-U-7	0.5	West Fork	5/9/03	0.14	0.19	8.26					<	3	Coal	
WVKC-10-U-7	0.5	West Fork	3/17/03	0.18	0.47	8.32						4.8	Coal	
WVKC-10-U-7	0.5	West Fork	7/9/02	0.13	0.17	8.33					<	3	Coal	
WVKC-10-U-7	0.5	West Fork	4/19/03	0.24	0.37	8.47					<	3	Coal	
WVKC-10-U-7	0.5	West Fork	8/31/02	0.15	0.17	8.50						3.2	Coal	
WVKC-10-U-7-A	0	Roach Branch	10/16/02	0.11	0.73	7.32						79	Coal	
WVKC-10-U-7-D	0	Browns Branch	4/20/03	1.68	2.49	4.89						3	Coal	
WVKC-10-U-7-D-{0.2}-Discharge		Mine Discharge into Browns Branch	4/20/03	2.36	3.06	4.74					<	3	Coal	
WVKC-31	4.9	Laurel Creek	5/28/03	0.1	0.4	7.78						6	Coal	
WVKC-31	4.9	Laurel Creek	7/30/02	0.14	0.22	7.85					<	3	Coal	

AnCode	Mile Point	Stream Name	Date	[illegible]	[illegible]	[illegible]	Q	[illegible] mg/L	Q	Total [illegible] mg/L	Q	TSS mg/L	Watershed	WVSCI
WVKC-32	0	Horse Branch	10/9/02	6.78	6.78	3.96					<	3	Coal	
WVKC-32	0	Horse Branch	8/26/02	7.02	7.02	4.20						10	Coal	
WVKC-32	0	Horse Branch	11/14/02	2.58	2.58	4.25					<	3	Coal	
WVKC-32	0	Horse Branch	3/30/03	3.77	3.88	4.35					<	3	Coal	
WVKC-32	0	Horse Branch	10/30/02	2.64	2.7	4.57						4	Coal	
WVKC-32	0	Horse Branch	3/19/03	2.98	4.53	4.75						5.2	Coal	
WVKC-32	0	Horse Branch	7/30/02	2.84	3.44	4.85						8	Coal	
WVKC-32	0	Horse Branch	12/17/02	3.06	3.19	4.88						8	Coal	
WVKC-32	0	Horse Branch	5/29/03	2.28	2.86	5.01						3	Coal	
WVKC-32	0	Horse Branch	1/29/03	2.9	4.59	5.04						75	Coal	
WVKC-32	0	Horse Branch	3/3/03	1.49	1.78	5.31					<	3	Coal	
WVKC-33	0	Haggle Branch	3/19/03	0.44	0.51	5.27						5.2	Coal	
WVKC-33	0	Haggle Branch	3/3/03	0.5	0.5	5.45					<	3	Coal	
WVKC-33	0	Haggle Branch	3/30/03	0.32	0.39	5.45					<	3	Coal	
WVKC-33	0	Haggle Branch	12/17/02	0.31	0.45	5.55						5	Coal	
WVKC-33	0	Haggle Branch	11/14/02	0.1	0.11	5.67					<	3	Coal	
WVKC-33	0	Haggle Branch	5/29/03	0.1	0.27	5.79					<	3	Coal	
WVKC-33	0	Haggle Branch	1/29/03	0.31	0.52	5.96						7	Coal	
WVKC-35	2.7	White Oak Creek	10/29/02	0.1	22	7.52						1320	Coal	
WVKC-35	2.7	White Oak Creek	11/13/02	0.09	0.14	7.63						4	Coal	
WVKC-35	2.7	White Oak Creek	3/3/03	0.09	0.8	7.69						30	Coal	
WVKC-35	0.1	White Oak Creek	10/29/02	0.09	3.88	7.74						275	Coal	
WVKC-35	2.7	White Oak Creek	12/20/02	0.09	0.21	7.76					<	3	Coal	
WVKC-35	2.7	White Oak Creek	10/9/02	0.1	0.1	7.79					<	3	Coal	
WVKC-35	2.7	White Oak Creek	7/24/02	0.11	0.14	7.81					<	3	Coal	
WVKC-35	2.7	White Oak Creek	8/26/02	0.1	0.12	7.82					<	5	Coal	
WVKC-35	0.1	White Oak Creek	5/29/03	0.1	0.81	7.87						30	Coal	
WVKC-35	0.1	White Oak Creek	3/19/03	0.11	0.18	7.89					<	3	Coal	
WVKC-35	2.7	White Oak Creek	5/29/03	0.12	0.79	7.89						23	Coal	
WVKC-35	2.7	White Oak Creek	1/29/03	0.11	0.28	7.95						3	Coal	
WVKC-35	2.7	White Oak Creek	3/19/03	0.16	0.27	7.98						3.6	Coal	
WVKC-35	2.7	White Oak Creek	3/30/03	0.11	0.24	8.05						4	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	3/19/03	12.1	12.2	3.98					<	3	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	7/23/02	6.79	6.79	4.03						10.4	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	5/29/03	8.42	8.53	4.15						6	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	3/3/03	7.36	7.4	4.17						8	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	11/14/02	4.98	4.98	4.19					<	3	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	3/30/03	12.8	12.8	4.30					<	3	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	12/17/02	4.25	4.25	4.47						30	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	10/30/02	6.6	6.61	4.49					<	3	Coal	
WVKC-35.8	0	UNT/Big Coal River RM 52.7	3/19/03	5.09	7.17	4.71						14.4	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	1/28/03	8.99	8.99	4.72					<	3	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	10/9/02	1.12	1.12	4.85					<	3	Coal	

AnCode	Mile Point	Stream Name	Date	[illegible]	[illegible]	pH	Q	Total Ca (mg/L)	Q	Total Mg (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	8/26/02	1.35	1.48	4.87						7	Coal	
WVKC-35.8	0	UNT/Big Coal River RM 52.7	3/3/03	3.06	3.18	5.13						6	Coal	
WVKC-35.8	0	UNT/Big Coal River RM 52.7	1/28/03	3.63	7.47	5.26						18	Coal	
WVKC-35.8	0	UNT/Big Coal River RM 52.7	5/28/03	0.81	3.69	5.32						37	Coal	
WVKC-35.8	0	UNT/Big Coal River RM 52.7	3/30/03	5.55	7.94	5.35						16	Coal	
WVKC-35.8	0	UNT/Big Coal River RM 52.7	11/14/02	0.38	2.56	5.36						10	Coal	
WVKC-35.8	0	UNT/Big Coal River RM 52.7	12/17/02	0.81	1.83	5.51						6	Coal	
WVKC-35.8	0	UNT/Big Coal River RM 52.7	7/22/02	0.09	3.36	7.36						12	Coal	
WVKC-35-D	0	Threemile Branch	3/19/03	0.52	0.53	4.65					<	3	Coal	
WVKC-35-E	0	Left Fork/White Oak Creek	3/3/03	0.1	0.47	8.09						21	Coal	
WVKC-35-E	0	Left Fork/White Oak Creek	5/29/03	0.11	0.21	8.10					<	3	Coal	
WVKC-35-E	0	Left Fork/White Oak Creek	3/19/03	0.15	0.36	8.16						5.2	Coal	
WVKC-35-E	0	Left Fork/White Oak Creek	3/30/03	0.1	0.33	8.22						5	Coal	
WVKC-39	0	Little Elk Creek	5/14/03	0.1	0.25	8.07					<	3	Coal	
WVKC-39	0	Little Elk Creek	9/5/02	0.1	0.72	8.08					<	3	Coal	
WVKC-46	32	Marsh Fork	10/9/02	0.088	0.148	7.82						3	Coal	
WVKC-46-A	0.7	Little Marsh Fork	11/25/02	0.14	1.16	7.77						13	Coal	
WVKC-46-A	0.7	Little Marsh Fork	11/4/02	0.1	0.58	7.81						13	Coal	
WVKC-46-A	0.7	Little Marsh Fork	10/15/02	0.19	0.55	7.96						7	Coal	
WVKC-46-A	0.7	Little Marsh Fork	12/23/02	0.09	0.22	8.02						4	Coal	
WVKC-46-A	0.7	Little Marsh Fork	1/21/03	0.1	0.58	8.07						6	Coal	
WVKC-46-A	0.7	Little Marsh Fork	4/17/03	0.09	0.33	8.12						8	Coal	
WVKC-46-A	0.7	Little Marsh Fork	5/12/03	0.16	0.55	8.18						15	Coal	
WVKC-46-A	0.7	Little Marsh Fork	3/17/03	0.16	1.03	8.21						36.4	Coal	
WVKC-46-A	0.7	Little Marsh Fork	8/27/02	0.19	0.21	8.21					<	5	Coal	
WVKC-46-A	0.7	Little Marsh Fork	7/24/02	0.22	0.44	8.26						8	Coal	
WVKC-46-A-4	0	Brushy Fork	11/26/02	0.1	1.55	7.57						22	Coal	
WVKC-46-A-4	0	Brushy Fork	11/4/02	0.1	1.11	7.64						16	Coal	
WVKC-46-A-4	0	Brushy Fork	3/18/03	0.11	1.68	7.78						24	Coal	
WVKC-46-A-4	0	Brushy Fork	5/12/03	0.18	0.96	7.95						19	Coal	
WVKC-46-A-4	0	Brushy Fork	4/16/03	0.21	0.97	8.03						22	Coal	
WVKC-46-A-4	0	Brushy Fork	7/24/02	0.29	1.1	8.05						17.2	Coal	
WVKC-46-A-4	0	Brushy Fork	12/23/02	0.15	2.9	8.07					<	3	Coal	
WVKC-46-A-4	0	Brushy Fork	10/15/02	0.11	0.92	8.10						18	Coal	
WVKC-46-A-4	0	Brushy Fork	8/27/02	0.15	0.49	8.12						8.8	Coal	
WVKC-46-D	0	Shumate Creek	2/24/03	1.51	1.51	7.46						36	Coal	
WVKC-46-G-2	2.6	Martin Fork	4/16/03	2.15	3.1	4.92						3.6	Coal	
WVKC-46-G-2	2.6	Martin Fork	12/30/02	1.84	3.43	5.29						8	Coal	
WVKC-46-G-3	0	Millers Fork	3/20/03	0.76	0.76	7.07						34	Coal	
WVKC-46-J-2	0.7	Bee Branch	7/25/02	2.6	2.84	4.62					<	3	Coal	
WVKC-46-J-2	0.7	Bee Branch	9/3/02	1.2	1.2	4.64						4	Coal	
WVKC-46-J-2	0.7	Bee Branch	5/29/03	1.36	1.77	5.01						6	Coal	
WVKC-46-N	0.1	Maple Meadow Creek	10/9/02	0.089	0.09	7.33						4	Coal	

AnCode	Mile Point	Stream Name	Date	[illegible] (mg/L)	[illegible] (mg/L)	pH	[illegible] (mg/L)	[illegible] (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVKC-46-Q	5	Miller Camp Branch	10/10/02	0.757	2.2	5.91				10	Coal	
WVKC-46-Q	4.2	Miller Camp Branch	10/10/02	0.106	0.129	7.13				10	Coal	
WVKC-46-Q	4.2	Miller Camp Branch	1/15/03	0.1	0.1	7.34			<	3	Coal	
WVKC-46-Q	4.2	Miller Camp Branch	5/8/03	0.3	0.18	7.36				3	Coal	
WVKC-46-Q	1	Miller Camp Branch	8/13/02	0.153	0.313	7.76				4	Coal	
WVKC-46-Q	0	Miller Camp Branch	10/22/02	0.104	0.198	7.81				2	Coal	
WVKC-46-Q	0	Miller Camp Branch	9/5/02	0.1	0.21	7.84			<	5	Coal	
WVKC-46-Q	0	Miller Camp Branch	9/25/02	0.1	0.202	7.85				5	Coal	
WVKC-47	7.2	Clear Fork	10/17/02	0.09	0.55	7.21				24	Coal	
WVKC-47	7.2	Clear Fork	11/14/02	0.09	0.3	7.69				5	Coal	
WVKC-47	4.1	Clear Fork	7/15/02	0.12	0.48	7.74				13.2	Coal	
WVKC-47	7.2	Clear Fork	3/24/03	0.1	0.38	7.84			<	3	Coal	
WVKC-47	2.4	Clear Fork	7/15/02	0.1	0.52	7.90				18	Coal	
WVKC-47	7.2	Clear Fork	7/10/02	0.26	0.29	7.91			<	3	Coal	
WVKC-47	0	Clear Fork	7/15/02	0.09	0.74	7.95				19.2	Coal	
WVKC-47	7.2	Clear Fork	5/13/03	0.16	0.26	8.06			<	3	Coal	
WVKC-47	4.1	Clear Fork	5/13/03	0.1	0.17	8.08			<	3	Coal	
WVKC-47	7.2	Clear Fork	9/4/02	0.2	0.24	8.16			<	5	Coal	
WVKC-47-F	0	Stonecoal Branch	2/25/03	6.6	6.6	4.59				10	Coal	
WVKC-47-F	0	Stonecoal Branch	3/24/03	6.12	6.12	4.64			<	3	Coal	
WVKC-47-F	0	Stonecoal Branch	4/16/03	6.33	6.33	4.65				4	Coal	
WVKC-47-F	0	Stonecoal Branch	5/13/03	5.63	5.75	4.74				10	Coal	
WVKC-47-F	0	Stonecoal Branch	7/10/02	1.46	6.09	4.77				170	Coal	
WVKC-47-F	0	Stonecoal Branch	9/4/02	1.01	1.85	4.77				38	Coal	
WVKC-47-F	0	Stonecoal Branch	1/30/03	6.09	6.09	4.88				6	Coal	
WVKC-47-F	0	Stonecoal Branch	10/29/02	2.6	4.39	4.94				65	Coal	
WVKC-47-F	0	Stonecoal Branch	10/17/02	3.34	3.71	5.01				14	Coal	
WVKC-47-F	0	Stonecoal Branch	11/14/02	1.53	2.4	5.14				7	Coal	
WVKC-47-F	0	Stonecoal Branch	12/10/02	0.34	8.39	5.30				382	Coal	
WVKC-47-G	0.5	Long Branch	10/17/02	0.1	0.68	6.32				5	Coal	
WVKC-47-G	0.5	Long Branch	10/30/02	0.11	0.5	6.66				5	Coal	
WVKC-47-G	0.5	Long Branch	1/29/03	0.11	0.78	7.26				6	Coal	
WVKC-47-G	0.5	Long Branch	9/4/02	0.13	1.14	7.27				7.2	Coal	
WVKC-47-G	0.5	Long Branch	7/10/02	0.15	1.22	7.31				3.2	Coal	
WVKC-47-G	0.5	Long Branch	5/13/03	0.1	0.64	7.36				3	Coal	
WVKC-47-G	0.5	Long Branch	4/2/03	0.1	0.68	7.42				8	Coal	
WVKC-47-G	0.5	Long Branch	12/10/02	0.09	0.46	7.45			<	3	Coal	
WVKC-47-G-1	0	Dow Fork	2/25/03	13	13	3.55				14	Coal	
WVKC-47-G-1	0	Dow Fork	1/29/03	10.4	10.6	3.79			<	3	Coal	
WVKC-47-G-1	0	Dow Fork	4/15/03	8.92	9	3.84				3.6	Coal	
WVKC-47-G-1	0	Dow Fork	7/10/02	13	13	3.94			<	3	Coal	
WVKC-47-G-1	0	Dow Fork	9/4/02	9.68	9.68	4.00			<	5	Coal	
WVKC-47-G-1	0	Dow Fork	4/2/03	10.6	10.8	4.03			<	3	Coal	

AN Code	Mile Point	Stream Name	Date	Diss. Al (mg/L)	Total Al (mg/L)	pH	Q	Total Ca (mg/L)	Q	Total Mg (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVKC-47-G-1	0	Dow Fork	5/13/03	10	10.1	4.09					<	3	Coal	
WVKC-47-G-1	0	Dow Fork	12/10/02	7.55	7.55	4.17					<	3	Coal	
WVKC-47-G-1	0	Dow Fork	10/17/02	9.2	9.2	4.36					<	3	Coal	
WVKC-47-G-1	0	Dow Fork	11/13/02	5.19	5.19	4.41					<	3	Coal	
WVKC-47-G-1	0	Dow Fork	10/30/02	5.8	5.8	4.48					<	3	Coal	
WVKE	89.5	Elk River	12/3/02	0.21	0.28	6.40					<	3	Elk	
WVKE	107	Elk River	12/3/02	0.1	0.18	6.64					<	3	Elk	
WVKE	27.2	Elk River	5/12/03	0.15	0.85	6.94						100	Elk	
WVKE	56.3	Elk River	4/4/03	0.15	0.22	7.06						3	Elk	
WVKE	4.4	Elk River	5/12/03	0.16	1.25	7.11						225	Elk	
WVKE	27.2	Elk River	4/4/03	0.19	0.25	7.16					<	3	Elk	
WVKE	107	Elk River	1/6/03	0.12	0.32	7.22						3	Elk	
WVKE	27.2	Elk River	1/9/03	0.12	0.2	7.27					<	3	Elk	
WVKE	4.4	Elk River	1/6/03	0.12	0.16	7.27					<	3	Elk	
WVKE	4.4	Elk River	12/6/02	0.11	0.15	7.40					<	3	Elk	
WVKE	27.2	Elk River	2/11/03	0.11	0.23	7.42					<	3	Elk	
WVKE	27.2	Elk River	3/6/03	0.16	0.23	7.45					<	3	Elk	
WVKE	89.5	Elk River	1/6/03	0.14	0.29	7.45					<	3	Elk	
WVKE	56.3	Elk River	6/5/03	0.18	0.29	7.47						11	Elk	
WVKE	27.2	Elk River	6/5/03	0.21	0.48	7.49						16	Elk	
WVKE	56.3	Elk River	2/11/03	0.14	0.16	7.57					<	3	Elk	
WVKE	56.3	Elk River	3/6/03	0.16	0.19	7.60					<	3	Elk	
WVKE	89.5	Elk River	4/2/03	0.22	0.26	7.66					<	3	Elk	
WVKE	107	Elk River	6/4/03	0.12	0.22	7.70						11	Elk	
WVKE	4.4	Elk River	2/20/03	0.14	0.57	7.72						43	Elk	
WVKE	107	Elk River	4/2/03	0.25	0.29	7.73					<	3	Elk	
WVKE	107	Elk River	2/10/03	0.15	0.31	7.83					<	3	Elk	
WVKE-23	0.9	Big Sandy Creek	2/17/01	0.1	4.74	6.50						360	Elk	
WVKE-23	0.9	Big Sandy Creek	5/12/03	0.15	0.36	6.65						22	Elk	
WVKE-23	0.9	Big Sandy Creek	4/18/00	0.144	2.52	6.90						110	Elk	
WVKE-23	0.9	Big Sandy Creek	2/11/03	0.25	0.3	7.27					<	3	Elk	
WVKE-23	0.9	Big Sandy Creek	1/9/03	0.11	0.16	7.28					<	3	Elk	
WVKE-23	0.9	Big Sandy Creek	4/4/03	0.16	0.28	7.31					<	3	Elk	
WVKE-23	0.9	Big Sandy Creek	12/6/02	0.14	0.15	7.35						3	Elk	
WVKE-23	0.9	Big Sandy Creek	3/6/03	0.14	0.19	7.40					<	3	Elk	
WVKE-23	0.9	Big Sandy Creek	6/5/03	0.11	0.46	7.48						9	Elk	
WVKE-23	0.9	Big Sandy Creek	4/4/00	0.122	3.94	7.60						260	Elk	
WVKE-26	0.7	Morris Creek	4/4/00	0.117	0.662	6.70						17	Elk	
WVKE-26	0.7	Morris Creek	4/18/00	0.118	0.4	7.00						5	Elk	
WVKE-26-A	0	Left Fork/Morris Creek	4/10/01	1.42	1.72	4.86						4	Elk	
WVKE-50	15.2	Buffalo Creek	5/7/01	0.391	0.838	4.85						4	Elk	
WVKE-50	15.2	Buffalo Creek	4/11/01	0.368	1.23	5.33						16	Elk	
WVKE-50	0.7	Buffalo Creek	4/4/03	0.17	0.52	6.75						3	Elk	

AN Code	Mile Point	Stream Name	Date	Dis Al (mg/L)	Total Al (mg/L)	pH		Total Fe (mg/L)		Total Mn (mg/L)		TSS (mg/L)	Watershed	WVSCI
WVKE-50	0.7	Buffalo Creek	1/9/03	0.16	0.44	6.87						5	Elk	
WVKE-50	0.7	Buffalo Creek	6/5/03	0.1	0.47	7.46					<	3	Elk	
WVKE-50	0.7	Buffalo Creek	2/11/03	0.26	0.31	7.73					<	3	Elk	
WVKE-50-P		Taylor Creek	5/7/01	1.9	1.89	4.14						2	Elk	
WVKE-50-P		Taylor Creek	4/11/01	1.28	1.46	4.46						5	Elk	
WVKE-50-R		Spanish Oak Branch	5/7/01	0.34	0.389	4.31						4	Elk	
WVKE-50-R		Spanish Oak Branch	4/11/01	0.407	0.417	4.59					<	1	Elk	
WVKE-50-S		Dille Run	5/7/01	2.95	2.99	3.88						2	Elk	
WVKE-50-S		Dille Run	4/11/01	1.24	1.28	4.44						2	Elk	
WVKE-50-T.3		2nd UNT/Buffalo Creek	4/11/01	0.878	0.918	5.04						4	Elk	
WVKE-50-T.3		2nd UNT/Buffalo Creek	5/7/01	0.293	0.618	5.50						4	Elk	
WVKE-50-T.5		3rd UNT/Buffalo Creek	5/7/01	0.897	0.93	4.89						2	Elk	
WVKE-50-T.5		3rd UNT/Buffalo Creek	4/11/01	1.06	1.08	4.91						1	Elk	
WVKE-50-U		Brushy Fence Run	5/7/01	1.67	1.84	4.84						1	Elk	
WVKE-50-U		Brushy Fence Run	4/11/01	1.26	1.86	4.89						4	Elk	
WVKE-76	11.9	Birch River	12/3/02	0.19	0.31	6.60					<	3	Elk	
WVKE-76	11.9	Birch River	2/10/03	0.18	0.18	7.22					<	3	Elk	
WVKE-76	11.9	Birch River	4/2/03	0.26	0.29	7.52					<	3	Elk	
WVKE-76	11.9	Birch River	5/6/03	0.3	0.31	7.60					<	3	Elk	
WVKE-9	0.7	Little Sandy Creek	4/18/00	0.128	3.28	7.20						140	Elk	
WVKE-9	0.7	Little Sandy Creek	4/4/00	0.118	3.89	8.20						230	Elk	
WVKE-9-B	0.1	Wills Creek	4/18/00	0.117	2.1	7.00						97	Elk	
WVKE-9-B	0.1	Wills Creek	4/4/00	0.102	1.99	7.50						100	Elk	
WVKG-13-G	0	Jones Branch	9/3/03	0.09	2.52	7.64						64	Gauley	
WVKG-13-O	0	Bryant Branch	3/31/04	0.09	15.9	7.63						528	Gauley	
WVKG-19-U-2-A	0	Briery Creek	9/3/03	1.22	1.28	4.84					<	3	Gauley	
WVKG-19-U-2-A	0	Briery Creek	1/13/04	0.41	0.79	5.02					<	3	Gauley	
WVKG-19-U-2-A	0	Briery Creek	11/4/03	0.34	0.8	5.19					<	3	Gauley	
WVKG-19-U-2-A	0	Briery Creek	10/21/03	0.22	0.64	5.41					<	3	Gauley	
WVKG-19-U-2-A	0	Briery Creek	7/16/03	0.18	0.82	5.55						9	Gauley	
WVKG-19-V-3.8	0	UNT/Little Clear Creek RM 7.5	9/3/03	0.12	0.81	7.42						5	Gauley	
WVKG-19-V-4	0	Cutlip Branch	9/24/03	0.09	2.59	7.64						23	Gauley	
WVKG-26-B	0.2	Glade Creek	11/12/03	0.1	7.94	6.40						265	Gauley	
WVKG-26-K-1	0.1	Lower Spruce Run	2/18/04	0.4	1.42	5.80						19	Gauley	
WVKG-26-K-1	0.1	Lower Spruce Run	1/21/04	0.15	0.23	6.05					<	3	Gauley	
WVKG-26-K-1	0.1	Lower Spruce Run	3/2/04	0.27	0.72	6.61						18	Gauley	
WVKG-26-K-1-A	0	Spruce Run	3/15/04	0.49	0.93	5.22						4	Gauley	
WVKG-26-K-1-A	0	Spruce Run	2/18/04	1.47	2.18	6.11						20	Gauley	
WVKG-26-K-1-A	0	Spruce Run	3/2/04	1.28	1.44	6.14					<	3	Gauley	
WVKG-26-K-1-A	0	Spruce Run	1/21/04	0.51	0.82	6.84						4	Gauley	
WVKG-30	14.1	Big Beaver Creek	10/24/03	0.18	0.19	6.98					<	2.39	Gauley	
WVKG-30	4.6	Big Beaver Creek	10/23/03	0.14	0.25	7.30					<	2.39	Gauley	
WVKG-30	6.3	Big Beaver Creek	10/14/03	0.23	0.23	7.41					<	2.39	Gauley	

AllCode	Mile Point	Stream Name	Date	Dis Al (mg/L)	Total Al (mg/L)	pH	Q	Total Ca (mg/L)	Q	Total Mg (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVKG-30-D	0.8	Wyatt Run	10/23/03	0.13	0.17	7.66					<	2.39	Gauley	
WVKG-30-E	2.9	Little Beaver Creek	10/14/03	0.22	0.27	6.88						3	Gauley	
WVKG-30-E	4	Little Beaver Creek	10/14/03	0.24	0.27	7.38						4	Gauley	
WVKG-30-E	0.4	Little Beaver Creek	10/14/03	0.13	0.25	7.48						6	Gauley	
WVKG-30-E-4	0	UNT/Little Beaver Creek RM 4.0	10/14/03	0.26	0.28	7.37						3	Gauley	
WVKG-30-L	0.3	Bearpen Fork	1/14/04	0.83	2.38	5.74						18	Gauley	
WVKG-30-L	0.3	Bearpen Fork	2/12/04	0.16	1.36	5.90						18	Gauley	
WVKG-30-L	0.3	Bearpen Fork	12/18/03	0.1	0.54	6.02						3	Gauley	
WVKG-30-L	0.3	Bearpen Fork	4/6/04	0.12	0.52	6.21						4	Gauley	
WVKG-30-L	0.3	Bearpen Fork	10/24/03	0.25	1.08	6.43						7	Gauley	
WVKG-30-L	1.1	Bearpen Fork	2/12/04	0.09	0.58	6.47						12	Gauley	
WVKG-30-N	0	Lower Laurel Run	10/24/03	0.2	0.22	6.76					<	2.39	Gauley	
WVKG-30-P	0.1	Upper Laurel Run	11/12/03	0.11	0.8	4.82						18	Gauley	
WVKG-30-P	0.1	Upper Laurel Run	12/15/03	0.18	0.23	5.03					<	3	Gauley	
WVKG-30-P	0.1	Upper Laurel Run	4/6/04	0.2	0.3	5.42					<	3	Gauley	
WVKG-30-P	0.1	Upper Laurel Run	3/8/04	0.15	0.36	5.73					<	3	Gauley	
WVKG-30-P	0.1	Upper Laurel Run	10/24/03	0.22	0.24	6.21						4	Gauley	
WVKG-30-P	0.1	Upper Laurel Run	2/12/04	0.18	0.2	6.28					<	3	Gauley	
WVKG-30-P	0.1	Upper Laurel Run	1/14/04	0.12	0.3	6.84						8	Gauley	
WVKG-30-Q	0.1	Board Fork	10/24/03	0.18	0.22	6.67					<	2.39	Gauley	
WVKG-31	0	Little Laurel Creek	7/22/03	0.13	0.36	7.44						3	Gauley	
WVKG-31	0	Little Laurel Creek	10/14/03	0.1	0.49	7.67					<	3	Gauley	
WVKG-31	0	Little Laurel Creek	10/1/03	0.09	0.3	7.67					<	3	Gauley	
WVKG-32	3.4	Panther Creek	9/5/03	0.2	0.29	6.17						8	Gauley	
WVKG-32	0	Panther Creek	7/22/03	0.09	0.43	7.16						3	Gauley	
WVKG-32	0	Panther Creek	10/1/03	0.1	0.4	7.64					<	3	Gauley	
WVKG-34-H-11.5	0	Carpenter Run	7/22/03	0.36	0.36	4.24						3	Gauley	
WVKG-34-H-11.5	0	Carpenter Run	4/7/04	0.49	0.52	4.59					<	3	Gauley	
WVKG-34-H-8	0	Windy Run	7/22/03	0.27	0.29	4.45					<	3	Gauley	
WVKG-34-H-8	0	Windy Run	9/9/03	0.28	0.29	4.47					<	3	Gauley	
WVKG-34-H-9	0	Armstrong Run	7/22/03	0.3	0.34	4.40						4	Gauley	
WVKG-5-B-1	0	Open Fork	12/29/03	0.5	1.32	5.01					<	3	Gauley	
WVKG-5-B-1	0	Open Fork	2/19/04	0.95	1.58	5.22						3	Gauley	
WVKG-5-B-1	0	Open Fork	1/28/04	1.04	1.68	5.42						4	Gauley	
WVKG-5-B-1	0	Open Fork	3/18/04	0.45	1.12	5.51						4	Gauley	
WVKG-5-B-1	0	Open Fork	3/30/04	0.18	0.93	5.76						3	Gauley	
WVKG-5-B-1	0	Open Fork	9/29/03	0.1	1.28	5.97						6	Gauley	
WVKG-5-B-1-C	0	Sangamore Fork	12/29/03	7	7	4.23					<	3	Gauley	
WVKG-5-B-1-C	0	Sangamore Fork	2/27/04	11	11	4.32						4	Gauley	
WVKG-5-B-1-C	0	Sangamore Fork	7/16/03	9.15	9.15	4.33					<	3	Gauley	
WVKG-5-B-1-C	0	Sangamore Fork	9/29/03	9.7	9.7	4.42					<	3	Gauley	
WVKG-5-B-1-C	0	Sangamore Fork	10/27/03	9.08	9.35	4.43						10	Gauley	
WVKG-5-B-1-C	0	Sangamore Fork	1/28/04	8	8	4.50					<	3	Gauley	

ANCode	Mile Point	Stream Name	Date	Dis. Al (mg/l)	Total Al (mg/l)	pH	Q	Total Fe (mg/l)	Q	Total Mn (mg/l)	Q	TSS (mg/l)	Watershed	WVSCI
WVKG-5-B-1-C	0	Sangamore Fork	3/19/04	5.8	6.17	4.58					<	3	Gauley	
WVKG-5-B-1-C	0	Sangamore Fork	11/11/03	6	6	4.64					<	3	Gauley	
WVKG-5-B-1-C	0	Sangamore Fork	9/2/03	3.42	4.69	4.72						32	Gauley	
WVKG-5-B-1-C	0	Sangamore Fork	4/2/04	2.28	3	5.15						16	Gauley	
WVKG-5-F	0	Rockcamp Fork	12/23/03	0.95	1.25	4.75						7	Gauley	
WVKG-5-F	0	Rockcamp Fork	2/26/04	1.92	2.08	4.81					<	3	Gauley	
WVKG-5-F	0	Rockcamp Fork	7/17/03	0.97	1.07	4.96					<	3	Gauley	
WVKG-5-F	0	Rockcamp Fork	10/28/03	1.04	1.19	4.97					<	3	Gauley	
WVKG-5-F	0	Rockcamp Fork	10/1/03	1.79	1.82	5.10					<	3	Gauley	
WVKG-5-F	0	Rockcamp Fork	11/11/03	0.22	0.6	5.19						3	Gauley	
WVKG-5-F	0	Rockcamp Fork	3/18/04	0.57	0.83	5.28						3	Gauley	
WVKG-5-F	0	Rockcamp Fork	2/2/04	0.9	1.19	5.29						4	Gauley	
WVKG-5-F	0	Rockcamp Fork	4/2/04	0.16	0.64	5.62						13	Gauley	
WVKG-5-F-1	0	Spring Branch	10/29/03	11.2	11.5	3.29					<	3	Gauley	
WVKG-5-F-1	0	Spring Branch	12/23/03	8	8	3.30					<	3	Gauley	
WVKG-5-F-1	0	Spring Branch	2/27/04	12.4	12.4	3.32					<	3	Gauley	
WVKG-5-F-1	0	Spring Branch	7/17/03	11.8	11.7	3.36						3	Gauley	
WVKG-5-F-1	0	Spring Branch	11/11/03	6	6	3.40					<	3	Gauley	
WVKG-5-F-1	0	Spring Branch	10/1/03	14.2	13.4	3.44					<	3	Gauley	
WVKG-5-F-1	0	Spring Branch	3/18/04	6.43	6.66	3.44					<	3	Gauley	
WVKG-5-F-1	0	Spring Branch	9/3/03	3.95	3.8	3.57					<	3	Gauley	
WVKG-5-F-1	0	Spring Branch	4/2/04	2.79	2.95	3.79						4	Gauley	
WVKN-22	14.9	Dunloup Creek	7/11/02	1.53	1.73	3.81						3.2	Lower New	
WVKN-22	14.1	Dunloup Creek	7/11/02	0.27	1.44	5.35						8.8	Lower New	
WVKN-22-{14.4}-Discharge		Dunloup Creek-Mine Discharge #2	7/11/02	12.6	12.6	3.53					<	3	Lower New	
WVKN-22-B	3.1	Meadow Fork	3/20/02	0.34	0.36	7.75						74	Lower New	
WVKN-22-B-1.3	0	UNT/Meadow Fork RM 0.7	1/17/02	5.44	7	3.40					<	5	Lower New	
WVKN-22-B-1.3	0	UNT/Meadow Fork RM 0.7	4/3/02	5.29	5.42	3.42					<	3	Lower New	
WVKN-22-B-1.3	0	UNT/Meadow Fork RM 0.7	3/21/02	0.74	0.98	3.67					<	3	Lower New	
WVKN-22-B-1.5	0.1	UNT/Meadow Fork RM 0.9	1/16/02	0.866	0.99	4.04					<	5	Lower New	
WVKN-22-B-1.5	0.1	UNT/Meadow Fork RM 0.9	4/3/02	1.29	1.42	4.58					<	3	Lower New	
WVKN-22-B-1.5	0.1	UNT/Meadow Fork RM 0.9	3/20/02	0.5	0.8	4.77						21.6	Lower New	
WVKN-22-B-3-{0.0}-Seep		Sleepy Hollow Mine Seep into UNT/Meadow Fork	4/3/02	0.27	0.34	5.29						9.2	Lower New	
WVKN-22-F	0	Smith Branch	4/3/02	0.63	0.77	5.37					<	3	Lower New	
WVKN-22-F	0	Smith Branch	3/13/02	0.11	0.96	6.43					<	3	Lower New	
WVKN-22-P	0	UNT/Dunloup Creek RM 14.1	7/11/02	1.67	1.67	3.59					<	3	Lower New	
WVKP-1	1.4	Heizer Creek	8/28/02	0.11	0.29	5.98					<	3	Lower Kanawha	
WVKP-1	1.8	Heizer Creek	8/28/02	0.12	0.28	6.22					<	3	Lower Kanawha	
WVKP-1-0.9A	0.1	UNT/Heizer Creek RM 0.6	2/27/03	5.94	6.08	4.08					<	3	Lower Kanawha	
WVKP-13	4	Tupper Creek	2/25/03	7.11	8.06	4.49						4	Lower Kanawha	
WVKP-13	5.8	Tupper Creek	2/25/03	5.3	6.11	4.75						28	Lower Kanawha	

AN Code	Mile Point	Stream Name	Date								TSS mg/L	Watershed	WVSCI
WVKP-13	1.3	Tupper Creek	2/25/03	0.22	3.01	6.65					28	Lower Kanawha	
WVKP-13	1.3	Tupper Creek	4/21/03	0.1	7.3	7.35					221	Lower Kanawha	
WVKP-13-A	0	Legg Fork	4/21/03	0.09	4.5	7.41					109	Lower Kanawha	
WVKP-13-C.5	0.1	Union Fork	2/26/03	14.1	14.7	3.77					32	Lower Kanawha	
WVKP-13-C.5	0.1	Union Fork	3/25/03	8.97	11.6	4.49					32	Lower Kanawha	
WVKP-13-C.5	0.1	Union Fork	4/24/03	0.18	5.43	5.97					33	Lower Kanawha	
WVKP-13-C.5	0.1	Union Fork	5/14/03	0.1	5.92	6.16					25	Lower Kanawha	
WVKP-13-C.5-1	0.2	UNT/Union Fork RM 0.2	2/25/03	15.6	15.6	3.57					28	Lower Kanawha	
WVKP-13-C.5-1	0.2	UNT/Union Fork RM 0.2	3/25/03	15.3	16.1	3.90					24	Lower Kanawha	
WVKP-13-C.5-1	0.2	UNT/Union Fork RM 0.2	5/14/03	4.98	9.35	4.86					27	Lower Kanawha	
WVKP-13-C.5-1	0.2	UNT/Union Fork RM 0.2	4/24/03	3.96	7.55	4.99					34	Lower Kanawha	
WVKP-1-A	1.1	Manila Creek	8/27/02	3.74	3.91	4.36					< 5	Lower Kanawha	
WVKP-1-A	0.8	Manila Creek	8/27/02	2.37	2.69	4.82					< 5	Lower Kanawha	
WVKP-1-A	1.1	Manila Creek	7/17/02	0.16	0.44	5.82					< 3	Lower Kanawha	
WVKP-1-A	0.8	Manila Creek	1/27/03	0.14	1.44	6.58					6	Lower Kanawha	
WVKP-1-A	1.1	Manila Creek	10/16/02	0.12	2.34	6.80					96	Lower Kanawha	
WVKP-1-A	0.8	Manila Creek	10/16/02	0.1	1.66	6.96					31	Lower Kanawha	
WVKP-1-A.3	0.1	Coal Hollow	3/24/03	7.56	7.56	3.76					13	Lower Kanawha	
WVKP-1-A.3	0.1	Coal Hollow	8/28/02	9.08	9.08	3.81					< 3	Lower Kanawha	
WVKP-1-A.3	0.1	Coal Hollow	7/18/02	7.32	7.32	3.90					< 3	Lower Kanawha	
WVKP-1-A.3	0.1	Coal Hollow	11/4/02	8.25	8.67	3.98					< 3	Lower Kanawha	
WVKP-1-A.3	0.1	Coal Hollow	10/15/02	10.5	10.5	4.12					< 3	Lower Kanawha	
WVKP-1-A.3	0.1	Coal Hollow	5/12/03	5.96	5.96	4.13					< 3	Lower Kanawha	
WVKP-1-A.3	0.1	Coal Hollow	4/24/03	5.95	5.95	4.20					< 3	Lower Kanawha	
WVKP-1-A.3	0.1	Coal Hollow	12/19/02	5.66	5.66	4.30					< 3	Lower Kanawha	
WVKP-1-A.3	0.1	Coal Hollow	11/18/02	4.21	4.21	4.52					13	Lower Kanawha	
WVKP-1-A.6	0	UNT/Heizer Creek RM 2.3	1/31/03	5.93	5.93	3.32					13	Lower Kanawha	
WVKP-1-A.6	0	UNT/Heizer Creek RM 2.3	12/19/02	4.06	4.06	3.34					< 3	Lower Kanawha	
WVKP-1-A.6	0	UNT/Heizer Creek RM 2.3	3/24/03	5.06	5.06	3.44					< 3	Lower Kanawha	
WVKP-1-A.6	0	UNT/Heizer Creek RM 2.3	5/12/03	5.93	5.93	3.62					10	Lower Kanawha	
WVKP-1-A.6	0	UNT/Heizer Creek RM 2.3	4/23/03	4.88	4.88	3.69					8	Lower Kanawha	
WVKP-1-A.6	0	UNT/Heizer Creek RM 2.3	6/12/03	5.5	5.82	3.83					15	Lower Kanawha	
WVKP-1-A.6	0	UNT/Heizer Creek RM 2.3	2/28/03	0.83	2.32	5.59					29	Lower Kanawha	
WVKP-1-A-{2.0}-Mine		Mine Drainage into Manila Creek	7/17/02	41.8	42.7	2.87					21.6	Lower Kanawha	
WVKP-1-A-{3.12}-Mine		Mine Discharge into Manila Creek	3/3/03	1.94	2.64	4.10					12	Lower Kanawha	
WVKP-1-A-0.2	0	UNT/Manila Creek RM 1.0	10/16/02	0.14	1.25	7.12					26	Lower Kanawha	
WVKP-1-A-0.3	0	Martins Branch	10/16/02	0.13	1.37	6.39					16	Lower Kanawha	
WVKP-1-A-0.4	0	Sulphur Hollow	7/17/02	23.2	23.5	3.16					< 3	Lower Kanawha	
WVKP-1-A-0.4	0	Sulphur Hollow	10/15/02	20.9	22.1	3.27					12	Lower Kanawha	
WVKP-1-A-0.4	0	Sulphur Hollow	11/4/02	13.6	13.7	3.39					< 3	Lower Kanawha	
WVKP-1-A-0.4	0	Sulphur Hollow	5/13/03	14.7	15.1	3.42					6	Lower Kanawha	
WVKP-1-A-0.4	0	Sulphur Hollow	2/27/03	11.8	11.8	3.47					32	Lower Kanawha	
WVKP-1-A-0.4	0	Sulphur Hollow	3/24/03	13	13	3.52					12	Lower Kanawha	

AnCode	Mile Point	Stream Name	Date	[illegible]	[illegible]	pH	Total Ca (mg/L)	Total Mg (mg/L)		[illegible] (mg/L)	Watershed	WVSCI
WVKP-1-A-0.4	0	Sulphur Hollow	4/22/03	3.52	6.62	4.63				19	Lower Kanawha	
WVKP-1-A-0.4	0	Sulphur Hollow	11/20/02	0.31	3.58	5.51				17	Lower Kanawha	
WVKP-1-A-0.48	0	UNT/Manila Creek RM 2.3 (#4 Hollow)	1/27/03	2.97	3.95	3.74				16	Lower Kanawha	
WVKP-1-A-0.48	0	UNT/Manila Creek RM 2.3 (#4 Hollow)	5/12/03	3.32	4.34	4.08				51	Lower Kanawha	
WVKP-1-A-0.48	0	UNT/Manila Creek RM 2.3 (#4 Hollow)	3/24/03	0.52	3.15	5.53				26	Lower Kanawha	
WVKP-1-A-0.48	0	UNT/Manila Creek RM 2.3 (#4 Hollow)	11/20/02	0.13	1.14	6.03				12	Lower Kanawha	
WVKP-1-A-0.6	0	Alcocks Hollow	11/5/02	6.19	6.19	3.99			<	3	Lower Kanawha	
WVKP-1-A-0.6	0	Alcocks Hollow	10/15/02	8.75	8.75	4.05				3	Lower Kanawha	
WVKP-1-A-0.6	0	Alcocks Hollow	5/12/03	4.89	4.93	4.58				5	Lower Kanawha	
WVKP-1-A-0.6	0	Alcocks Hollow	4/24/03	3.72	5.16	4.86				14	Lower Kanawha	
WVKP-1-A-0.6	0	Alcocks Hollow	2/27/03	1.83	4.97	5.23				24	Lower Kanawha	
WVKP-1-A-0.6	0	Alcocks Hollow	3/24/03	0.53	4.2	5.40				16	Lower Kanawha	
WVKP-1-A-0.6	0	Alcocks Hollow	12/20/02	0.1	0.34	7.14			<	3	Lower Kanawha	
WVKP-1-A-0.6	0	Alcocks Hollow	11/19/02	0.09	0.37	7.20			<	3	Lower Kanawha	
WVKP-1-A-0.7	0	UNT/Manila Creek RM 2.9	10/16/02	0.13	0.92	7.10				8	Lower Kanawha	
WVLK-31	20	Spring Creek	12/14/99	0.51	1.68	7.80				144	Little Kanawha	
WVLK-31	0	Spring Creek	12/14/99	0.41	4.02	8.10				375	Little Kanawha	
WVLK-31	7	Spring Creek	12/14/99	0.28	4.23	8.10				650	Little Kanawha	
WVLK-31-A		Bear Run	12/14/99	0.24	1.49	8.40				144	Little Kanawha	
WVLK-31-AA	4	Right Fork/Spring Creek	12/14/99	0.34	1.44	7.10				96	Little Kanawha	
WVLK-31-AA	0	Right Fork/Spring Creek	12/14/99	0.41	1.68	7.50				144	Little Kanawha	
WVLK-31-AA-1	2.6	Lick Fork	12/14/99	0.49	1.13	7.40				70	Little Kanawha	
WVLK-31-AA-1	0	Lick Fork	12/14/99	0.45	0.84	7.50				52	Little Kanawha	
WVLK-31-AA-3		Missouri Fork	12/14/99	0.11	1.81	7.50				206	Little Kanawha	
WVLK-31-H	0.2	Beaverdam Run	12/14/99	0.31	0.8	7.70				15	Little Kanawha	
WVLK-31-N		Toms Run	12/14/99	0.47	0.94	7.80				18	Little Kanawha	
WVLK-31-O	4.8	Little Spring Creek	12/14/99	0.54	1.95	7.70				180	Little Kanawha	
WVLK-31-O	0	Little Spring Creek	12/14/99	0.46	2.07	8.00				114	Little Kanawha	
WVLK-31-O-2		Left Fork/Little Spring Creek	12/14/99	0.94	1.52	7.60				68	Little Kanawha	
WVLK-31-O-6		Right Fork/Little Spring Creek	12/14/99	0.38	2	7.00				156	Little Kanawha	
WVLK-31-R		Island Run	12/14/99	0.46	1.19	7.90				72	Little Kanawha	
WVLK-31-W		Nancy Run	12/14/99	0.46	3.34	7.90				285	Little Kanawha	
WVLK-31-X		Tanner Run	12/14/99	0.58	1.33	7.40				74	Little Kanawha	
WVLK-31-X-1		Miletree Run	12/14/99	0.47	1.4	7.20				190	Little Kanawha	
WVLK-31-X-2		Scaffold Run	12/14/99	0.88	2.92	7.20				34	Little Kanawha	
WVLK-31-Y		Goff Run	12/14/99	0.38	0.86	7.20				48	Little Kanawha	
WVLK-31-Y-1		Laurel Run/Goff Run	12/14/99	0.53	0.56	7.00				20	Little Kanawha	
WVLK-31-Z	2.8	Left Fork/Spring Creek	12/14/99	0.36	1.31	6.40				140	Little Kanawha	
WVLK-31-Z	0	Left Fork/Spring Creek	12/14/99	0.46	2.11	6.70				190	Little Kanawha	

ANCode	Mile Point	Stream Name	Date	[illegible]	[illegible]	pH	[illegible]		[illegible] (mg/L)			TSS (mg/L)	Watershed	WVSCI
WVLK-31-Z-1	0	Charles Fork	12/14/99	0.29	0.8	6.50						78	Little Kanawha	
WVLK-31-Z-1	2.9	Charles Fork	12/14/99	0.49	2.36	7.30						266	Little Kanawha	
WVLK-31-Z-2		Daniels Run	12/14/99	0.33	0.84	6.40						36	Little Kanawha	
WVLK-31-Z-3		Vandale Fork	12/14/99	0.4	0.96	6.50						78	Little Kanawha	
WVMC-11	1	Bull Run	6/25/01	13.4	14.9	3.24						1	Cheat	13.54
WVMC-16-A	0.8	South Fork/Greens Run	6/18/01	25.9	28	2.69						1	Cheat	20.6
WVMC-16-A	0.5	South Fork/Greens Run	6/20/01	28.8	31.1	2.69						4	Cheat	15.25
WVMC-16-A-1	0	UNT/South Fork RM 0.6/Greens Run	6/20/01	32.1	34.4	2.72						15	Cheat	9.78
WVMC-17	0	Muddy Creek	6/20/01	11	11.1	3.13						13	Cheat	15.37
WVMC-17	3.37	Muddy Creek	6/18/01	0.66	2.23	4.83						16	Cheat	
WVMC-17-A	0	Martin Creek	6/19/01	36.5	39.1	2.90						2	Cheat	13.68
WVMC-17-A-0.5	0	Fickey Run	6/25/01	69.3	75.1	2.70						4	Cheat	9.78
WVMC-24		Heather Run	6/19/01	13.6	15.3	2.97						1	Cheat	18.99
WVMC-25		Lick Run/Cheat River	6/19/01	42.5	48	2.65						3	Cheat	17.3
WVMC-27		Pringle Run	6/19/01	6.83	7.86	3.84						2	Cheat	31.39
WVMT-12	11.2	Three Fork Creek	9/25/02	7.46	7.46	4.46					<	3	Tygart Valley	49.8
WVMT-12	0.3	Three Fork Creek	9/26/02	1.53	1.87	4.88						6	Tygart Valley	53.55
WVMT-12	11.2	Three Fork Creek	9/25/02	7.92	7.92							4	Tygart Valley	33.04
WVMT-12-C	0.1	Raccoon Creek	9/25/02	8.33	8.33	4.43					<	3	Tygart Valley	51.2
WVMT-12-G	0	Fields Creek	9/25/02	0.23	0.27	5.11						4	Tygart Valley	
WVMT-12-H	0.1	Birds Creek	9/25/02	16	16.6	4.04						3	Tygart Valley	23.54
WVMT-18	3.5	Sandy Creek	10/1/02	0.91	0.92	6.62						6	Tygart Valley	48.29
WVMT-18-E	0.7	Little Sandy Creek	10/1/02	2.81	2.81	5.62					<	3	Tygart Valley	
WVMT-18-E-3	0	Left Fork/Little Sandy Creek	10/1/02	24.4	24.9	5.46					<	3	Tygart Valley	9.78
WVMT-37	0	Beaver Creek	10/2/02	8.88	8.89	3.38					<	3	Tygart Valley	21.21
WVMT-42	0.2	Roaring Creek	9/25/02	15.7	15.7	3.11						12	Tygart Valley	11.84
WVMT-42	9.3	Roaring Creek	10/3/02	0.38	0.42	4.89					<	3	Tygart Valley	
WVMT-42	6.3	Roaring Creek	10/3/02	0.3	0.34	5.55					<	3	Tygart Valley	
WVMT-42-B	0	Flatbush Fork	10/3/02	0.88	0.88	4.33					<	3	Tygart Valley	
WVMTB-11-B	0.5	Mud Lick	10/3/02	0.54	0.54	4.18					<	3	Tygart Valley	
WVMTB-11-B.7	0.1	Bridge Run	10/3/02	2.72	2.72	3.38					<	3	Tygart Valley	
WVMTM-16	1.5	Cassity Fork	9/24/02	56.9	56.9	3.06						10	Tygart Valley	
WVO-100-{0.3}-Discharge		Clay Mine Discharge into Hardin Run	12/4/01	24	30	3.29					<	3	Tygart Valley	46.17
WVO-100-{0.3}-Discharge		Clay Mine Discharge into Hardin Run	1/8/02	11.4	12.3	3.47						93	Upper Ohio North	
WVO-100-{0.3}-Discharge		Clay Mine Discharge into Hardin Run	2/5/02	6.59	7.44	3.85						57	Upper Ohio North	
WVO-100-{0.3}-Discharge		Clay Mine Discharge into Hardin Run	3/19/02	1.73	4.24	5.56						36.8	Upper Ohio North	
WVO-101	0.2	Deep Gut Run	9/10/01	4.16	4.17	3.23						27.6	Upper Ohio North	
WVO-101	0.2	Deep Gut Run	8/20/01	3.8	4	3.42					<	5	Upper Ohio	
												9	Upper Ohio	

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]		[illegible]		TSS [illegible]	Watershed	WVSCI
WVO-101	0.2	Deep Gut Run	10/23/01	3.8	3.8	3.42					<	5	Upper Ohio	
WVO-101	0.2	Deep Gut Run	11/5/01	1.65	2.08	4.00						5	Upper Ohio	
WVO-101	0.2	Deep Gut Run	7/23/01	1.83	2.02	5.54						12	Upper Ohio	
WVO-101	2	Deep Gut Run	9/10/01	0.12	0.31	7.63						18	Upper Ohio	
WVO-101-E	0	UNT/Deep Gut Run RM 1.8	9/10/01	0.17	0.17	7.59						20	Upper Ohio	
WVO-21-B-2	0	UNT/Robinson Run	4/17/00	0.48	6.6	6.50						140	Middle Ohio	
WVO-21-B-2	0.8	UNT/Robinson Run	4/17/00	0.71	5.1	6.90						110	Middle Ohio	
WVO-23	3.4	Tenmile Creek	8/19/03	4.02	7.05	6.39						10	Middle Ohio	50.7
WVO-3	7.7	Fourpole Creek	1/24/02	0.097	10.4	7.32						532	Lower Ohio	
WVO-3	4.8	Fourpole Creek	1/24/02	0.0898	16.8	7.51						896	Lower Ohio	
WVO-3	7	Fourpole Creek	1/24/02	0.097	6.26	7.60						254	Lower Ohio	
WVO-3	7.5	Fourpole Creek	10/9/01	0.21	0.23								Lower Ohio	
WVO-3	1.6	Fourpole Creek	10/9/01	0.24	0.25								Lower Ohio	
WVO-3	1.6	Fourpole Creek	11/7/01	0.13	0.26								Lower Ohio	
WVO-3-B	0.1	Grapevine Branch	1/24/02	0.101	14.3	7.27						876	Lower Ohio	
WVO-3-B	0	Grapevine Branch	10/9/01	0.15	0.18								Lower Ohio	
WVO-95	3.5	Cross Creek	9/12/01	0.23	0.24	8.16						5	Upper Ohio	
WVO-95	7.8	Cross Creek	5/21/02	0.13	0.52	8.21						8.4	Upper Ohio	
WVO-95	7.8	Cross Creek	4/16/02	0.12	0.58	8.26						15.6	Upper Ohio	
WVO-95	7.8	Cross Creek	9/11/01	0.14	0.22	8.36						5	Upper Ohio	
WVO-95	7.8	Cross Creek	6/18/02	0.13	0.28	8.38						5.6	Upper Ohio	
WVO-95	5	Cross Creek	4/16/02	0.11	0.5	8.39						11.2	Upper Ohio	
WVO-95	5.05	Cross Creek	9/11/01	0.1	0.18	8.42						5	Upper Ohio	
WVO-95	1.1	Cross Creek	4/15/02	0.09	0.48	8.42						13.2	Upper Ohio	
WVO-95-B	0	Ebenezer Run	9/11/01	0.19	0.29	8.45					<	5	Upper Ohio	
WVO-95-C	0	North Potrock Run	9/11/01	0.1	0.26	8.32					<	5	Upper Ohio	
WVO-95-F	0	UNT/Cross Creek RM 6.9	9/11/01	0.12	0.36	8.39						5	Upper Ohio	
WVO-97	7.2	Harmon Creek	9/11/01	0.14	0.15	7.34						11	Upper Ohio	
WVO-97	1.2	Harmon Creek	9/11/01	0.16	0.22	7.85						16	Upper Ohio	
WVO-97-0.7A	0	UNT/Harmon Creek RM 2.9	9/11/01	0.14	0.14	7.92					<	5	Upper Ohio	
WVO-97-0.9A	0	UNT/Harmon Creek RM 3.2	9/12/01	0.12	0.22	7.95					<	5	Upper Ohio	
WVO-97-B	0	Alexanders Run	9/10/01	0.12	0.19	7.41						12	Upper Ohio	
WVO-97-B	2.8	Alexanders Run	9/12/01	0.1	0.18	7.87					<	5	Upper Ohio	
WVO-97-B.5	0	UNT/Harmon Creek RM 5.4	9/11/01	0.13	0.48	7.79						14	Upper Ohio	
WVO-97-D	0	Brown Hollow	9/11/01	0.12	0.34	7.70						11	Upper Ohio	
WVO-98	0.1	Kings Creek	9/12/01	0.23	0.26	7.77						11	Upper Ohio	
WVO-98-0.5A	0	Turkeyfoot Run	9/11/01	0.1	0.22	7.69						5	Upper Ohio	
WVO-98-A.5	0	Marrow Run	9/11/01	0.14	0.17	7.99						7	Upper Ohio	
WVOG	79.5	Guyandotte River	9/4/03	0.18	4.92	7.23						1870		
WVOG	2.8	Guyandotte River	9/4/03	0.16	0.29	7.34						3		
WVOG	79.5	Guyandotte River	6/16/03	0.28	2	7.65						190	Lower	
WVOG-110	0.2	Indian Creek	9/6/00	0.11	0.45	8.47							Upper	71.21
WVOG-124	0.7	Pinnacle Creek	9/5/00	0.15	0.18	8.21							Upper	60.47

ANCode	Mile Point	Stream Name	Date	Dis Al mg/L	Tot Al mg/L	pH	Q	[illegible]	Q	[illegible]	Q	TSS mg/L	Watershed	WVSCI
WVOG-124-D		Smith Branch/Pinnacle Creek	9/6/00	0.22	0.35	8.25							Upper	52.69
WVOG-134-D		Measle Fork	9/5/00	5.79	5.79	3.70							Upper	68.04
WVOG-139	0	Stonecoal Creek	9/6/00	0.089	0.164	7.99						8	Upper	52.01
WVOG-65-B-1-A		Lower Dempsey Branch	8/23/00	0.19	3.7	5.62						37	Upper	53.19
WVOG-65-B-1-E		Upper Dempsey Branch	8/23/00	6.7	6.7	4.72					<	5	Upper	29.26
WVOG-65-B-4-C	0.1	UNT/Trace Fork RM 0.6	4/1/04	21.8	21.8	3.01						14	Upper	
WVOG-65-B-4-C	0.1	UNT/Trace Fork RM 0.6	3/16/04	10.4	10.4	3.08						6	Upper	
WVOG-75	18	Buffalo Creek	8/30/00	2.26	9.96	5.00							Upper	
WVOG-77-A.5		Oldhouse Branch/Rockhouse	8/31/00	7.4	8	4.37						30	Upper	31.2
WVOG-96	1.6	Big Cub Creek	9/5/00	0.2	0.2	8.00						2	Upper	63.14
WVOG-96-B	0.4	Road Branch	9/5/00	0.3	0.4	7.58						6	Upper	67.32
WVOG-96-F		Toler Hollow	9/6/00	0.18	0.38	8.12						8	Upper	58.5
WVOG-96-H		McDonald Fork	9/6/00	0.11	0.22	7.96						4	Upper	63.03
WVOG-99		Reedy Branch	9/6/00	0.13	0.22	7.63						6	Upper	65.91
WVOGC-16-U		Franks Fork	8/29/00	0.11	0.18	7.33							Upper	50.46
WVOGC-26		Crane Fork	8/30/00	0.13	1.04	7.25							Upper	49.3
WVPNB-11	0.5	Montgomery Run	1/13/03	7.04	7.04	3.48						9	North Branch	
WVPNB-11	0.5	Montgomery Run	3/11/03	6.03	6.09	3.52						20	North Branch	
WVPNB-11	0.1	Montgomery Run	3/11/03	5.21	5.21	3.60						20	North Branch	
WVPNB-11	0.1	Montgomery Run	1/13/03	6.29	6.29	3.88						9	North Branch	
WVPNB-11	0.5	Montgomery Run	4/15/03	3.86	4.67	4.09						7.6	North Branch	
WVPNB-11	0.1	Montgomery Run	4/15/03	3.15	4.21	4.76						10	North Branch	
WVPNB-11	1.4	Montgomery Run	4/15/03	0.28	0.52	4.81						3.6	North Branch	
WVPNB-11	1.4	Montgomery Run	1/13/03	3.13	3.46	4.91						3	North Branch	
WVPNB-11	1.4	Montgomery Run	5/6/03	1.69	2.19	5.10					<	3	North Branch	
WVPNB-11	0.1	Montgomery Run	7/9/02	0.14	2.02	7.88						9.6	North Branch	
WVPNB-11	0.1	Montgomery Run	8/6/02	0.13	1.49	7.97						9.2	North Branch	
WVPNB-11	0.1	Montgomery Run	8/6/02	0.13	1.53							9.2	North Branch	
WVPNB-11-A	0	UNT/Montgomery Run RM 1.4	11/19/02	4.08	4.11	4.64					<	3	North Branch	
WVPNB-11-A	0	UNT/Montgomery Run RM 1.4	8/6/02	1.93	5.74	4.98						19.8	North Branch	
WVPNB-11-A	0	UNT/Montgomery Run RM 1.4	12/9/02	11.1	11.1	5.01					<	3	North Branch	
WVPNB-11-A	0	UNT/Montgomery Run RM 1.4	11/13/02	3.79	3.79	5.14					<	3	North Branch	
WVPNB-11-A	0	UNT/Montgomery Run RM 1.4	5/6/03	0.53	1.51	5.49						4	North Branch	
WVPNB-11-A	0	UNT/Montgomery Run RM 1.4	1/13/03	1.26	1.26	5.58					<	3	North Branch	
WVPNB-11-A	0	UNT/Montgomery Run RM 1.4	4/15/03	0.34	0.52	5.79						3.2	North Branch	
WVPNB-12	0	Piney Swamp Run	10/8/02	17.4	17.8	3.11					<	3	North Branch	
WVPNB-12	0	Piney Swamp Run	6/26/02	16.1	16.1	3.26						5.6	North Branch	
WVPNB-12	0	Piney Swamp Run	2/10/03	8.01	8.01	3.30					<	3	North Branch	
WVPNB-12	0	Piney Swamp Run	1/13/03	4.89	4.89	3.43						7	North Branch	
WVPNB-12	0	Piney Swamp Run	4/15/03	6.45	6.47	3.62						8.8	North Branch	
WVPNB-12	0	Piney Swamp Run	12/9/02	9.07	9.09	3.63						9	North Branch	
WVPNB-12	0	Piney Swamp Run	8/6/02	11.3	11.3	3.63						7.6	North Branch	
WVPNB-12	0	Piney Swamp Run	3/12/03	4.02	4.61	3.96						13.6	North Branch	

AN Code	Mile Point	Stream Name	Date			pH						TSS (mg/L)	Watershed	WVSCI
WVPNB-12	0	Piney Swamp Run	5/6/03	4.52	4.78	3.96						12	North Branch	
WVPNB-12	0	Piney Swamp Run	11/12/02	4.19	4.47	4.03						26	North Branch	
WVPNB-12	0	Piney Swamp Run	11/19/02	3.68	3.82	4.15						6	North Branch	
WVPNB-12	2.2	Piney Swamp Run	2/10/03	1.47	1.47	4.75					<	3	North Branch	
WVPNB-12	2.2	Piney Swamp Run	12/9/02	1.52	1.61	4.77						4	North Branch	
WVPNB-12	2.2	Piney Swamp Run	11/12/02	1.2	1.47	4.86						10	North Branch	
WVPNB-12	3.2	Piney Swamp Run	10/8/02	0.55	0.56	4.98					<	3	North Branch	
WVPNB-12	3.2	Piney Swamp Run	8/6/02	0.65	0.7	5.02						4.8	North Branch	
WVPNB-12	3.2	Piney Swamp Run	6/26/02	0.4	0.46	5.19						4.8	North Branch	
WVPNB-12	1.6	Piney Swamp Run	3/11/03	0.77	1.92	5.19						10	North Branch	
WVPNB-12	1.6	Piney Swamp Run	1/13/03	0.98	2.02	5.22						8	North Branch	
WVPNB-12	2.2	Piney Swamp Run	1/13/03	0.47	0.99	5.23						9	North Branch	
WVPNB-12	1.6	Piney Swamp Run	2/10/03	0.71	1.61	5.41						4	North Branch	
WVPNB-12	1.6	Piney Swamp Run	11/19/02	1.95	1.95	5.47						11	North Branch	
WVPNB-12	3.2	Piney Swamp Run	12/9/02	0.19	0.55	5.51						4	North Branch	
WVPNB-12	1.6	Piney Swamp Run	4/15/03	0.59	1.93	5.57						18.4	North Branch	
WVPNB-12	3.2	Piney Swamp Run	3/11/03	0.19	0.56	5.62						4	North Branch	
WVPNB-12	2.2	Piney Swamp Run	11/19/02	0.26	0.81	5.66						6	North Branch	
WVPNB-12	3.2	Piney Swamp Run	2/10/03	0.3	0.52	5.73					<	3	North Branch	
WVPNB-12	1.6	Piney Swamp Run	12/9/02	0.15	1.51	5.79						8	North Branch	
WVPNB-12	1.6	Piney Swamp Run	5/6/03	0.18	1.62	5.79						19	North Branch	
WVPNB-12	3.2	Piney Swamp Run	4/15/03	0.09	0.69	5.84						12.8	North Branch	
WVPNB-12	2.2	Piney Swamp Run	3/11/03	0.11	0.72	5.86						6.8	North Branch	
WVPNB-12	3.2	Piney Swamp Run	1/13/03	0.13	0.38	5.92						3	North Branch	
WVPNB-12	3.2	Piney Swamp Run	11/19/02	0.1	0.43	6.09						4	North Branch	
WVPNB-12	3.2	Piney Swamp Run	11/12/02	0.1	1.26	6.25						37	North Branch	
WVPNB-12	3.2	Piney Swamp Run	10/8/02	0.55	0.56						<	3	North Branch	
WVPNB-12-{2.4}-Mine		Mine Seep into Piney Swamp Run	10/8/02	8.81	9.68	4.59						9	North Branch	
WVPNB-12-{2.4}-Mine		Mine Seep into Piney Swamp Run	2/10/03	1.03	3.13	5.22						16	North Branch	
WVPNB-12-{2.4}-Mine		Mine Seep into Piney Swamp Run	12/9/02	1.5	3.21	5.80						14	North Branch	
WVPNB-12-B	0	UNT/Piney Swamp Run RM 0.7	3/11/03	2.34	5.4	3.87						3.2	North Branch	
WVPNB-12-B	0	UNT/Piney Swamp Run RM 0.7	8/6/02	9.79	9.79	4.25						3.2	North Branch	
WVPNB-12-B	0	UNT/Piney Swamp Run RM 0.7	5/6/03	5.81	6.7	4.51						4	North Branch	
WVPNB-12-B	0	UNT/Piney Swamp Run RM 0.7	4/15/03	8.18	8.2	4.63					<	3	North Branch	
WVPNB-12-B	0	UNT/Piney Swamp Run RM 0.7	12/9/02	8.37	9.12	4.69					<	3	North Branch	
WVPNB-12-B	0	UNT/Piney Swamp Run RM 0.7	1/13/03	6.63	6.63	4.89					<	3	North Branch	
WVPNB-12-B	0	UNT/Piney Swamp Run RM 0.7	2/10/03	7.99	7.99	4.91					<	3	North Branch	
WVPNB-12-B	0	UNT/Piney Swamp Run RM 0.7	11/19/02	2.87	5.18	5.41						15	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	10/8/02	16.1	16.2	3.49						8	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	11/12/02	7.55	7.55	4.29						13	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	7/9/02	11.3	11.4	4.43						7.2	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	8/6/02	10.2	11.1	4.47						12.4	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	12/9/02	8.76		4.85						16	North Branch	

AnCode	Mile Point	Stream Name	Date	[illegible]	[illegible]	pH		[illegible]		[illegible]	Q	TSS (mg/L)	Watershed	WVSCI
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	4/15/03	4.84	6.62	4.85						8.4	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	5/6/03	4.61	8.09	4.91						16	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	3/11/03	4.36	4.41	4.94						6.4	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	1/13/03	4.33	6.84	4.94						13	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	2/10/03	7.61	10.3	4.97						24	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	11/19/02	4.34	6.11	5.14						11	North Branch	
WVPNB-12-F	0	UNT/Piney Swamp Run RM 2.2	5/6/03	8.16	8.29	4.41						6	North Branch	
WVPNB-12-F	0	UNT/Piney Swamp Run RM 2.2	4/15/03	8.22	8.53	4.58						5.2	North Branch	
WVPNB-12-F	0	UNT/Piney Swamp Run RM 2.2	1/13/03	8.62	8.87	4.61						10	North Branch	
WVPNB-12-F	0	UNT/Piney Swamp Run RM 2.2	3/11/03	7.65	10.8	4.64						3.6	North Branch	
WVPNB-12-F	0	UNT/Piney Swamp Run RM 2.2	11/19/02	11.3	11.3	4.72						15	North Branch	
WVPNB-12-F	0	UNT/Piney Swamp Run RM 2.2	11/12/02	5.87	14.2	4.78						82	North Branch	
WVPNB-12-F	0	UNT/Piney Swamp Run RM 2.2	2/10/03	4.35	7.05	5.15						20	North Branch	
WVPNB-12-F	0	UNT/Piney Swamp Run RM 2.2	12/9/02	1.26	6.24	5.36						27	North Branch	
WVPNB-16	15.8	Abrams Creek	6/25/02	3.99	3.99	4.27						6	North Branch	
WVPNB-16	15.8	Abrams Creek	8/12/02	3.84	4.02	4.30						4	North Branch	
WVPNB-16	15.8	Abrams Creek	4/17/03	3.76	3.85	4.58						5	North Branch	
WVPNB-16	15.8	Abrams Creek	3/13/03	1.76	2.05	4.61						6.4	North Branch	
WVPNB-16	17.7	Abrams Creek	5/8/03	5.31	5.51	4.70						8	North Branch	
WVPNB-16	3.1	Abrams Creek	7/17/02	1.16	1.16	4.74					<	3	North Branch	
WVPNB-16	9	Abrams Creek	10/9/02	2.4	2.63	4.78						3	North Branch	
WVPNB-16	3.1	Abrams Creek	10/8/02	1.15	1.67	4.79					<	3	North Branch	
WVPNB-16	17.7	Abrams Creek	10/10/02	1.81	3.05	4.84						8	North Branch	
WVPNB-16	9	Abrams Creek	8/7/02	2.01	2.18	4.87					<	3	North Branch	
WVPNB-16	9	Abrams Creek	7/11/02	2.35	2.57	4.88					<	3	North Branch	
WVPNB-16	17.7	Abrams Creek	4/14/03	1.59	1.98	4.89						4	North Branch	
WVPNB-16	15.8	Abrams Creek	10/10/02	1.86	2.68	4.91						22	North Branch	
WVPNB-16	9	Abrams Creek	4/17/03	1.47	2.44	4.92						9	North Branch	
WVPNB-16	17.7	Abrams Creek	2/12/03	2.23	2.46	4.98						3	North Branch	
WVPNB-16	17.7	Abrams Creek	8/12/02	1.24	2.3	4.98						8.4	North Branch	
WVPNB-16	15.8	Abrams Creek	11/11/02	1.17	1.34	5.04						6	North Branch	
WVPNB-16	15.8	Abrams Creek	12/10/02	1.67	2.11	5.12						10	North Branch	
WVPNB-16	3.1	Abrams Creek	8/6/02	0.64	0.72	5.12						4.4	North Branch	
WVPNB-16	9	Abrams Creek	11/11/02	0.46	0.94	5.21						5	North Branch	
WVPNB-16	15.8	Abrams Creek	5/8/03	0.68	1.89	5.21						20	North Branch	
WVPNB-16	15.8	Abrams Creek	2/12/03	1.87	1.87	5.22						6	North Branch	
WVPNB-16	15.8	Abrams Creek	11/21/02	1.34	1.44	5.26						4	North Branch	
WVPNB-16	17.7	Abrams Creek	3/10/03	1.24	1.77	5.29						18.4	North Branch	
WVPNB-16	17.7	Abrams Creek	11/21/02	1.36	1.4	5.29					<	3	North Branch	
WVPNB-16	9	Abrams Creek	12/11/02	0.73	2.5	5.31						14	North Branch	
WVPNB-16	17.7	Abrams Creek	12/10/02	1.06	1.55	5.33					<	3	North Branch	
WVPNB-16	17.7	Abrams Creek	1/15/03	0.9	1.66	5.39						6	North Branch	
WVPNB-16	9	Abrams Creek	3/13/03	0.27	1.91	5.52						11.6	North Branch	

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	TSS (mg/L)	Watershed	WVSCI
WVPNB-16	17.7	Abrams Creek	11/11/02	2.35	2.35	5.65					<3	North Branch	
WVPNB-16	3.1	Abrams Creek	4/16/03	0.22	1.37	5.66					9.6	North Branch	
WVPNB-16	0	Abrams Creek	10/8/02	0.2	0.58	5.68					<3	North Branch	
WVPNB-16	9	Abrams Creek	2/11/03	0.21	2.17	5.77					14	North Branch	
WVPNB-16	9	Abrams Creek	11/20/02	0.16	1.08	5.82					8	North Branch	
WVPNB-16	9	Abrams Creek	5/8/03	0.16	2.02	5.93					12	North Branch	
WVPNB-16	3.1	Abrams Creek	1/14/03	0.1	0.58	6.07					<3	North Branch	
WVPNB-16	3.1	Abrams Creek	12/11/02	0.1	1.43	6.16					8	North Branch	
WVPNB-16	9	Abrams Creek	1/15/03	0.47	1.45	6.55					7	North Branch	
WVPNB-16-0.5A	0	UNT/Abrams Creek RM 1.9	5/6/03	0.09	0.39	7.67					10	North Branch	
WVPNB-16-A	1.7	Emory Run	3/11/03	4.38	4.56	4.33					6.4	North Branch	
WVPNB-16-A	1.7	Emory Run	1/14/03	4.13	4.13	4.36					4	North Branch	
WVPNB-16-A	0	Emory Run	10/8/02	3.19	3.46	4.52					<3	North Branch	
WVPNB-16-A	1.7	Emory Run	12/11/02	4.38	4.82	4.61					12	North Branch	
WVPNB-16-A	0	Emory Run	1/14/03	1.72	2.78	4.62					7	North Branch	
WVPNB-16-A	1.7	Emory Run	2/11/03	3.78	4.06	4.71					5	North Branch	
WVPNB-16-A	1.7	Emory Run	8/12/02	2.13	5.05	4.83					12	North Branch	
WVPNB-16-A	1.7	Emory Run	11/20/02	2.54	3	4.85					6	North Branch	
WVPNB-16-A	1.7	Emory Run	10/9/02	2.5	3.79	4.92					8	North Branch	
WVPNB-16-A	0	Emory Run	8/6/02	1.34	2.43	4.94					10	North Branch	
WVPNB-16-A	1.7	Emory Run	11/13/02	1.04	1.77	5.02					9	North Branch	
WVPNB-16-A	1.7	Emory Run	4/6/03	1.68	2.49	5.06					9.2	North Branch	
WVPNB-16-A	0	Emory Run	3/11/03	1.06	2.68	5.06					16	North Branch	
WVPNB-16-A	0	Emory Run	7/17/02	0.61	1.74	5.15					4.4	North Branch	
WVPNB-16-A	0	Emory Run	11/20/02	0.54	2.74	5.23					14	North Branch	
WVPNB-16-A	0	Emory Run	4/16/03	0.41	2.72	5.24					22	North Branch	
WVPNB-16-A	0	Emory Run	2/11/03	0.62	3.26	5.25					14	North Branch	
WVPNB-16-A	0	Emory Run	12/11/02	0.56	6.46	5.28					40	North Branch	
WVPNB-16-A	1.7	Emory Run	5/8/03	0.14	1.52	5.46					12	North Branch	
WVPNB-16-A	0	Emory Run	11/13/02	0.2	1.64	5.56					14	North Branch	
WVPNB-16-A-1	0	UNT/Emory Run RM 0.8	10/8/02	4.08	4.86	3.36					<3	North Branch	
WVPNB-16-A-1	0	UNT/Emory Run RM 0.8	7/9/02	5.84	5.84	3.59					3.6	North Branch	
WVPNB-16-A-1	0	UNT/Emory Run RM 0.8	8/6/02	3.95	3.95	3.77					<3	North Branch	
WVPNB-16-A-1	0	UNT/Emory Run RM 0.8	1/14/03	1.98	2.2	4.58					4	North Branch	
WVPNB-16-A-1	0	UNT/Emory Run RM 0.8	11/20/02	1.61	2.43	4.79					14	North Branch	
WVPNB-16-A-1	0	UNT/Emory Run RM 0.8	11/13/02	1.01	1.37	4.87					9	North Branch	
WVPNB-16-A-1	0	UNT/Emory Run RM 0.8	2/11/03	0.3	2.6	5.69					14	North Branch	
WVPNB-16-A-1	0	UNT/Emory Run RM 0.8	3/11/03	0.31	1.88	5.70					31.6	North Branch	
WVPNB-16-A-1	0	UNT/Emory Run RM 0.8	12/11/02	0.14	16.4	5.95					162	North Branch	
WVPNB-16-B.5	0	Glade Run	6/27/02	2.15	2.15	3.94					14	North Branch	
WVPNB-16-B.5	0	Glade Run	10/9/02	2.17	2.21	4.44					10	North Branch	
WVPNB-16-B.5	0	Glade Run	8/7/02	1.84	1.91	4.73					11.6	North Branch	
WVPNB-16-B.5	0	Glade Run	2/12/03	0.15	0.78	5.81					6	North Branch	

AnCode	Mile Point	Stream Name	Date	[illegible]	[illegible]	pH	[illegible]	[illegible]	[illegible]	[illegible]		TSS (mg/l)	Watershed	WVSCI
WVPNB-16-B.5-1	0	UNT/Glade Run RM 0.3	10/9/02	2.85	2.94	4.53						5	North Branch	
WVPNB-16-B.5-1	0	UNT/Glade Run RM 0.3	8/7/02	1.75	2.08	4.96						7.2	North Branch	
WVPNB-16-C	0.2	Laurel Run	10/9/02	8.94	8.94	4.57					<	3	North Branch	
WVPNB-16-C	0.2	Laurel Run	6/27/02	8.23	9	4.59						5.6	North Branch	
WVPNB-16-C	0.2	Laurel Run	8/7/02	6.11	6.52	4.73						6	North Branch	
WVPNB-16-C	0.2	Laurel Run	2/13/03	3.26	5.84	4.81						13	North Branch	
WVPNB-16-C	0.2	Laurel Run	12/12/02	3.62	4.97	4.84						8	North Branch	
WVPNB-16-C	0.2	Laurel Run	4/16/03	2.72	4.51	4.85						14	North Branch	
WVPNB-16-C	0.2	Laurel Run	11/20/02	2.14	2.32	4.98						4	North Branch	
WVPNB-16-C	0.2	Laurel Run	3/12/03	3.6	5.01	4.98						12.8	North Branch	
WVPNB-16-C	0.2	Laurel Run	1/14/03	2.8	3.81	5.03						8	North Branch	
WVPNB-16-C	0.2	Laurel Run	5/8/03	1.69	4.3	5.03						18	North Branch	
WVPNB-16-C	0.2	Laurel Run	11/13/02	1.1	2.18	5.07						16	North Branch	
WVPNB-16-C	0.2	Laurel Run	11/20/02	2.21	2.41						<	3	North Branch	
WVPNB-16-C.4	0	UNT/Abrams Creek RM 13.6	4/16/03	6.26	8.01	4.84						5.6	North Branch	
WVPNB-16-C.4	0	UNT/Abrams Creek RM 13.6	1/14/03	2.13	4.85	5.04						18	North Branch	
WVPNB-16-C.4	0	UNT/Abrams Creek RM 13.6	7/10/02	3.21	6.63	5.28						21.6	North Branch	
WVPNB-16-C.4	0	UNT/Abrams Creek RM 13.6	8/7/02	0.5	3.38	5.85						14.8	North Branch	
WVPNB-16-C.4	0	UNT/Abrams Creek RM 13.6	11/20/02	0.1	2.2	6.31						8	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	10/10/02	23.7	24.3	2.99						4	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	8/12/02	34.3	34.3	3.23					<	3	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	7/11/02	19.8	19.8	3.41						3.6	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	1/15/03	17.2	17.2	3.52						10	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	4/17/03	25.4	25.4	3.54						5	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	3/13/03	10.9	10.9	3.89						9.2	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	12/10/02	14.1	14.1	3.89						6	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	2/12/03	12.2	12.6	4.02						6	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	11/11/02	6.94	6.94	4.13						4	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	5/8/03	5.18	5.45	4.41						9	North Branch	
WVPNB-16-D	0	Little Creek	4/14/03	1.91	2.19	4.68						6	North Branch	
WVPNB-16-D	0	Little Creek	11/21/02	1.99	1.99	4.85						4	North Branch	
WVPNB-16-D	0	Little Creek	11/11/02	1.54	1.54	4.85					<	3	North Branch	
WVPNB-16-D	0	Little Creek	1/15/03	1.7	1.75	5.05						6	North Branch	
WVPNB-16-D	0	Little Creek	3/10/03	1.6	1.87	5.08						6	North Branch	
WVPNB-16-D	0	Little Creek	12/10/02	1.33	1.53	5.17						3	North Branch	
WVPNB-16-D	0	Little Creek	2/12/03	1.02	1.22	5.17						4	North Branch	
WVPNB-17	6.9	Stony River	8/13/97	0.147	0.05	7.90							North Branch	77.5
WVPNB-19	0.5	Buffalo Creek	8/12/02	0.11	0.33	7.32						10	North Branch	
WVPNB-19-0.5A	0	UNT/Buffalo Creek RM 0.6	11/18/02	0.18	0.63	7.72						4	North Branch	
WVPNB-19-0.5A	0	UNT/Buffalo Creek RM 0.6	12/10/02	0.21	0.34	8.16						3	North Branch	
WVPNB-19-0.5A	0	UNT/Buffalo Creek RM 0.6	2/10/03	0.41	0.66	8.22						4	North Branch	
WVPNB-19-0.5A	0	UNT/Buffalo Creek RM 0.6	10/10/02	0.14	0.21	8.44						6	North Branch	
WVPNB-19-0.5A	0	UNT/Buffalo Creek RM 0.6	3/10/03	1.52	1.97	8.61						5.6	North Branch	

AN Code	Mile Point	Stream Name	Date	Dis Al mg/l	Tot Al mg/l	pH		Fecal (#/...)		Total Mg (mg/L)		TSS mg/L	Watershed	WVSCI
WVPNB-19-0.5A	0	UNT/Buffalo Creek RM 0.6	8/7/02	0.23	0.38	8.62						3.6	North Branch	
WVPNB-19-0.5A	0	UNT/Buffalo Creek RM 0.6	5/7/03	0.33	0.49	8.63					<	3	North Branch	
WVPNB-19-0.5A	0	UNT/Buffalo Creek RM 0.6	4/14/03	0.96	1.18	8.76					<	3	North Branch	
WVPNB-19-0.5A	0	UNT/Buffalo Creek RM 0.6	1/13/03	0.3	0.36	8.95					<	3	North Branch	
WVPNB-19-A	0	Little Buffalo Creek	10/10/02	4.64	6.61	4.54						14	North Branch	
WVPNB-19-A	0	Little Buffalo Creek	12/10/02	0.14	1.12	5.52						6	North Branch	
WVPNB-19-A	0	Little Buffalo Creek	11/11/02	0.62	0.86	6.13						7	North Branch	
WVPNB-19-A	0.6	Little Buffalo Creek	4/14/03	0.33	0.49	7.16						10	North Branch	
WVPNB-19-A-1	0	UNT/Little Buffalo Creek RM 0.6	7/8/02	416	422	2.55						7.6	North Branch	
WVPNB-22-A	0	Elk Run	11/12/02	0.09	0.82	6.78						28	North Branch	

Division of Water and Waste Management
414 Summers Street, Second Floor
Charleston, WV 25301
Telephone Number: (304) 558-2107
Fax Number: (304) 558-5905

West Virginia Department of Environmental Protection

Bob Wise
Governor

Stephanie R. Timmermeyer
Cabinet Secretary

September 24, 2004

Via Electronic Submittal and U. S. Mail
Dr. Edward Snyder, Chairman
Environmental Quality Board
Suite 301
1615 Washington Street, East
Charleston, WV 25311-2126

RE: Comments on proposed temporary suspension of chronic aluminum criterion

Dear Dr. Snyder:

This correspondence is offered in response to the Environmental Quality Board's (EQB) request for comments on its proposed aluminum criteria revisions within 46 CSR 1. The Department of Environmental Protection (DEP) has already supplied the EQB with considerable information on this topic and supports the proposed temporary suspension of the warm water fishery chronic aluminum criteria pending studies to determine an appropriate criterion.

The DEP would like to offer both general comments as well as comments in response to your specific request for information on the impact of the proposed criteria suspension on 303(d) listing and TMDL development.

General comments.

The DEP presented information to the EQB at two separate meetings reflecting that both the DEP and DNR have found healthy aquatic communities in warm water streams that routinely violate the current chronic aluminum criterion. Based on that information, the DEP supports the proposed temporary suspension of the chronic criteria to allow an opportunity to conduct studies, hopefully with the assistance or participation of the United States Environmental Protection Agency (EPA) and other interested parties, to develop an appropriate chronic criteria for West Virginia. Such studies need to be designed and initiated such that they could be completed prior to the next triennial review in 2007.

The DEP does not, however, support a suspension of the chronic criteria without a commitment to undertake appropriate studies. The DEP recognizes the Board's reference to studies in its "Statement of Circumstances Requiring Proposed Amendments," but is concerned that footnote *e*, as currently drafted, does not mention that the criteria is being suspended to allow time for these studies. Study of aluminum to determine the most appropriate chronic criteria for West Virginia is a critical component of the EQB's action, and should be reflected in footnote *e* to insure that EPA and the public are fully aware of West Virginia's planned path forward without need to refer to any document other than 46 CSR 1.

The DEP also recognizes that footnote *e* proposes to adopt 750 ug/l as the chronic as well as acute criterion until a new chronic criterion is developed (or until July 4 2004). The DEP suggests that if the EQB decides to adopt a 750 ug/l chronic value, equivalent to the acute value, during the period the 87 ug/l value is temporarily suspended, that it consider offering a specific basis to support this action. DEP does not support establishing a permanent chronic criteria for all waters without the studies referred to above, but suggests that the Board offer support for these temporary steps in working toward an appropriate chronic aluminum criteria to insure that EPA has sufficient understanding of and basis for approving this proposal.

Finally, questions were raised during the Board's meetings regarding how this temporary action might impact NPDES permits. If approved by EPA, the DEP would implement the 750 ug/l criterion in permits impacting warm water streams, but not the 87 ug/l criterion. However, the DEP would continue to require detection levels sufficient to track "compliance" with the 87 ug/l value, and would not hesitate to follow up if it observed any adverse in-stream conditions thought to be related to aluminum, including the imposition of more stringent permit limits. In addition, the DEP would continue to impose "report only" requirements in permits where appropriate.

The DEP is supportive of the Board's proposal relating to aluminum, and notes that even with a temporary suspension of the chronic criteria, West Virginia will be regulating aluminum discharges based on more stringent regulations than other Region III jurisdictions, including Maryland, Virginia, and the District of Columbia.

Specific comments.

The Board included in its notice of public comment a specific request for comment on how the lack of the 87 ug/l chronic aluminum criterion would affect those waters listed as impaired on the 303(d) list prior to the effective date of the suspension. In response, the DEP offers the following information.

The 2004 "Integrated Report", including the 303(d) list, has already been submitted to the EPA for approval. The report development process was extensive and was based on the currently approved chronic and acute aluminum criteria. With the submittal of the report to EPA in August, the 2004 303(d) process is complete pending EPA's final approval. EPA's approval is expected to occur early this fall, which will most likely be in advance of any formal action on the proposed criteria revision. As such, any change in the criteria could be reflected in the 2006 report, provided the criteria suspension receives EPA approval. DEP expects to begin data compilation and evaluation for the 2006 report in the summer of 2005.

The streams on the 2004 list for aluminum would remain until re-evaluated in 2006 listing process. DEP, in accordance with TMDL Stakeholder Committee recommendations, has not and does not intend to make mid-cycle listing changes. However, if the suspension becomes effective, DEP would not pursue TMDL development for streams listed solely based on the suspended criteria.

I appreciate this opportunity to comment on the EQB's proposed action. The DEP looks forward to working with you as this proposal is carried forward, including participation in the Board's study efforts. We understand that the Board intends to file this proposed amendment as an emergency rule. Should you have any questions regarding this matter, or if we can be of further assistance, please contact me at 926-0495.

Respectfully,

Allyn G. Turner
Director
Division of Water and Waste Management

Cc: Stephanie R. Timmermeyer, Cabinet Secretary
Joe Parker, Acting Director, Division of Mining and Reclamation
Bill Brannon, Deputy Director, DWWM
Lewis Halstead, DMR
Patrick Campbell, DWWM
Randolph Sovic, DWWM
Ken Politan, DMR

West Virginia Environmental Council
1324 Virginia Street East ~ Charleston, WV 25301
(304) 346-5905 www.wvecouncil.org

September 24, 2004

Dr. Edward M. Snyder, Chair
West Virginia Environmental Quality Board
1615 Washington Street East, Suite 301
Charleston, West Virginia 25311-2126
Email: clerk@wvaqbeqb.org

RE: Comments on revisions to the West Virginia aluminum criterion

Dear Dr. Snyder:

The West Virginia Environmental Council remains strongly opposed to the proposal to suspend the current chronic standard for aluminum of 87 ug/liter in warm water streams, and replace it with a 750 ug/liter standard..

We believe that lowering the standard for dissolved aluminum WILL have a negative impact on the fish species in these streams, as indicated and documented in the June 23rd letter to the Board submitted by Dr. Margaret Janes and the Appalachian Center for the Economy and the Environment, to which we are a signatory.

The ultimate result of lowering the standard will be a negative impact on both the existing and designated uses of these streams. Clearly that is not the intent of the federal Clean Water Act, and clearly West Virginian citizens are better served by the current, more protective standard.

The West Virginia Environmental Council strongly opposes both the filing of this weakened water quality standard as an Emergency Rule and as an "Agency Approved" legislative rule.

Thank you for the opportunity to provide these comments.

Donald S. Garvin, Jr.
WVEC Legislative Coordinator
PO Box 666
Buckhannon, WV 26201
(304) 472-8716
DSGJR@aol.com

Representing West Virginia "Special Interests":
Folks Who Want to Breathe Clean Air and Drink Clean Water

RESPONSES TO COMMENTS and EXPLANATION OF PROPOSED AMENDMENTS
46 CSR 1
Requirements Governing Water Quality Standards
September 29, 2004

This document describes a change proposed to the Water Quality Standards legislative rule. To explain the change, the following are provided: a description of the existing rule; the amendment proposed by the Board in its Notice of Public Hearing filed on August 11, 2004; a summary of the comments received on the proposed amendment at the public hearing and throughout the public comment period, the Board's response to the comments and the final action taken by the Board on the proposed amendment.

This proposed aluminum revision was completed in response to a directive established in HB 4193 which was passed by the West Virginia Legislature in the 2004 session. That bill directed the Board to revise the aquatic life criteria for aluminum by October 1, 2004, and to do so in cooperation with the West Virginia Department of Environmental Protection and the regulated community in the state. In responding to the directive, the Board held a preliminary comment period and provided opportunity for discussion of the aluminum criterion at its June 28th Board meeting. The Board heard presentations at that meeting from the Division of Water and Waste Management of the DEP, members of the regulated community and members of the environmental community. The Board again considered the matter at its meeting held on July 22 and 23, 2004.

During the discussions on this matter the West Virginia Department of Environmental Protection suggested the need for studies in state streams to fully evaluate the impacts of the proposed revision to the aluminum criterion – and to ensure that the revision proposed herein will be fully protective of aquatic life. Other interested parties agreed with this suggestion by the agency. Although the particulars of the study, and details of how it will be sponsored have not been decided, the Board also agrees with the agency that it is important, and considers it to be one of the supporting bases for the proposal to establish 750 ug/liter as the interim chronic aluminum criteria for warmwater fishery streams.

APPENDIX E, TABLE 1

This Table includes numeric criteria applicable to designated use categories.

Proposed Change

Section 8.1 – Dissolved Aluminum. The Board proposes to revise the numeric criterion for aluminum in Table 1 by adding a footnote [(e)] in three places: once, after the words "Not to exceed" in the text of section 8.1 under the "PARAMETER" column and once after each of the values "87xCF[5]" which occur in section 8.1 in both of the columns labeled "CHRON" under the headings "B1, B4" and "B2" which are under the

"AQUATIC LIFE" Use Designation columns. The text of the footnote, which will be placed at the end list of footnotes at the end of Table 1, will read:

> "e The current chronic aluminum standard of 87 ug/liter will be suspended in all but trout waters until July 4, 2007. During the period of the suspension, the acute and chronic aquatic life values for aluminum are 750 ug/liter."

Comments Received and Board Responses

1. A set of comments filed jointly by several groups identified as the Industry Groups expressed support for the Board's proposed revision to suspend the 87 ug/liter value on all streams but trout steams, a suspension, which they note, will allow interested parties to perform a study to prepare an appropriate chronic aquatic life criterion for West Virginia waters. These commenters prepared a draft rationale of the Board's proposed revision. This document provided a history of the aluminum criteria in West Virginia.

One of the primary concerns identified by these commenters is the weakness of the USEPA's recommended 87 ug/l chronic aquatic life value. Commenters maintain that in setting the chronic aquatic life aluminum value at 87 ug/liter, USEPA failed to follow its own "Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and their USES (1985) which serve as the agency's guidelines for setting aquatic life criteria. They maintain that the data relied upon by USEPA to justify the current chronic aluminum criterion of 87 ug/l is inadequate; and that if they had followed their guidelines correctly, that the chronic value would have been equal to the acute criterion of 750 ug/liter. Commenters outline inconsistencies with the studies relied upon by USEPA to derive their 87 ug/liter value (one study on brook trout and one on striped bass) including quality assurance and quality control deficiencies, internal inconsistencies such as higher mortality of fish at lower aluminum concentrations; and reports in both studies indicating that concentrations of aluminum higher than 87 ug/liter did not cause mortality.

These commenters also included a review of recent scientific literature on aluminum toxicity. One conclusion outlined at the end of this review is that all available data indicates that bioavailable forms of aluminum at low pH can be toxic; however, aluminum is generally not going to be present in a toxic or bioavailable form in waters that are not violating the State's water quality standards for pH.

While these groups made strong arguments against the scientific validity of the 87 ug/liter chronic value, they did, however, indicate support for retaining the 87 ug/l value in trout streams. This support is based on their recognition of the sensitive nature of these streams and noting that further study and development of an alternate number is intended to be conducted.

Several commenters also included a review of aluminum criteria from other states, indicating that only 5 states have adopted USEPAs recommended chronic and acute criteria as total aluminum concentrations. Four other states, including WV, have adopted those criteria as dissolved concentrations. Commenters noted that USEPA's recommended acute aquatic life value of 750 ug/liter value has been adopted as both the acute and chronic value aquatic life criteria by the state of Pennsylvania, and approved by Region 3 USEPA in that state.

BOARD RESPONSE

The Board acknowledges the commenters concerns and agrees that the issues raised regarding the validity of USEPA's recommended chronic aquatic life criterion of 87 ug/liter must be addressed. We are also concerned about the fact that a number of states surrounding West Virginia have not adopted aluminum criteria or have adopted criteria less protective that our current numbers. We support the proposal of a statewide study to determine potential impacts of aluminum to aquatic life.

2. Several commenters suggested that the language of the proposed footnote should be revised to mention the study on which the Board's decision to suspend the criterion is based.

BOARD RESPONSE

The Board agrees with these commenters.

3. In support of the Board's proposed revision, a commenter indicated that the WV DEP Division of Water has stated that the 87 microgram per liter chronic criteria for aluminum is overprotective and needs to be changed. He stated that we all have limited resources and need to expend them in an efficient manner.

The Industry Groups also commented that WVDEP's draft 2004 303(d) List of the states impaired streams (compiled to comply with federal Clean Water Act requirements) includes 166 waters that are considered impaired based on the chronic aluminum criterion of 87 ug/l. The commenters maintain that many of these listed streams – North Fork of the Cherry River, Cranberry River, Williams River, Cacapon River, Cheat River, Greenbrier River and Opequon River - have thriving aquatic communities and have no physical signs of impairment.

BOARD RESPONSE

The Board agrees with these concerns. In particular, the Board is persuaded by the information submitted during the preliminary comment period which indicates that a number of good quality streams in the state have been placed on the 303(d) list based on violations for the 87 ug/liter criterion. This, and other information presented by WVDEP during the Board's deliberations on this matter, which is attached to this document as **Attachments A and B**, indicate to us that the 87 ug/liter value may be overprotective of aquatic life in the state.

4. One commenter expressed concern that the Statement of Circumstances document filed with the rule did not include a scientific basis for the Boards proposed revision. This commenter and others suggested that a thorough scientific justification document be prepared for submission to USEPA one the rule is finalized. This commenter also requested that the Board forward the emergency rule package directly to USEPA for immediate consideration.

The Industry Groups included with their comments a revised Statement of Circumstances document, which contains a greater description of the science that has been presented to the Board describing the reasons that the chronic criterion of 87 ug/liter is invalid. They also included a document entitled "WV ALUMINUM CRITERIA Draft Rationale Document for Proposed Amendments – September 24, 2004" which provides that group's scientific justification for the Board's proposed revisions. Those commenters offered these documents for the Board's review and adoption.

BOARD RESPONSE

The Board agrees with the commenters and adopts the two documents outlined above for submission to the West Virginia Legislature and the US Environmental Protection Agency with the rule. The Rationale Document submitted by the Industry Groups is attached to this document as **Attachment C**.

5. Commenters presented reviews of aluminum criteria effective in other states based both on total and dissolved concentrations. They indicated that in Region 3, Maryland, Virginia and the District of Columbia have not adopted aluminum criteria, and that their Water Quality Standards rules have been approved by USEPA. This commenter also addressed other commenters concerns about human intake of aluminum, indicating that humans consume about 50 milligrams of aluminum a day from a number of, including bread and baking powder, water treated by using alum and other sources.

BOARD RESPONSE

The Board agrees with the commenters concerns regarding the aluminum criteria in other states.

6. Use of the term "suspension". Several commenters suggest that by drafting the footnote to state that 750 ug/liter will serve as the chronic value in trout streams during the period of suspension, that the Board in fact has adopted an interim criterion of 750 ug/liter value rather than suspend the 87 ug/liter value. To correct this, they suggest that the footnote be reworded to indicate that its action is a temporary modification, not a suspension.

In addition, these commenters expressed concern that the footnote revising the rule does not include a reference to the proposed scientific study to develop appropriate aluminum criteria for West Virginia. These comments include revised language of the footnote which provides:

> Until July 4, 2007, the aluminum criteria will be implemented as follows: the chronic aluminum criterion shall be 87 ug/l for trout waters (as defined in section 2.20 of this rule) and shall be 750 ug.l for all other waters of the State. The implementation of the interim criteria provides time for a study to develop aluminum criteria for waters of the State which are based upon sound science and are protective of aquatic life.

BOARD RESPONSE

The Board finds merit in these concerns and agrees with the rewording of the footnote offered by the commenter.

7. Citing language from 40 CFR 131.11(a), a number of commenters from the environmental community who filed joint comments expressing concern about the proposal, urged the Board to fulfill its obligation under Section 303 of the federal Clean Water Act, to "adopt those water quality criteria that protect the designated use. Such criteria must be based on sound scientific rationale and must contain sufficient parameters or constituents to protect the designated use. For waters with multiple use designations, the criteria shall support the most sensitive use." These commenters maintain that the Board's proposal to suspend the 87 ug/l chronic criterion in all but trout waters is not supported by science.

These commenters provided a brief history of consideration of the aluminum criteria as follows:

- In 1998, USEPA disapproved a revision to the aluminum criterion proposed by the Board and adopted by the WV Legislature. That revision deleted the 87 ug/liter value for chronic protection of aquatic life.
- In response to the disapproval by USEPA, the Board reconsidered the aquatic life aluminum criteria and proposed readoption of the 87 ug/liter value and a provision allowing the aluminum criteria to be measured based on dissolved, rather than total concentrations.
- This provision was passed by the West Virginia Legislature, without challenge by the regulated community; and in April of 2003, was approved by USEPA.

These commenters maintain that eliminating the chronic criterion is not an option that complies with the Board's minimum legal requirements and the need to adopt conservative and protective criteria. In support of this position, these commenters describe the complex toxicology of aluminum to aquatic biota, toxicity which may be affected by, among other things, temperature, pH and levels of Ca, K, Mg, P, Si, Fl and dissolved organic matter. They indicate that generally, the sensitivity of fish to elevated levels of aluminum is significantly greater than that of macroinvertebrates, plants and algal forms, which runs counter to USEPA's "Ambient Water Quality Criteria for Aluminum – August, 1998" published by the USEPA Office of Water.

These commenters further urge adoption or maintenance of criteria protective enough for West Virginia's headwater streams, which are particularly vulnerable because they are impacted by acid precipitation and exhibit significant seasonal variations in pH. Another important concern expressed by these commenters is that the impacts of aluminum on the numbers and diversity of fish and other aquatic species in West Virginia have not been adequately characterize, or in most cases characterized at all.

Other commenters expressed concern about the proposed revision, citing data and information indicating that the 750 ug/liter value would not provide adequate protection of aquatic life, particularly fish species, in state waters.

BOARD RESPONSE

The Board acknowledges the concerns of these commenters and believes further study of aluminum impacts is warranted. However, in the interim, we are also persuaded that 750 ug/liter value based on dissolved concentrations will provide adequate protection to aquatic life in warmwater fishery streams. Data submitted by the Industry Groups and by WVDEP provide support for this position.

8. A commenter expressed concern about, and questioned the Board's reason for, making the aluminum criterion less stringent. He cited information indicating that aluminum is harmful to all life forms and that it damages all types of tissue. It is a protoplasmic poison and a persistent neurotoxin, which has a tendency to accumulate in the brain and the bones. It is common in our environment, but no living systems use aluminum as part of a biochemical process. The commenter suggested that to protect humans from its impacts, avoidance of ingestion, blocking its uptake with supplements and eliminating it from human systems through intake of certain foods are most effective.

BOARD RESPONSE

The Board acknowledges this commenters concerns but finds that the matters raised in these comments address human health impacts from aluminum, which is not the focus of the Board's review.

9. One commenter expressed concern that the Board cannot fully understand the implications of their suspension of the chronic aluminum standard, which will allow the dissolved aluminum levels to increase 862% higher than the currently applicable standard. The commenter indicated that two-hour laboratory tests could easily demonstrate that at just a 19% increase from the current standard, plant roots will show adverse and measurable growth inhibition and physiological impairment in two hours. Commenter expressed concern that no scientific basis has been provided for distinguishing between trout and non-trout streams for the application of the more protective criterion. The commenter also indicated that inorganic aluminum can serve to precipitate particulates and phosphate ions, but that it will also remove living microbes from streams - some of which will be beneficial microbes. The commenter also urged the Board and the DEP to consider that the rule will facilitate increased metal discharges

from mountaintop mining sites in half of the state – and the full impacts of those increased discharges over time. Commenter also indicated that experts are recognizing that all long-term projections – on all topics – have been incorrect, therefore warranting caution in revisions to the rule that may reduce water quality.

BOARD RESPONSE

The Board acknowledges these comments and appreciates the broad range of concerns addressed by the commenter. It is our intention that the proposed study will answer at least some of the questions he has raised, and that additional revisions made at the end of this study period will address some of these concerns.

10. In addition to providing an opportunity for comments on the proposal generally, the Board solicited comments two matters which are outlined below, along with the comments received on them.

- How will the use of the 750 ug/liter numeric criterion, measured based on dissolved concentrations rather than total concentrations, ensure the protection of warm water fishery streams?
    - Comments from the Industry Groups referred to work they had submitted to the Board in 1999 by Robert Gensemer, which they believe demonstrates use of dissolved concentrations is appropriate. The commenters also indicated that the state of Wyoming is considering a revision to their criterion from total to dissolved.

- How will the suspension of the 87 ug/liter value affect waters listed for aluminum on the Clean Water Act Section 303(d) list of impaired waters for West Virginia, which were finalized before the effective date of the suspension?
    - DEP's comments indicate that they will not change the 303(d) list based on the aluminum criterion change. Their letter provides: "The streams on the 2004 list for aluminum would remain until re-evaluated in the 2006 listing process. DEP, in accordance with TMDL Stakeholder Committee recommendations, has not and does not intend to make mid-cycle listing changes. However, if the suspension becomes effective, DEP would not pursue TMDL development for streams listed solely based on the suspended criteria."
    - The Industry Groups indicate that DEP has discretion in managing its list of impaired streams, and they defer to DEP's assessment on the issue. They note that many of these previously listed streams were also impaired for parameters other than aluminum, and therefore a TMDL must be prepared for these streams regardless of the aluminum criteria. The Board's current proposed action, however, would prevent healthy streams from being improperly listed for aluminum until appropriate aluminum criteria can be prepared.

BOARD ACTION ON THE PROPOSAL

The Board agrees to revise its proposed language, to be included as footnote "e" in Table 1 in the rule to read as follows:

> Until July 4, 2007, the aluminum criteria will be implemented as follows: the chronic aluminum criterion shall be 87 ug/l for trout waters (as defined in section 2.20 of this rule) and shall be 750 ug/l for all other waters of the State. The implementation of the interim criteria provides time for a study to develop aluminum criteria for waters of the State which are based upon sound science and are protective of aquatic life.

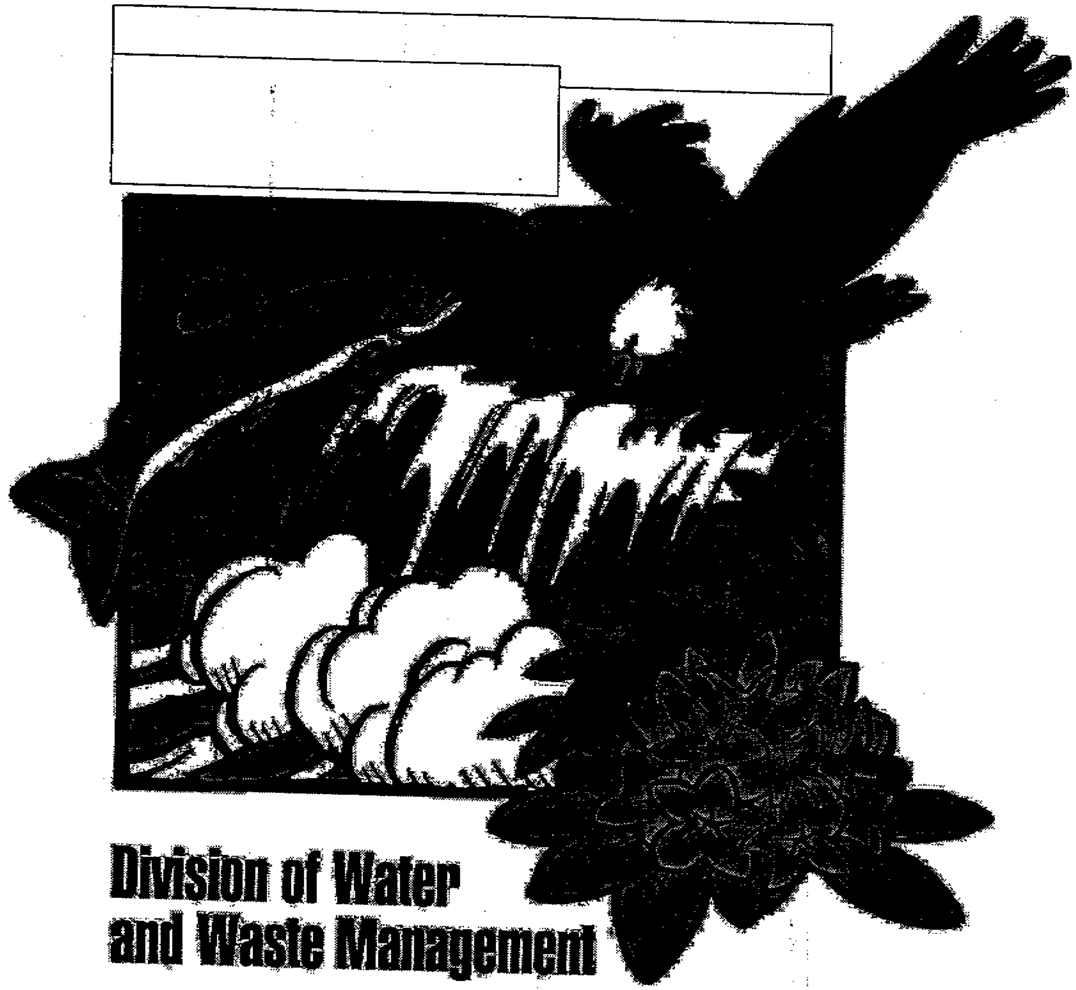
RESPONSE TO COMMENTS

ATTACHMENT "A"

WV DEP Aluminum Data

John Wirts – Watershed Branch

6/28/04



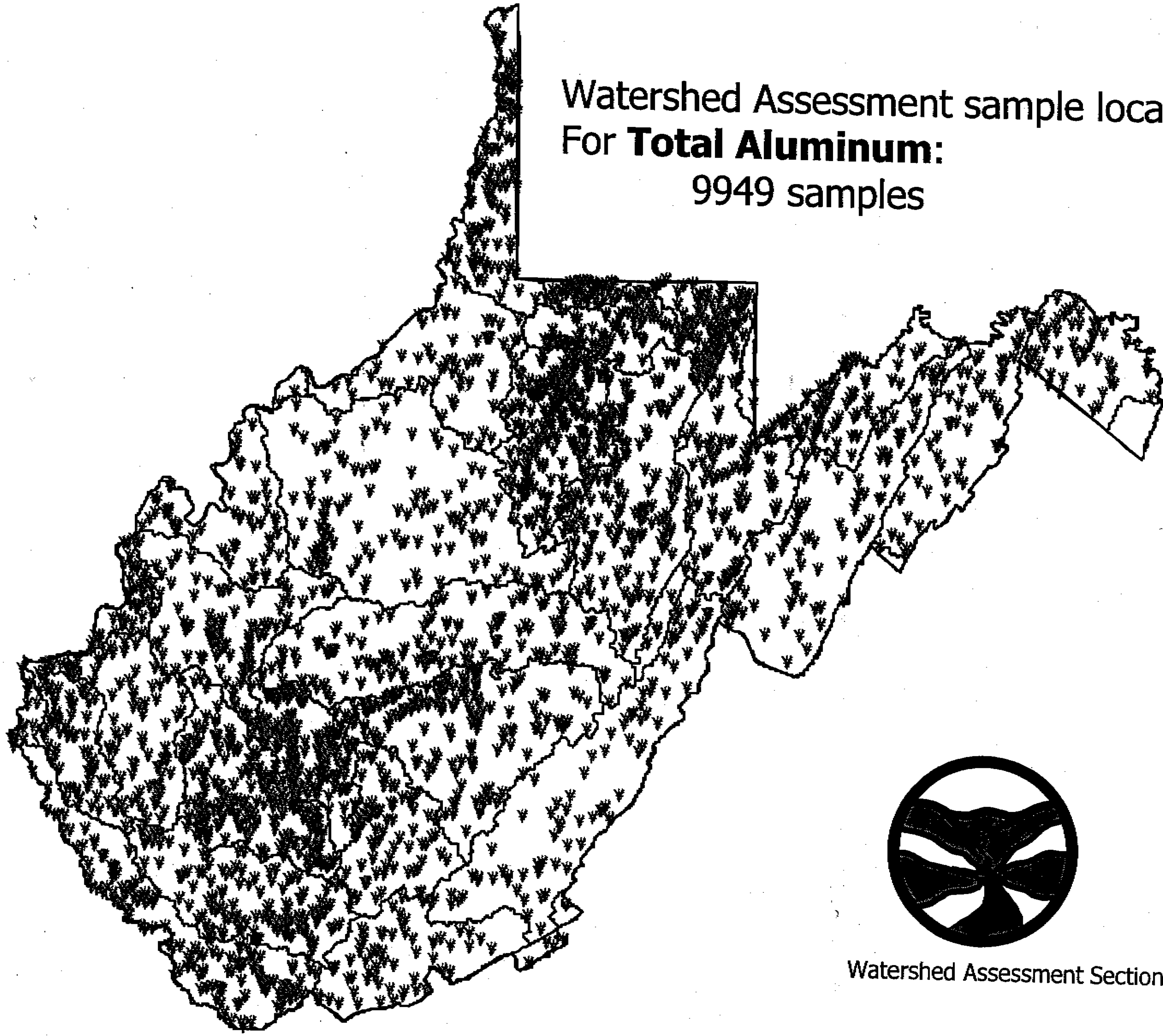
Watershed Branch Responsibilities:

- Statewide Monitoring Program
  - Ambient Monitoring of Major Rivers (25 sites quarterly)
  - Random Monitoring of Wadeable Streams (1^{st} - 4^{th} order; 150 sites annually)
- Watershed Specific Monitoring Program
  - General Water Quality Screening – Targeted (single visit)
  - Pre-TMDL Development Monitoring (monthly for one year)
- TMDL Development
- Support of other agency programs (ex. Permitting)
- Preparation of 305(b), 303(d) and Watershed Reports
- Fish Tissue Monitoring Program (multi-agency)

Aluminum data from DEP

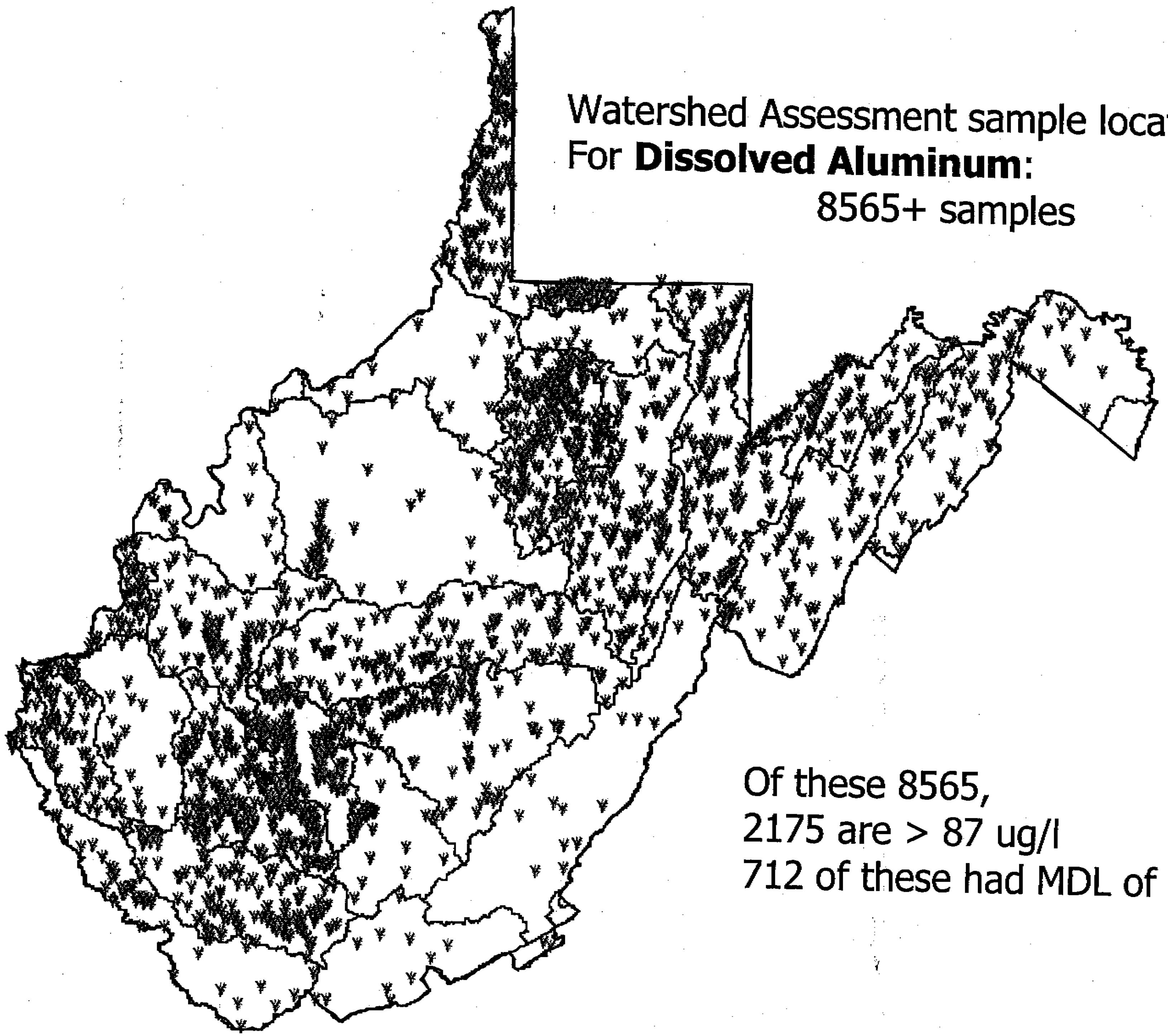
- DEP's Watershed Assessment data from Targeted, Probabilistic, and pre-TMDL development Efforts
- DEP's "Ambient" data from WV's largest streams
- DEP Mining & Reclamation – "Trend Data"

Watershed Assessment sample locations
For **Total Aluminum:**
9949 samples



Watershed Assessment Section

Watershed Assessment sample locations
For **Dissolved Aluminum**:
8565+ samples



Of these 8565,
2175 are > 87 ug/l
712 of these had MDL of <100

Ambient Monitoring Program

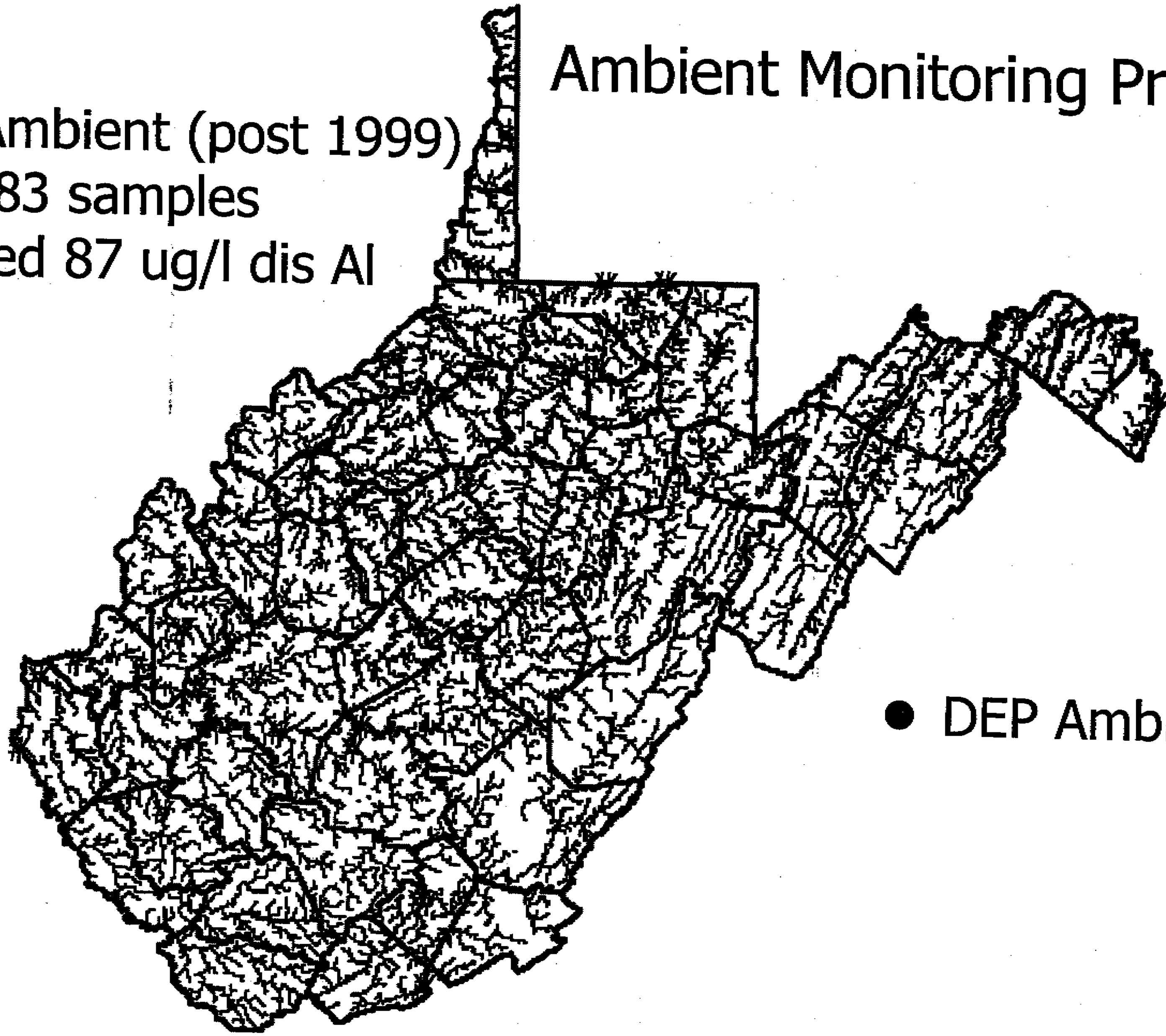
Currently 25 sites on the major rivers.

Quarterly samples for many parameters.

Long term data - many have been monitored for nearly 50 years.

Ambient Monitoring Program

DEP's Ambient (post 1999)
86 of 383 samples
exceeded 87 ug/l dis Al



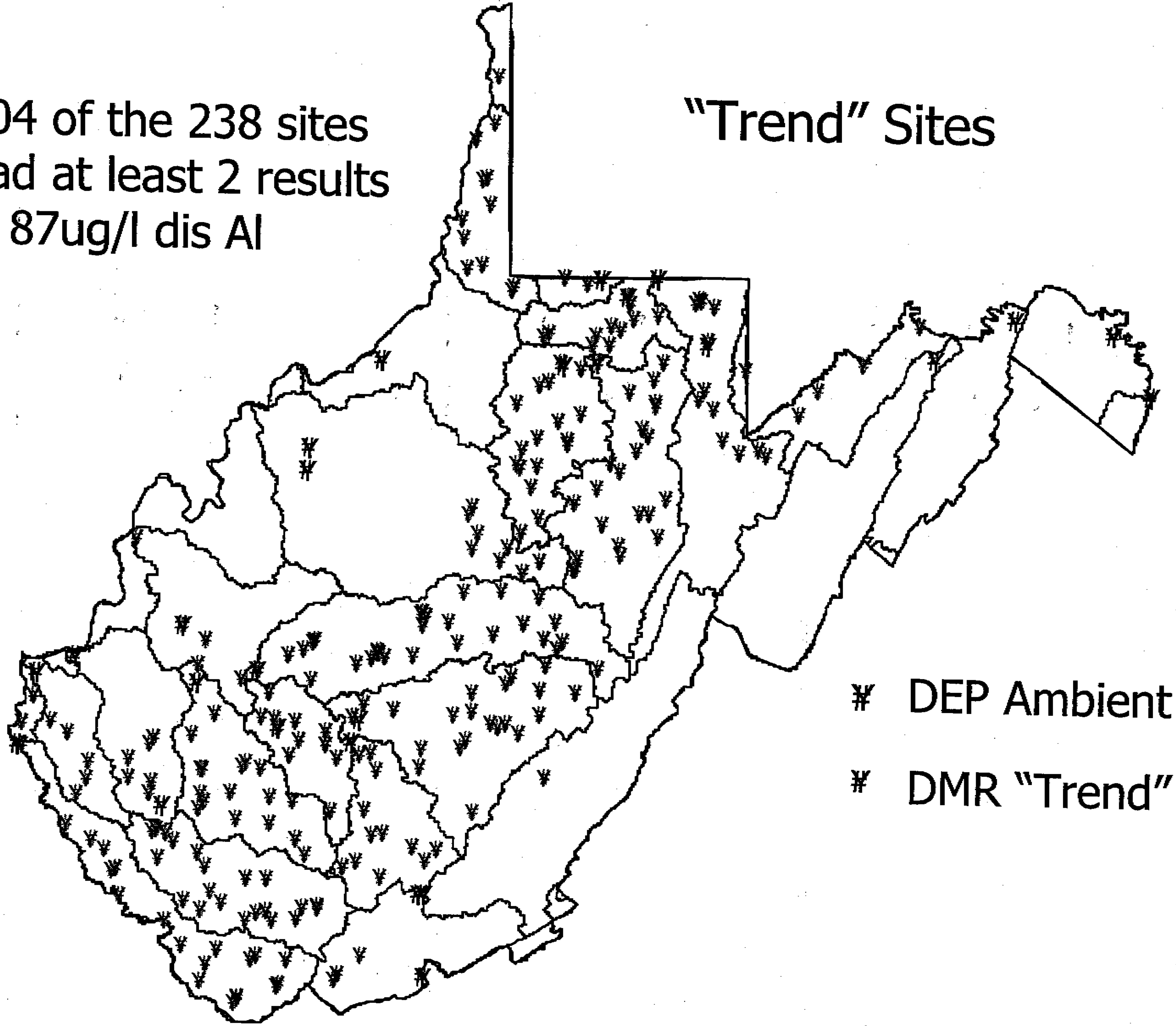
• DEP Ambient

OSM / DEP DMR Trend Station Data "CHIA baseline"

- Monthly sampling from 238 sites from coal producing areas
- 2 years of data (2004 303(d) considered only 1st 10 months)
- Bi-annual macroinvertebrate samples

"Trend" Sites

104 of the 238 sites had at least 2 results > 87ug/l dis Al

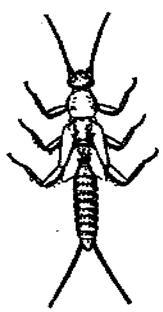


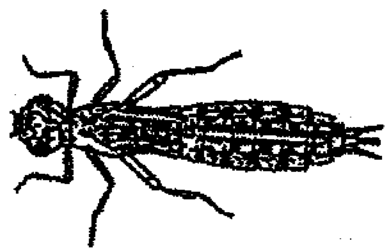
Supporting data available

There are TSS, pH, hardness, temp, etc.,

As well as benthic macroinvertebrate

data from many of these sites






WVSCI WV Stream Condition Index

Metrics calculated

Taxa richness

Total taxa
EPT taxa

Taxa composition

% EPT
% Chironomid
% 2 dominant taxa

Tolerance / Intolerance

HBI (family level)

WVSCI WV Stream Condition Index

Aggregating metrics into an index

- calculate values for the 6 metrics
- standardize scores to a 0-100 point scale
  use 95^{th} or 5^{th} percentile of all sites (n=1268) to determine standard (best value)
- average the 6 standardized scores (max of 100 for each metric) to get the index score.

WVSCI WV Stream Condition Index

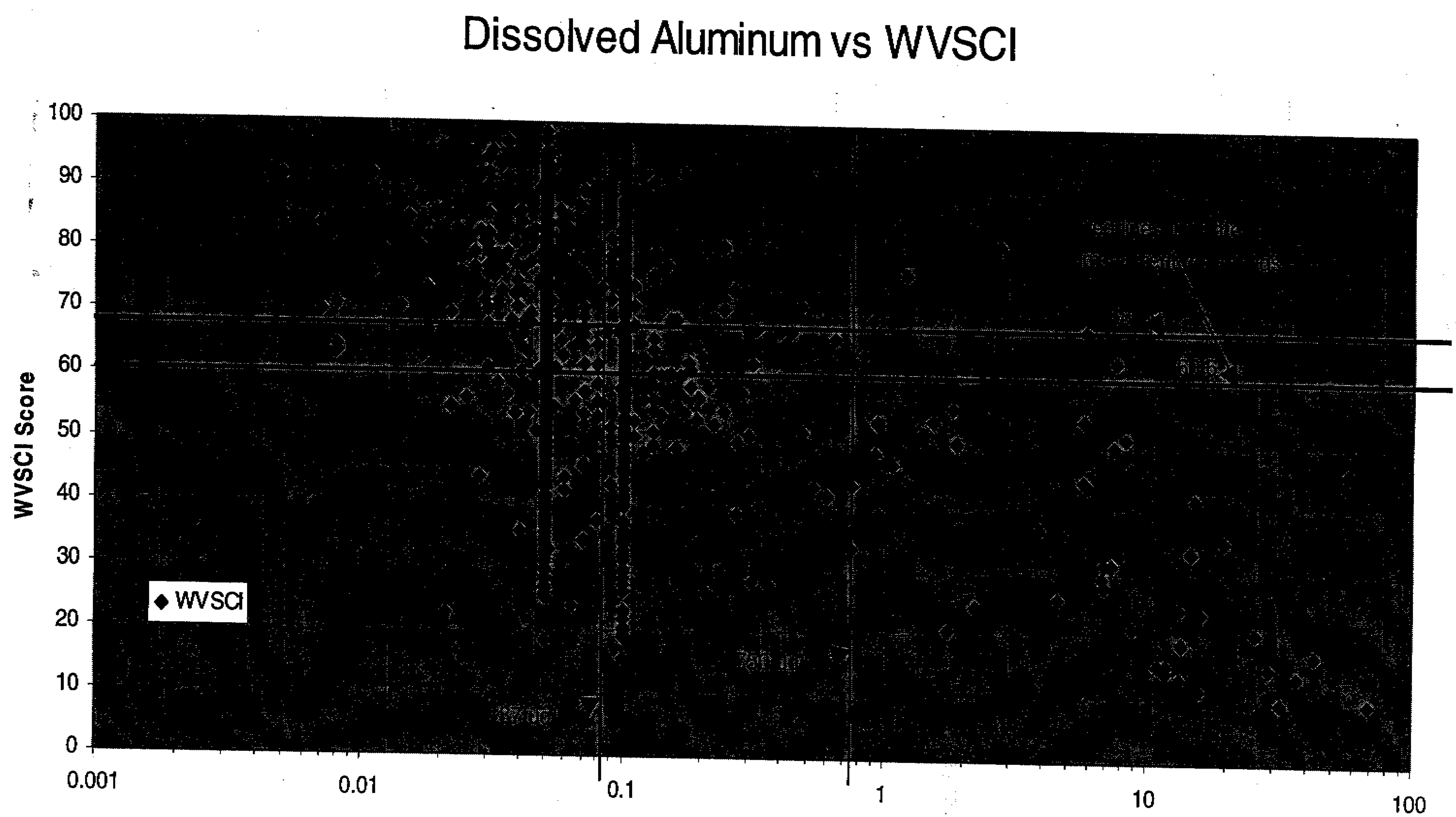
Determining Impairment Threshold

Used the distribution of reference site scores to determine thresholds

> 78 highly comparable to reference sites (above 25th percentile)

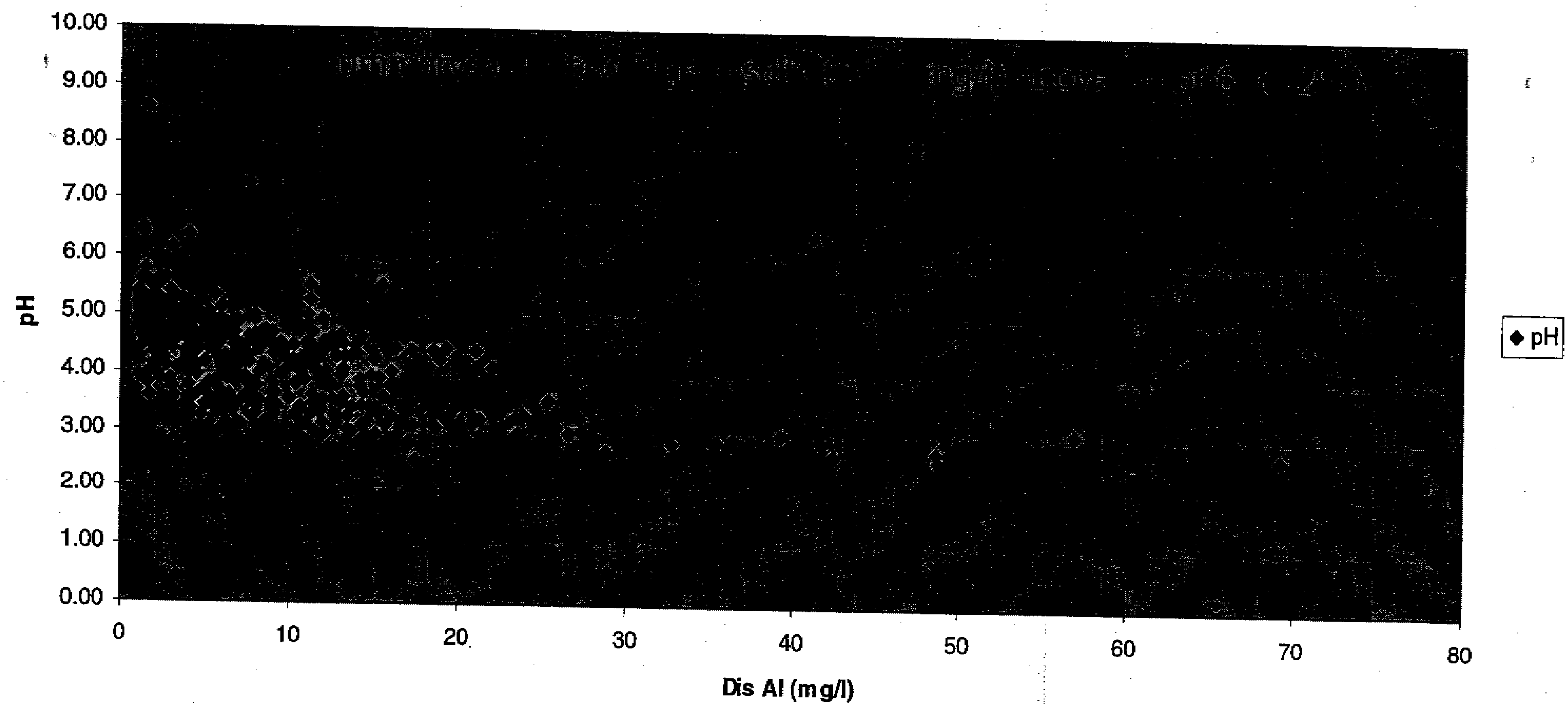
> 68 – 78 comparable to below-average ref sites (between 5th & 25th percentiles)

< 68 increasingly different from reference condition



Dissolved Aluminum vs WVSCI
WVSCI Score
100
90
80
70
60
50
40
30
20
10
0
0.001
0.01
0.1
1
10
100
◆ WVSCI

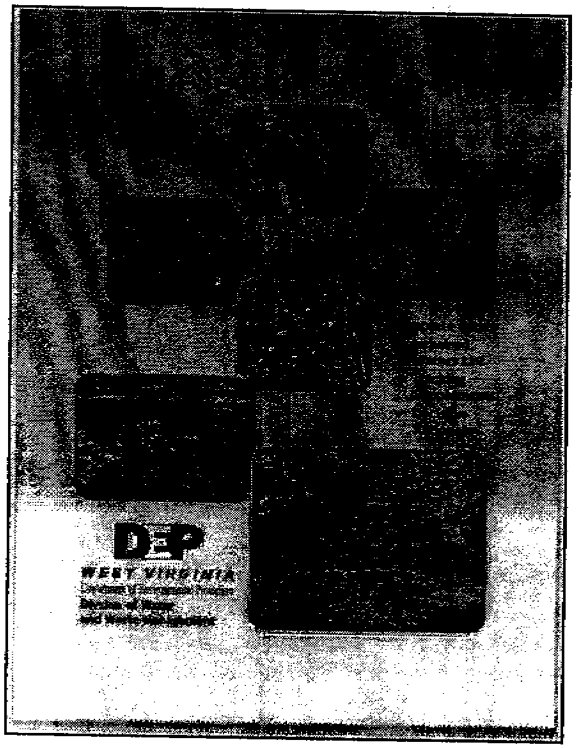
Dissolved Al (> 1.0 mg/l) vs pH



Summary of *Draft 2004 Section 303(d) List of Impaired Streams* Impacted by 87 ug/l Aluminum criteria.

~ 165 streams (~2100 miles) on draft 303(d) list

Noteworthy streams listed:



Greenbrier River
South Branch Potomac River
Elk River
Cacapon River
New River (Lower)
Birch River
Gauley River
Williams River
Cranberry River
Shenandoah River

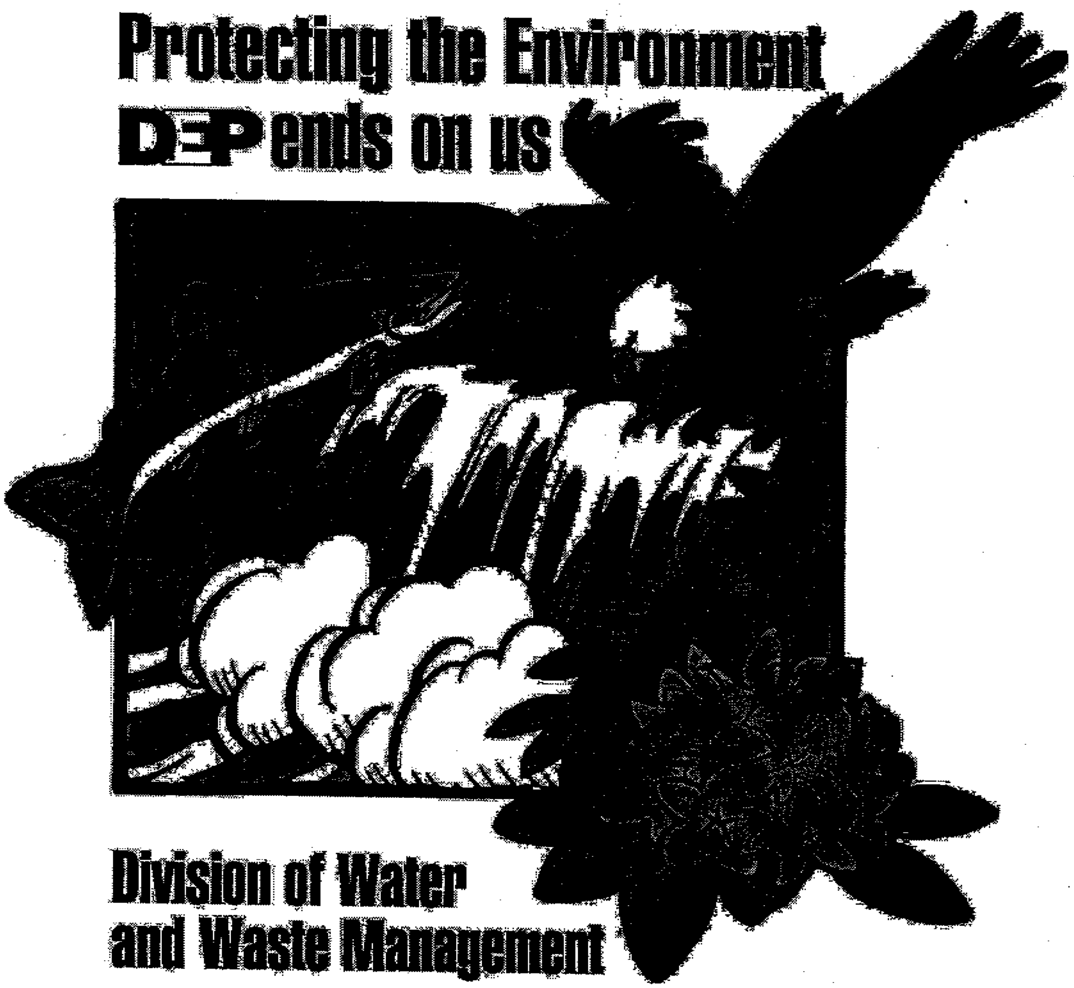
Conclusions

- Greater volume of data currently available from which to base decisions
- 87 ug/l for warmwater streams appears overprotective
- 87 ug/l for coldwater streams needs further evaluation
- Evaluation of pH / hardness associations needed
- Believe fishery data needs further analysis
- Dynamic criteria creates instability for all affected parties
- DWWM available for assistance

RESPONSE TO COMMENTS

ATTACHMENT "B"

WV DEP Aluminum Update



Patrick Campbell –
Watershed Branch

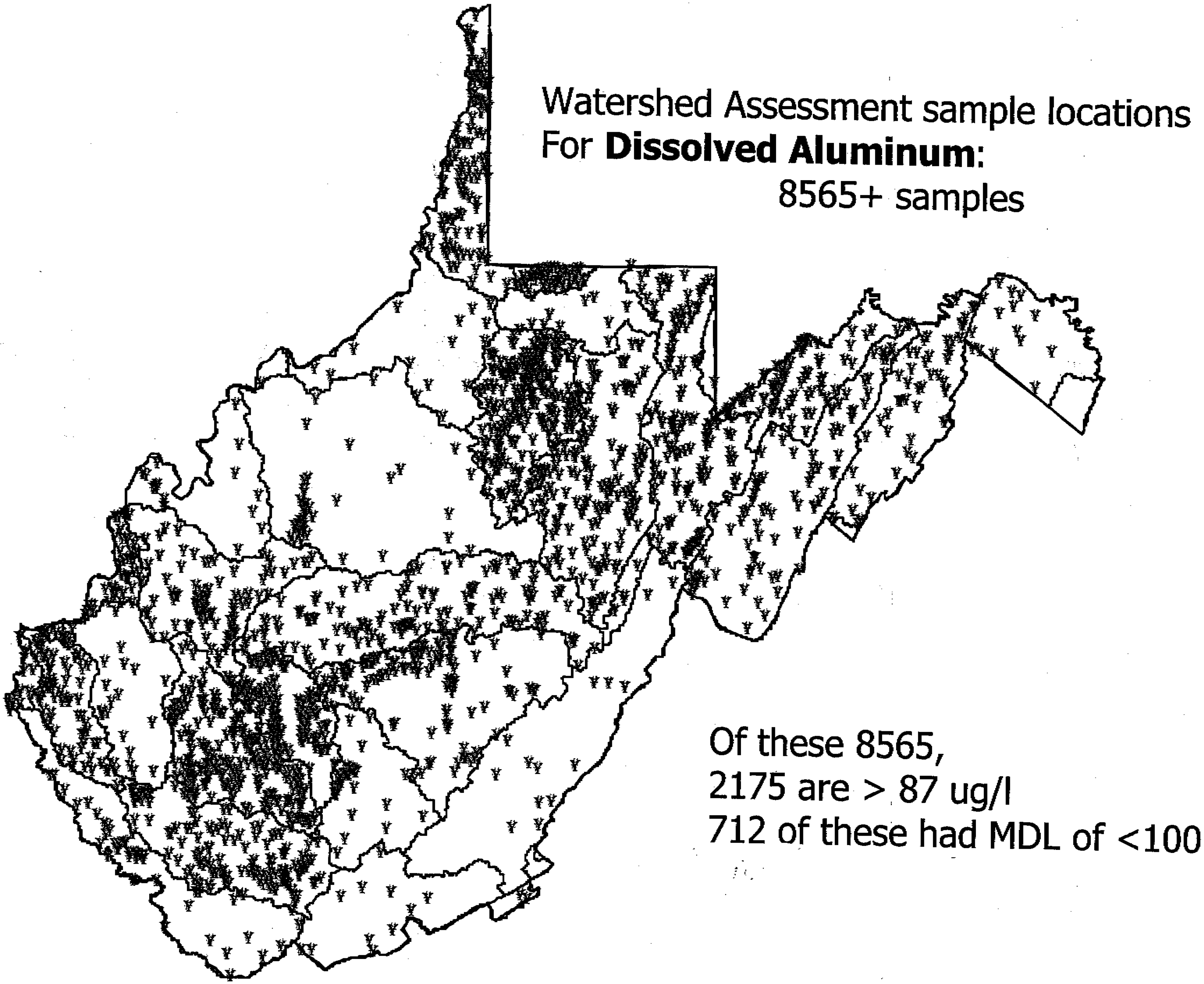
7/22/04

Topics

- Review highlights of Wirts 6/28/04 presentation
- Discuss 3 types of fishery information reviewed
- Advance some thoughts/options for moving forward

Recap - Aluminum data from DEP

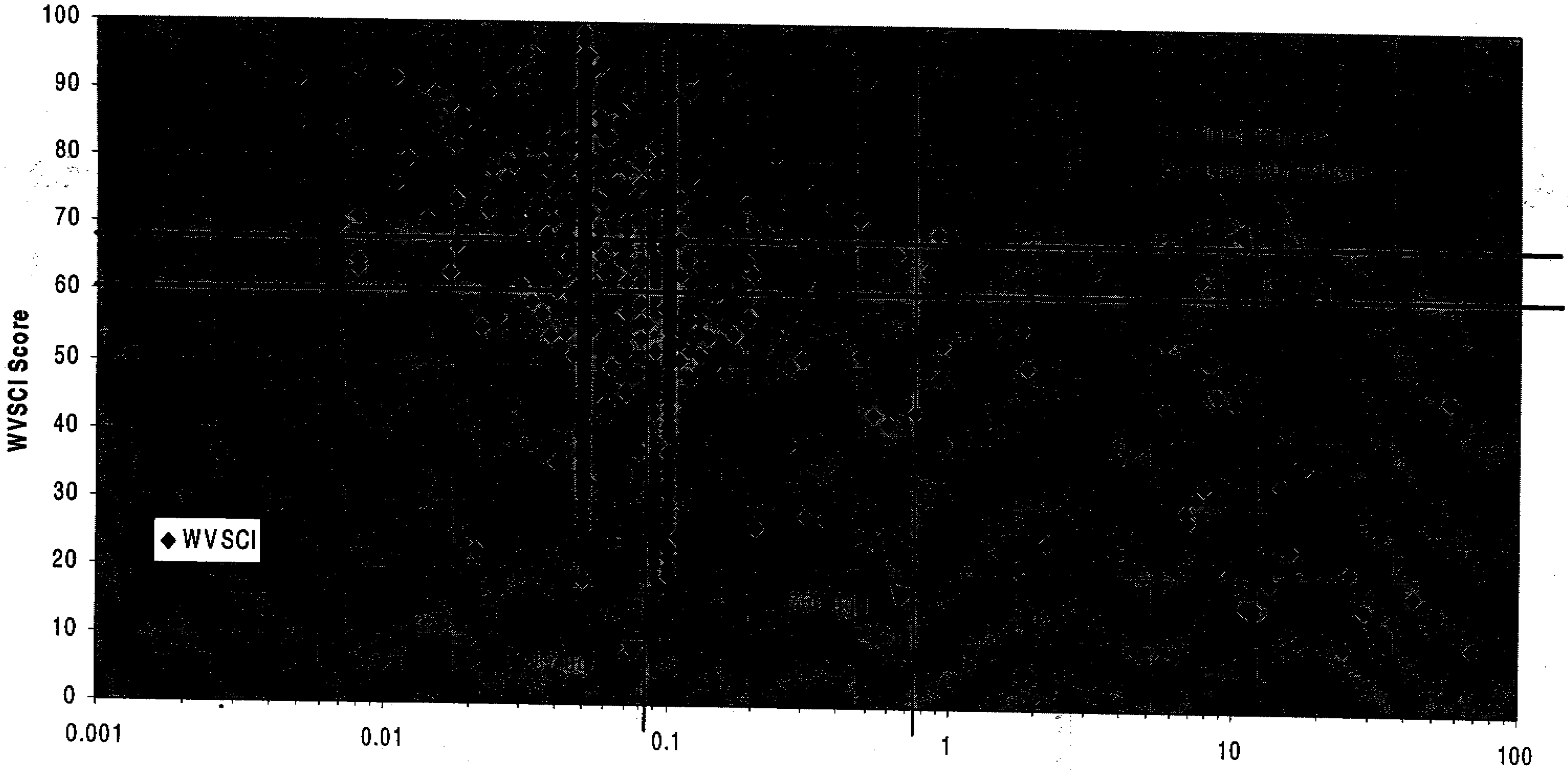
- DEP's Watershed Assessment data from Targeted, Probabilistic, and pre-TMDL development efforts
- DEP's "Ambient" data from WV's largest streams
- DEP Mining & Reclamation – "Trend Data"



Watershed Assessment sample locations
For **Dissolved Aluminum**:
8565+ samples

Of these 8565,
2175 are > 87 ug/l
712 of these had MDL of <100

Dissolved Aluminum vs WVSCI



Quick Review of 6/28/2004 Presentation

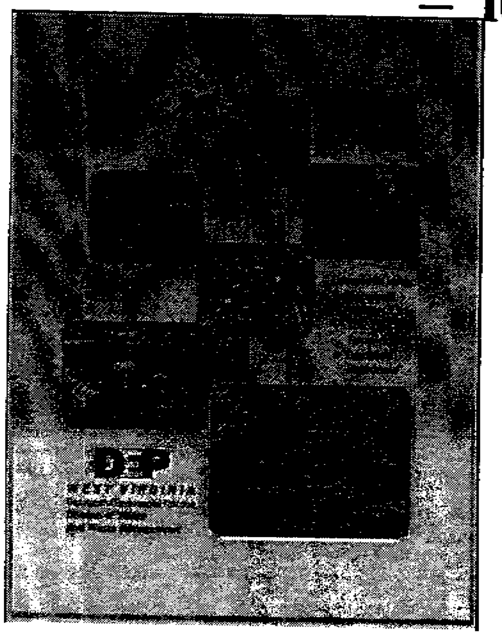
- Considerable new Dis. Al. data along w/ benthics
- Concern that “good” streams being listed
- Desire to further analyze the fishery connection

Aluminum WQ Criteria Post 6/28/04 Findings

- Work Performed
  - Further analysis of streams on current draft 303(d) List
  - Examined the presumptive Tier 2.5 waters (trout only) dis. Al. data v. trout population
  - Looked into Fish IBI work undertaken by DNR-Cincotta

Aluminum WQ Criteria Post 6/28/04 Findings

- Analyzed the 166 streams 2004 303(d) listed for dis. Al.
  - eliminated streams with known/suspected other aql stressors
  - left w/ top 10 list
    - Birch River, Gauley (lower), Cranberry, Greenbrier, Cacapon, S. Branch, New River (lower), Shenandoah, Kanawha River (upper), Beards Fk/Loop Ck.
    - Top 10 make up ~625 miles (30%) of the dis. Al. listings



...More on the Top 10

- DNR –standing crop via rotenone one way for good information. Available on Tygart and Cheat mainstems
- Have done proportional stock density on S. Branch & Greenbrier. New River upcoming (% fish > 12")
- Basically due to varying methods and indices, BPJ is best tool available.
- None of the top 10 "raise any flags"
- Jernejcic or Preston can provide more detail

Dis. Al. and Presumptive Tier 2.5 Waters

- Tier 2.5 waters (Contained reproducing trout streams, HQ on public land and reference streams)
- Limited to repro. trout only (303 streams)
  - then looked to see if we had dis. Al. data (105 streams)
  - 3 of 105 streams had dis. Al. > 87 μg/l
- Trout stream health measured in pounds/acre

Stream	#'s acre trout	#'s/acre all fish	Dis. Al data µg/l
Big Run of North Fk.	15.4	50.3	120, <100 <20
Mill Ck. of Tygart Kumbrabow	16.7	18	95 <50 45
First Fork of Shavers (to be limed)	1	5	100, ~2 <100

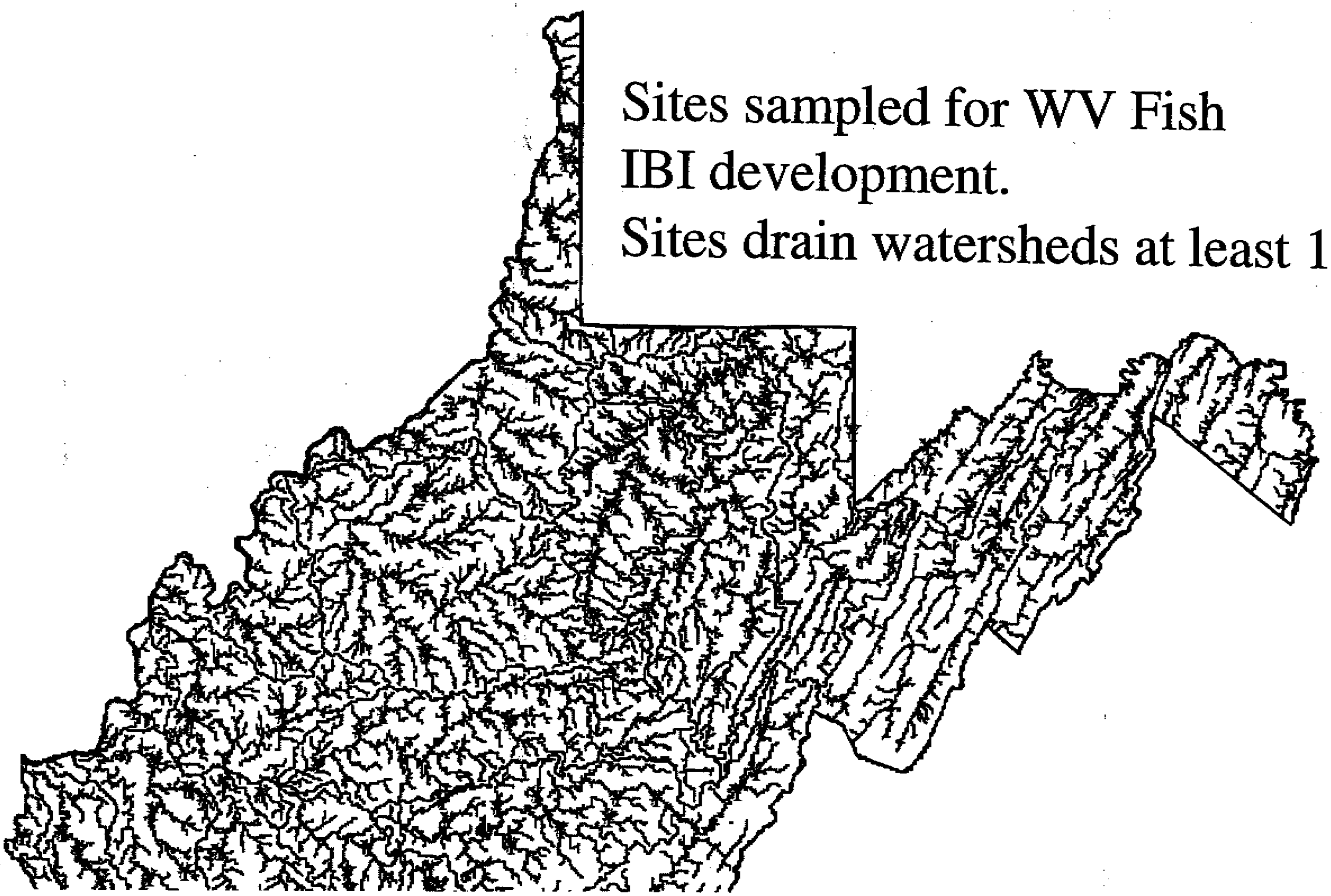
DNR Fish IBI work – Cincotta, Detenbeck, et.al.

- ~100 stratified random sites (50 ea. in 2001 and 2002) (10,000 – 100,000 acre watersheds)
- Purpose to develop a fish index of biotic integrity for WV
- Draft Report is imminent
- Does have one-time dissolved aluminum data with it.

119 samples with dis. Al. data

76 were non-detectable (MDL of either 30 or 4 µg/l)

The remaining 43 samples had reportable levels:



Sites sampled for WV Fish IBI development.

Sites drain watersheds at least 10,000 acres

Considerations

- Are tank studies in order? (EPA hasn't undertaken)
- Or need we do both?
- How do we pay for it?
- What do we do in the meantime?

Thoughts...

- DEP, EQB, EPA and interested parties could partner to initiate and oversee stream and/or tank studies
- Same partner's could work w/ EQB et.al. to develop work plans for one or both.
  - results would be needed by next triennial review

If studies pursued..

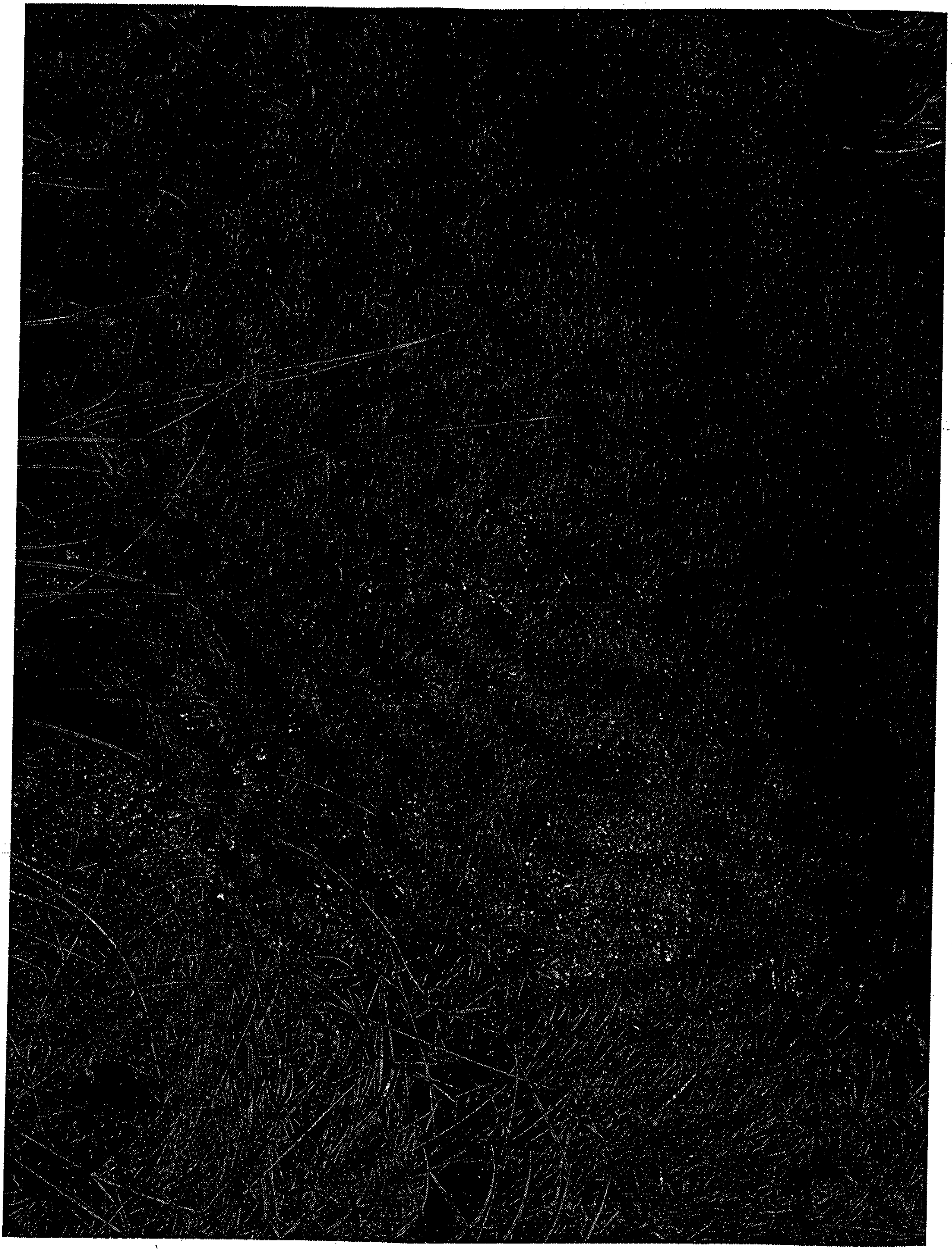
- Pro's
  - produces science based criteria
  - could be used regionally
  - opportunity for partnerships in resolution
  - possible EPA $'s

- Con's
  - delays final criteria resolution
  - complicated study (pH v. Al toxicity)
  - still may be critics at the end of process
  - shouldn't EPA do it?

Need funding and oversight commitments

Possible Interim Measures

- retain 750 µg/l acute dis. Al. criteria for warmwater and coldwater
- suspend chronic criteria pending study outcome
- keep Al. monitoring in new and existing permits
- include permit reopener if toxicity suspected



RESPONSE TO COMMENTS

ATTACHMENT "C"

ALUMINUM CRITERIA

Rationale Document for
Proposed Amendments

September 29, 2004

TABLE OF CONTENTS

I. INTRODUCTION

During its 2004 session, the West Virginia Legislature passed H.B. 4193, which mandates that the Environmental Quality Board (the "Board") shall, with the cooperation of the Department of Environmental Protection ("DEP") and the regulated community, propose an emergency and legislative rule to revise the aluminum criteria in the West Virginia Water Quality Standards, 46 CSR §1.

In response to this directive, the Board began consideration of the aquatic life aluminum criteria at its April 2004 meeting. The Board circulated a *Request for Information on Aluminum Water Quality Standard* asking for "information from all interested parties regarding appropriate aquatic life protection limits for aluminum." The Board received written comments from ten individuals and organizations, and heard oral comments from five speakers.

Based on the information presented, the Board agreed to propose a modification of the aluminum criteria by adding the following footnote to the current aluminum criteria:

> The current chronic aluminum standard of 87 ug/l will be suspended in all but trout waters until July 4, 2007. During the period of the suspension, the acute and chronic aquatic life values for aluminum are 750 ug/l.

The Board conducted a public comment period on the proposed modification. A public hearing on the proposed rule was conducted on September 15, 2004, and written comments were received until September 24, 2004.

Based on the comments received by the Board both in 2004 and in past triennial reviews, the Board believes that a modification of the aluminum criteria is appropriate in light of the questions regarding the scientific validity of the 87 ug/l chronic criterion proposed by US EPA, the stream data presented by the Department of Environmental Protection, and the disparity between the current chronic criterion and the aluminum criteria adopted by other states, in particular those states surrounding West Virginia. This information is set forth in greater detail in following sections of this Rationale Document. In consideration of public comments, the language of the footnote has been rewritten in the emergency rule and the proposed Legislative rule as follows:

> Until July 7, 2004, the aluminum criteria will be implemented as follows: the chronic aluminum criterion shall be 87 ug/l for trout waters (as defined in section 2.20 of this rule) and shall be 750 ug/l for all other waters of the State. The implementation of the interim criteria provides time for a study to develop aluminum criteria for waters of the State which are based upon sound science and are protective of aquatic life.

II. HISTORY OF THE WEST VIRGINIA ALUMINUM CRITERIA

In 1994, at the urging of the United States Environmental Protection Agency ("EPA"), West Virginia adopted EPA's proposed aluminum aquatic life criteria of 87 $\mu g/l$ for chronic exposures and 750 $\mu g/l$ for acute exposures. While these criteria were proposed by EPA as acid soluble concentrations, the Board adopted these standards as total concentrations to correspond to the method of measurement required for NPDES (water discharge) permits.

In 1996, DEP made a presentation to the Board regarding DEP stream data collected since 1990. This data indicated that 87.6% of all total aluminum samples collected (3,293 samples) from various streams throughout the state exceeded the Board's chronic aquatic life aluminum criterion of 87 $\mu g/l$ total aluminum, and 28.5% of the stream samples exceeded the current acute aluminum aquatic life criterion of 750 $\mu g/l$ total aluminum.

In its presentation, DEP outlined that although the chronic and often the acute aluminum criteria were exceeded, the majority of these streams support large, diverse and healthy populations of aquatic life. Using the Board's criteria in place at that time, DEP would have been required to place the vast majority of West Virginia's streams on the State's 303(d) list despite the fact that these streams are healthy. Further, DEP expressed its belief that EPA's recommended acute and chronic aluminum criteria are overprotective and inappropriate for many streams in West Virginia.

DEP's original presentation provided the groundwork for the Board's reconsideration of its aluminum criteria. Based on this presentation, the Board requested additional data to support DEP's belief that streams were not being adversely affected by total aluminum concentrations in excess of the Board's criteria. In addition, the Board created an informal aluminum task force to evaluate available toxicity data on aluminum and possible alternative aluminum criteria.

During the 1997 triennial review, the Board reevaluated its aluminum criteria in detail. Much time was devoted during the Board's meetings to examining EPA's document setting forth its rationale for EPA's recommended aluminum criteria, as well as EPA's guidance document for preparing aquatic life water quality criteria. Based on this review, the Board determined that EPA's criteria were not scientifically justifiable. In fact, had EPA followed its own guidance document for preparing water quality criteria, the chronic aluminum criterion would be equal to the acute aluminum criterion of 750 $\mu g/l$.[1] Accordingly, the Board determined that EPA's recommended chronic aluminum criterion was technically deficient and should be removed from the state water quality standards.

This modification was approved by the West Virginia Legislature and was submitted to EPA for approval. However, the justification provided to the EPA for the deletion of the chronic criterion did not the detail of the large amount of science supporting the Board's decision to delete the chronic criterion. Instead, the rationale document submitted to EPA referred primarily to the large number of streams in West Virginia that violate the chronic criterion and the problems with issuing NPDES permits based upon the chronic criterion.

[1] The scientific justification for rejecting the chronic aluminum criterion is discussed in detail on pages 6 to 8 herein.

At the same time, DEP conducted its further study of the aluminum concentrations and aquatic life communities in West Virginia's streams. Following the Board's decision, DEP presented the results of its stream study to the Board in 1998. The study indicated that many streams in the State with total aluminum concentrations in excess of 87 μg/l support healthy benthic communities. In addition, the study indicated that most of the streams with total aluminum concentrations in excess of 87 μg/l had nondetectable or very low concentrations of dissolved aluminum.

In addition, the Board's informal work group continued its study of the Board's aluminum criteria. The research done by this work group clearly indicates that the dissolved fraction of the total aluminum concentration is the portion that is toxic to aquatic life.

On June 22, 1999, EPA Region III notified the Board that it was disapproving the Board's deletion of the chronic aluminum criterion. EPA stated that the Board had failed to provide EPA with a scientific rationale to support the deletion of the chronic criterion. EPA requested that the Board take one of the following actions: (1) readopt the chronic criterion of 87 μg/l total aluminum, or (2) adopt an alternative chronic criterion that is scientifically defensible.

In 1999, the Board considered its alternatives to address EPA's disapproval of its deletion of the chronic aluminum criterion. A number of commenters requested that the Board provide a scientific justification for the deletion of the chronic criterion, and adopt a chronic criterion of 750 μg/l. Other commenters requested that the Board adopt dissolved aluminum criteria. After considering its alternatives, the Board decided that it would adopt dissolved aluminum criteria in place of the technically deficient total recoverable aluminum criteria. This revision was approved by EPA.

III. LITERATURE REVIEW

The rationale for revision of the chronic aluminum criteria is based in part on an evaluation of the content and validity of the Criteria Document as well as a literature review of recent studies performed regarding aluminum toxicity. The results of these efforts are outlined briefly in this section. The best scientific evidence demonstrates that, for streams which meet the West Virginia water quality standards for pH, a chronic criterion of 750 μg/l (0.75 mg/l) dissolved is scientifically justified and is protective of aquatic life.

A. EPA's Criteria Document

EPA's recommended aluminum criteria are set forth in EPA's *Ambient Aquatic Life Water Quality Criteria for Aluminum* (1988) ("Criteria Document"). During the 1997 triennial review, the Board received detailed comments demonstrating that EPA's chronic criterion of 87 μg/l is scientifically flawed.

In fact, EPA failed to follow its own guidance document, (*Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and their Uses* (1985). (the "Guidelines") for setting aquatic life criteria when it established the chronic aluminum criterion of 87 μg/l. If EPA had followed its guidance document, the chronic aluminum criterion would be equal to the acute criterion of 750 μg/l.

The data relied upon by EPA to justify the current chronic aluminum criterion of 87 μg/l is inadequate. Chronic criteria are typically calculated by determining the acute to chronic ratios for acutely sensitive species. In the case of aluminum, calculating the acute to chronic ratio for the most acutely sensitive species results in a chronic criterion which is *higher* than the acute criterion of 750 μg/l. According to the guidance document relied upon by EPA for calculating numeric criteria, in such instances the chronic criterion should be equal to the acute criterion of 750 μg/l.

Instead of doing this, EPA attempted to rely on an alternate method of establishing the chronic criterion. According to the *Guidelines*, EPA may adopt the species mean chronic value for a commercially or recreationally important species as the chronic criterion instead of using the calculated chronic value. In other words, EPA may adopt the chronic value for one particular species as determined in laboratory studies instead of a chronic criterion calculated from the chronic values for multiple species. In setting its chronic criterion, EPA rejected its calculated chronic criterion and instead relied on data from two studies to set the chronic criterion. (Cleveland, et al, 1986, on brook trout); (Buckler, et al., 1987 on striped bass). EPA's reliance on these two studies is seriously misplaced.

First, and most importantly, the *Guidelines* specify that a Species Mean Chronic Value for a commercially or recreationally important species may be adopted as the chronic criterion in place of a calculated chronic value. Neither of the two studies relied upon by EPA report final chronic values for brook trout or striped bass, and therefore cannot justify adopting a lower chronic criterion.

Second, the two studies had significant quality assurance and quality control deficiencies which made them inadequate for use in the actual calculation of the chronic and acute criteria, and in fact were excluded by EPA from those calculations. The Guidelines require that "[q]uestionable data, whether published or unpublished, should not be used." The dilution water in the striped bass study caused considerable mortality to 11-day-old fish (26%) and the 13-day-old fish (20% to 100% based on pH). The dilution water in the brook trout study caused an 11 percent mortality of juvenile brook trout in the pH 7.0 control group, and a 7.5 percent mortality in the pH 5.7 control group. The brook trout study monitored water quality in modified flow-through proportional diluters only once per week, which is insufficient to ensure constant water quality in the test chambers. Water quality in the striped bass study was monitored only twice per week. In addition, the brook trout study used a 0.1 μm filter in the dissolved aluminum measurement, while the applicable EPA analytical method requires the use of a 0.45 μm filter. While the striped bass study does not specify the filter size used, it was performed by the same scientists at virtually the same time and likely also used a 0.1 μm filter. This likely resulted in significantly lower aluminum concentrations than if they had been measured with a 0.45 μm filter.

Third, the studies are internally inconsistent. For example, toxicity tests on 160 day-old striped bass experienced 100% mortality at 349 μg/l. However, both 159 day-old and 190 day-old striped bass experienced 0% mortality at 390 μg/l, the highest concentration to which they were exposed. Surely, the results of this study for 160 day-old striped bass are suspect. The brook trout study was based on two separate exposure scenarios. However, the control groups between the two scenarios experienced very different mortalities at the same background aluminum concentration and virtually identical pH (10.8% at pH 7.0; 1.0% at pH 6.9).

Fourth, while neither study reports a final chronic value, both studies indicate that concentrations of aluminum significantly higher than 87 μg/l did not cause mortality. The striped bass study noted a significantly greater mortality only when aluminum concentrations exceeded 292 μg/l. Concentrations of aluminum as high as 390 μg/l did not cause mortality in striped bass based on the age of the fish, and aluminum concentrations at the maximum exposure of 300 ug/l had no apparent mortality to brook trout eggs and larva at a circumneutral pH.

Finally, the two studies do not correspond well to natural conditions in West Virginia streams. These studies generally were performed with water of low pH and low hardness. The water in the toxicity tests would violate West Virginia's water quality criteria for pH. The water in the brook trout study had an average hardness of 25 mg/l $CaCO_3$, with only 3 mg/l Ca^{+2}. Based on the water preparation method in the striped bass study, the water would be practically devoid of hardness. Other studies demonstrate that hardness plays an important role in mitigating the toxicity of aluminum. Further discussion of this issue is provided on pages 10 to 12 herein.

A letter from Eder Associates to EPA providing additional detail on the problems with these two studies and EPA's May 10, 1996, response are provided in Attachment A. In its response, EPA stated, "Available data indicates that aluminum is less toxic in waters having more typical hardness and neutral or higher pH, than in soft acidic waters. We are hoping to obtain sufficient data to rigorously account for this phenomenon." To date, no such work has been completed by EPA.

B. Recent Studies on Aluminum Toxicity

When EPA published the Criteria Document, EPA's recommended aluminum criteria were based on the limited information available at that time. Since then, a significant amount of new research has been conducted on aluminum bioavailability and toxicity. A literature review of recent studies on aluminum toxicity shows that it is the form and bioavailability of aluminum in the water column that determines its toxicity.

Assessments of fish, benthic macroinvertebrates, and other aquatic biota conducted under the auspices of the National Acid Precipitation Assessment Program ("NAPAP") clearly document that the amount of total recoverable aluminum within a given stream provides no meaningful information regarding aluminum toxicity. Instead, it is the form and bioavailability of the metal in the water column combined with the relevant chemical properties of surface waters (e.g., pH, acid neutralizing capacity, etc.) that determine aluminum toxicity. NAPAP Report 9 (Current Status of Surface Water Acid-Base Chemistry) and Report 13 (Biological Changes in Surface Water Acid-Base Chemistry).

These reports also outline that the single most important chemical parameter that determines the toxicity of aluminum is pH. If a stream has a seasonal or continuously low pH (<5.5-6.0) and little buffering capacity, then the form of aluminum present in the water column will generally be bioavailable, and if present in a high enough concentration, toxic. However, at a pH in the range from 6.6 to 8.8, the form of aluminum in the water column is not generally bioavailable or toxic. In other words, in those streams that meet the West Virginia water quality criteria for pH, the aluminum is not in the stream is not bioavailable and is not toxic to aquatic life.

The NAPAP literature also shows that many acidic surface waters with pH <5.5 have elevated concentrations of the toxic form of aluminum (i.e., inorganic monomeric aluminum). NAPAP Report 9. The studies referenced in these reports also show that measurements of labile monomeric aluminum serve as better predictors of potential biotic effects than do total aluminum concentrations.

The sum of the three primary forms of aluminum that make up the inorganic monomeric aluminum include the aluminum hydroxide complexes [$Al(OH)^{+2}$ and $Al(OH)^{+3}$] and the free aluminum ion (Al^{+3}). However, inorganic monomeric aluminum is generally not present in the water column at a higher pH range. At a pH >6.0, the monomeric aluminum converts to an insoluble precipitate. This relationship between increasing inorganic monomeric aluminum concentrations at pH<6.0 and very low inorganic monomeric aluminum concentrations at pH>6.0 is documented by Wigington, et al. (1996).

A recent comprehensive literature review confirms previous studies documenting that bioavailable aluminum acts as a gill toxicant to adult fish, and that this toxicity is manifested where the water column pH is low and the monomeric forms of aluminum are present. (Gensemer 1999). Further, scientists now have a much greater understanding of the mechanisms that cause toxicity at the gill surface than they did back in 1988 when EPA last updated its aluminum criteria document. In a paper presented at the 20th Annual Meeting of the Society of Environmental Toxicology and Chemistry (1999), Gensemer et al. speculated that calcium-related hardness reduced aluminum toxicity by stabilizing fish gills by out- competing Al for binding sites on the epithelial membrane.

Gensemer's review of the bioavailability and toxicity of aluminum in aquatic environments provides more than adequate documentation of the effect of pH on aluminum toxicity and further explains the problems with the chronic criterion in the Criteria Document. Gensemer's research also demonstrates that the criteria should be established based on dissolved aluminum concentrations. Further, Gensemer suggests that EPA should update the Criteria Document to address the ameliorating effects that water hardness, dissolved organic matter, and other water quality characteristics have on aluminum toxicity. EPA should initiate a thorough and comprehensive review and update of its Criteria Document.

Gensemer's review references a 1996 literature review by Donald W. Sparling and T. Peter Lowe. The Sparling and Lowe summary provides a detailed review of toxicity studies performed on plants, invertebrates, fish, and wildlife. The literature review states, "The toxicity of aluminum is intimately associated with pH in that the metal is soluble and biologically available in acidic (pH<5.5) soils and water but relatively innocuous in circumneutral (pH 5.5-7.5) conditions." The Sparling review indicates that aluminum toxicity is "greatly influenced by" alkalinity, acidity, calcium, dissolved organic carbon, and fluoride. Specifically, the Sparling review cites studies which indicate that small increases in calcium levels "can dramatically improve" alevin and adult survival of brown trout, brook trout, and rainbow trout when exposed to waters with low pH and elevated aluminum concentrations. The hardness-related protective mechanism was confirmed by Lyderson, et al. (2002), who tested the mitigating effect of ionic strength on the toxicity of aluminum in fish. Their study demonstrated that increasing the water ionic strength by adding Ca or Na reduced the toxic effect of aluminum. They concluded that Ca and Na mitigate the aluminum toxicity by their effect on the ability for aluminum to bind with the gill surface.

As set forth in the *Toxicology Profile for Aluminum* (1999), aluminum is the most abundant metal and third most abundant element, after oxygen and silicon, in the earth's crust. It is commonly found in soil, minerals, rocks, and clays. It also occurs as bauxite ore. Aluminum concentrations in soil can range from 0.07% by weight (700 ppm) up to and over 10% by weight (100,000 ppm). The typical concentration is around 7.1% by weight (71,000 ppm). *Most aluminum containing compounds do not dissolve much in water unless the water is acidic.*

Aluminum occurs ubiquitously in natural waters as a result of weathering of aluminum-containing clays, rocks, and minerals. The toxicological profile also states that aluminum can also be mobilized from terrestrial environments through acidification (e.g., seasonal snow melts, runoff into streams with low acid neutralizing capacity, or from acid mine drainage); however, at a pH>5.5, naturally occurring aluminum compounds exist predominantly in an undissolved form such as gibbsite, $Al(OH)_3$, or aluminosilicates. In the presence of high amounts of dissolved organic material, dissolved aluminum generally is not present in a form which will cause aquatic life impairment.

The toxicological profile also outlines study results conducted by Goenaga and Williams (1988), that, in general, decreasing the water pH (acidification) results in an increase in mobility of the monomeric (toxic) forms of aluminum. The predominant form at pH<4 is the hydrated trivalent aluminum ion. Between pH of 5 and 6, the predominant forms are $Al(OH)^{+2}$ and $Al(OH)_2^{+}$, while the solid $AL(OH)_3$ is most prevalent between pH 5.2 and 8.8 (Martell and Motekaitis 1989). The soluble species $Al(OH)_4^{-}$ is the predominant species above pH 9 and the only species above pH 10.

All available data indicates that bioavailable forms of aluminum at low pH can be toxic; however, aluminum is generally not going to be present in a toxic or bioavailable form in waters that are not violating the State's water quality standards for pH.

IV. OTHER STATE'S ALUMINUM CRITERIA

Attachment B provides a summary of the current EPA-approved aluminum criteria for all fifty States. This summary is based upon the information available on the EPA website and generally has not been confirmed by contacts to the States due to time constraints. In all, only nineteen states have adopted some form of aluminum criteria. Only five states have adopted both EPA's proposed chronic and acute criterion as total aluminum concentrations. Four additional states, including West Virginia, have adopted EPA's proposed chronic and acute aluminum concentrations as dissolved concentrations. The remaining ten states have a variety of different aluminum criteria. Of the remaining ten states, approximately five have adopted dissolved aluminum criteria, including Texas, Utah, and Missouri, which have no chronic criterion and an acute criterion of 750 ug/l or greater.[2]

Based on a survey of the states surrounding West Virginia and the EPA Region III states (collectively, Pennsylvania, Ohio, Kentucky, Virginia, Maryland, Delaware, and Washington, D.C.), only Pennsylvania and Delaware have adopted aluminum criteria. Delaware has adopted criteria of 87 $\mu g/l$ total aluminum for chronic exposures and 750 $\mu g/l$ for acute exposures. Pennsylvania has adopted a criterion of 750 $\mu g/l$ for chronic exposures.

Importantly, Pennsylvania formally rejected the chronic criterion of 87 $\mu g/l$ in 1999 because of the flawed science on which it is based. In 2001, EPA accepted Pennsylvania's rejection of the chronic criterion, stating specifically:

> Aluminum is considered a non-priority pollutant by EPA, and on that basis and the basis that EPA Region III recognizes the uncertainty surrounding the chronic aquatic life criteria, we will not recommend to the Administrator that she use her discretionary authority and promulgate the chronic aluminum aquatic life criterion at this time.

Copies of Pennsylvania's rationale for rejecting the chronic criterion and EPA's letter approving Pennsylvania's action are provided in Attachment C.

V. STREAM DATA

As mentioned previously, DEP's 2004 Draft Section 303(d) List includes 166 waters, comprising 2,090 stream miles, that are considered impaired pursuant to the chronic aluminum criteria. As presented to the Board in its past consideration of the aluminum criteria, many of the listed streams have thriving aquatic communities and have no physical signs of impairment.

The North Fork of the Cherry River, Cranberry River, Williams River, Cacapon River, Cheat River, Greenbrier River, and Opequon River are all listed on the draft 303(d) list because the dissolved aluminum concentrations exceed the chronic aluminum criterion. Yet all of these streams have a dissolved aluminum concentration below the 292 $\mu g/l$ concentration determined to not cause toxicity in the cited brook trout or striped bass studies.

These streams have thriving aquatic communities. DEP has extensive benthic studies demonstrating the health of the aquatic systems. In addition, detailed fish studies have been performed on the Cheat River watershed. This data shows little correlation

---

[2] The number of states with dissolved criteria is an approximation, because it was not clear in some circumstances whether the standards were based on dissolved or total recoverable concentrations.

between aluminum concentration and fish population. *See* Attachment D, which is a scatter diagram prepared by Dr. Todd Petty, Assistant Professor of Fisheries, WVU, based on Index of Biologic Integrity ("IBI") scores and dissolved aluminum data for streams in the Cheat River watershed. As stated previously, this 303(d) listing will require DEP to prepare a TMDL for these streams, despite their thriving aquatic communities. Clearly, this will detract from DEP's ability to use its limited resources for developing TMDLs on streams with actual impairment.

Importantly, the majority of streams in the State have much higher calcium concentrations and hardness than used in the toxicity studies for brook trout and striped bass. Calcium and hardness have been demonstrated to ameliorate the effect of aluminum in low pH waters. Calcium has been demonstrated to reduce the loss of other salts which are essential to maintaining sodium and potassium levels in fish. Sodium and potassium are the most important salts in fish blood. They are integral to normal heart, nerve and muscle function. Many of the toxicity studies performed on brook trout and striped bass were performed in extremely soft water (≤25 mg/l $CaCO_3$). DEP has collected extensive data for streams across the State as part of its monitoring network. A summary of data for streams with dissolved aluminum concentrations greater than 75 μg/l is provided in Attachment E.[3] The summary contains more than 350 streams which have at least one dissolved aluminum concentration above 87 μg/l. Only 48 of these streams on the summary list have calcium concentrations <10 mg/l or a calculated hardness less than 25 mg/l $CaCO_3$.

About half of the streams in the summary with dissolved aluminum concentrations above 87 μg/l are in compliance with West Virginia's pH criteria. The effect of aluminum is dependent on the pH of the stream. The recent toxicity studies on aluminum have demonstrated that aluminum exacerbates the stress of low pH on the aquatic environment. The streams with pH<6 are already out of compliance with the pH criteria and therefore must be considered for 303(d) listing regardless of the aluminum concentrations.

[3]The more thorough and extensive data review provided to the Board by DEP is incorporated herein by reference.

Importantly, the aluminum included in the dissolved aluminum measurement may not actually be dissolved. The EPA method for analysis of dissolved aluminum utilizes a 0.45 μm filter, while the brook trout study cited in the criteria document used a 0.1 um filter. Small suspended and colloidal particles are capable of passing through a 0.45 μm filter. While the Board has historically taken the position that compliance with water quality standards should be based upon an EPA-approved method, the difference in filter size clearly affects the comparability of sampling results in the toxicity studies cited in the EPA Rationale Document and the DEP stream sampling results used in the draft 303(d) list.

Extensive review of stream data was also performed as part of the 1999 review of the aluminum criteria. The data review indicated that streams with concentrations of dissolved aluminum above 750 μg/l tend to have impaired aquatic communities, and that **elevated dissolved aluminum concentrations above 750 μg/l were encountered exclusively in streams with pH<6 and which therefore violate the State's water quality criteria for pH.** Only 3% of the 204 total streams analyzed had dissolved aluminum concentrations in excess of 87 μg/l which could not be attributable to a low pH.

VI. CONCLUSION

Based on the comments received by the Board both in 2004 and in past triennial reviews, the Board believes that a modification of the aluminum criteria is appropriate in light of the questions regarding the scientific validity of the 87 ug/l chronic criterion proposed by US EPA, the stream data presented by the Department of Environmental Protection, and the disparity between the current chronic criterion and the aluminum criteria adopted by other states, in particular those states surrounding West Virginia.

The aluminum criteria remain as dissolved concentrations. In 1999, the Board established that studies conducted in both the laboratory and in the field clearly demonstrate that the dissolved aluminum fraction is the toxic portion and that the particulate associated forms of aluminum are regarded as nontoxic. Thus, the most scientifically defensible alternative is to regulate only the dissolved (bioavailable) form of aluminum by establishing dissolved criteria.

Importantly, the current criteria do not address any of the water quality characteristics which exist in many West Virginia streams which mitigate aluminum toxicity. In addition, the EPA-approved method for dissolved aluminum measurements utilizes a 0.45 μm filter, which allows a considerable amount of particulate aluminum to pass through and therefore be included in the dissolved aluminum measurement. Most toxicity tests which measure a dissolved aluminum concentration utilize a 0.1 μm filter, which is a smaller portion of the total aluminum concentration.

A critical component of the Board's consideration is the study which has been planned to develop scientifically sound aluminum criteria for West Virginia. The modification to the aluminum criteria will allow all interested parties, including EPA, DEP, WV Division of Natural Resources, and all other interested parties, to develop and implement scientific studies to evaluate aquatic life effects of aluminum in state waters. However, the study must be completed in a timely manner. If no new criteria are promulgated on or before July 4, 2007, the chronic criterion of 87 ug/l will be reinstated for all waters of the State.

References

Buckler, D.R., *et al.*, Influence of pH on the Toxicity of Aluminum and Other Inorganic Contaminants to East Coast Striped Bass. Water Air Soil Pollut. 35 97-106, 1987.

Cleveland, L., *et al.*, Interactive Toxicity of Aluminum and Acidity to Early Life Stages of Brook Trout. Transactions of the American Fisheries Society. 115:610-620, 1986.

Gensemer, R.W. and Playle, R.C. The Bioavailability and Toxicity of Aluminum in Aquatic Environments. Critical Reviews in Environmental Science and Technology. 29(4):315-450, 1999.

Gensemer, R.W., R.C. Playle, W.A. Stubblefield and J.R. Hockett. 1999. Aluminum Bioavailability and Toxicity to Freshwater Biota at Circumneutral and Higher pH. 20th Annual Meeting of Society of Environmental Chemistry and Toxicology. Philadelphia

Goenaga X, Williams DJA. 1988. Aluminum speciation in surface waters from a Welsh upland area. Environ. Pollut. 52:131-149.

Lyderson, E., S. Oxnevad, K. Ostybe, R.A. Anderson, F. Bjerkely, L. A. Vollestad and A.B.S. Poleo. 2002. The Effect of Ionic Strength on the Toxicity of Aluminum to Atlantic Salmon (*Salmo salar*) Under Non-Steady State Chemical Conditions. J. Linmology, 61(1): 69-76.

Martell A. E., Mortekaitis R.J. 1989. Coordination chemistry and speciation of Al (III) in aqueous solution. In: Lewis T.E. ed. Environmental chemistry and toxicology of aluminum. Chelsea, MI: Lewis Publishers, Inc.

Muniz, I.P. and Leivstad, H. 1980. Acidification – effects on freshwater fish. In: Ecological Impact of Acid Precipitation: Proceedings of an International Conference, Sandfjord, Norway, March 11-14, 1980, pp. 84-92.

National Acid Precipitation Assessment Program, State of Science and Technology, Vol. II, 1990.

US Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Aluminum, July 1999.

Wigington, P.J., Jr., et al. 1996. Episodic Acidification of Small Streams in the Northeastern United States: Episodic Response Project. Ecological Applications, 6(2):374-388, 1996.

1310298

eder associates
environmental scientists and engineers

OFFICES:
Locust Valley, NY
Madison, WI
Ann Arbor, MI
Augusta, GA
Jacksonville, FL
Trenton, NJ
Tampa, FL

June 6, 1995
File #670-15

Margaret Stasokowski, Director
Health and Ecological Criteria Division
Mail Code 4304
United States Environmental Protection Agency
Washington, D.C. 20460

Re: Comments on the USEPA Ambient Water Quality Criteria for Aluminum

Dear Ms. Stasokowski:

This letter discusses the technical basis for USEPA's Ambient Water Quality Criteria for aluminum and suggests revisions to improve the technical justification for the criteria and its acceptance by the regulated community.

A paper mill that produces specialty fine papers retained us to evaluate a draft of its proposed NPDES permit renewal which includes a very strict aluminum limit. This mill and others in the industry use alum as a process chemical to produce high quality paper. The current stage of papermaking technology does not allow paper mills to eliminate aluminum without severe adverse impacts on product quality.

The chronic aluminum criteria (87 µg/ℓ) were developed from the USEPA report, "Ambient Water Quality Criteria for Aluminum - 1988", which, in turn, used the data and results from the paper, "Influence of pH on the Toxicity of Aluminum and Other Inorganic Contaminants to East Coast Striped Bass".[1] EPA's 87 µg/ℓ chronic criteria is based on the following assumptions from the Bucker paper:

- 160-day-old striped bass
- A pH of 6.5
- Seven-day test duration
- No mortality value

[1] Bucker, D.N., P.M. Mehrle, L. Cleveland, and F.J. Dwyer. 1987. "Influence of pH on the Toxicity of Aluminum and Other Inorganic Contaminants to East Coast Striped Bass." *Water, Air, and Soil Pollution*, 35: 97-106.

Continued . . .

480 FOREST AVE., P.O. BOX 707, LOCUST VAL...

We reviewed this paper and noticed that the dilution water used for the test exhibited severe toxicity which, under reasonable scrutiny, would render the test results invalid, and that identical experiments yielded different toxicity results.

USEPA should reconsider and reevaluate the aluminum criteria and the technical basis used to develop the criteria, and how USEPA used the reports to justify the criteria. Papers published after the 1988 water quality criteria indicate the strong relationship between aluminum toxicity, pH, solids content, organic compounds, and hardness[2]. Many of these relationships were not taken into account and are not reflected in the criteria. USEPA should consider all relevant toxicity information, that aluminum is a very common and ubiquitous compound and that alum, an aluminum derivative, is a major industrial chemical, and review the aluminum toxicity issue to address the following:

- That its criteria are based on sound scientific data.
- That its criteria could be adjusted depending on site conditions.
- That the societal benefits derived from enforcing the criteria at least balance the cost burden.

The following aspects of our evaluation should be of interest to you:

- Table 1 shows the mortality of 11- and 13-day-old striped bass exposed to 0, 131, and 393 μg/ℓ of aluminum at pH values from 5.0 to 7.2. The dilution water itself caused a 28 percent mortality for 11-day-old fish at pH 7.2, and 100 percent mortality at pH 5.5. The dilution water also caused 20 percent mortality of 13-day-old fish at pH 7.2; 52 percent mortality at pH 6.5; and 100 percent mortality at pH 5.5.

---

2 Curtis, L.R., and Seim, W.K. 1992. "Calcium and Organic Acids as Determinants of Aluminum Toxicity at Alkaline and Neutral pH." Final Report for the Aluminum Association, Inc.

Gundersen, D.T., Bustaman, S., Seim, W.K., and Curtis, L.R. 1994. "pH, Hardness, and Humic Acid Influence Aluminum Toxicity to Rainbow Trout *(Oncorhynchus mykiss)* in Weakly Alkaline Waters." *Can. J. Fish. Aquat. Sci.*, 51: 1345-1355.

Continued . . .

These results indicate that the dilution water itself was very toxic to fish with the toxicity increasing at lower pH values without the addition of aluminum.

- Table 2 shows mortality data for 159- and 195-day-old striped bass exposed to 0 and 390 μg/ℓ of aluminum at pH values 5.5, 6.5, and 7.2. There were no fish mortalities at the 390 μg/ℓ concentration at pH values of 6.5 (the pH value used for the Water Quality Criteria) and 7.2. These conditions are similar to those used to develop the Water Quality Criteria, and show that an aluminum concentration as high as 390 μg/ℓ had no effect on fish mortality.

- Table 3 shows the mortality of 11-day-old striped bass exposed to a "logarithmic" series of aluminum concentrations. The dilution water itself, without aluminum, caused a 26 percent mortality at pH 7.2. Similar mortalities (approximately 26 percent) were observed at this pH at all aluminum concentrations from 0 to 179 μg/ℓ. The toxicity of the dilution water itself was confirmed at the lower pH-value tests.

  The test was also done on 160-day-old striped bass using the same dilution water. The dilution water did not cause any mortality at pH 7.2 and 6.5. At pH 6.5, an aluminum concentration of 174 μg/ℓ caused a 58 percent mortality, but a concentration of 87 μg/ℓ (the Water Quality Criteria value) caused 0 percent mortality. These results contradict the Table 2 results that show no mortality at a much higher aluminum concentration (390 μg/ℓ). The fact that the dilution water was not lethal to the older fish, notwithstanding, the test was effectively invalidated as a scientific method when the dilution water killed the juvenile fish.

- The dilution water used in the Bucker study was groundwater "purified" in a commercial water softener, then by reverse osmosis, and finally by an anionic, cationic, and mixed-bed ion exchange system. This water would be very soft and almost free of hardness, and can hardly characterize the general range of conditions in receiving waters. Recent tests show that hardness greatly affects aluminum toxicity, the lower the hardness, the higher the toxicity.

Continued . . .

USEPA used a questionable and perhaps invalid database to set the National Criteria because identical experiments by the same researcher using the same dilution water did not give similar results.

EPA's stated policy in deriving the aquatic life criteria[3] is as follows (underlined for emphasis):

> *"Questionable data, whether published or unpublished, should not be used. Examples would be data from tests that did not contain a control treatment, tests in which too many organisms in the control treatment died or showed signs of stress or disease, and tests in which distilled or deionized water was used as the dilution water without addition of additional salts."*

> *"Data should be rejected if obtained by using ... organisms that were previously exposed to substantial concentrations of the test material or other contaminants."*

> *"Questionable data, data on formulated mixtures and emulsified concentrations, and data obtained with nonresident species or previously exposed organisms may be used to provide auxiliary information but should not be used in the derivation of criteria."*

The conclusion to be drawn from USEPA's Criteria and Policy is that one invalidates the other. If the Policy stands, the Criteria cannot; if the Criteria stands, the Policy cannot.

Summary

- The Aluminum Water Quality Criteria must be based on representative receiving waters and the representative fish species. The dilution water must not be toxic.

[3] USEPA, 1994. "Appendix H: Derivation of the 1985 Aquatic Life Criteria." Water Quality Standards Handbook, Second Edition.

Continued . . .

- The pH in most U.S. receiving waters is in the range of near neutrality to basic. Aluminum toxicity depends on pH, and the criteria should be based on a neutral pH.

- In addition to pH, aluminum toxicity also depends on total suspended solids (TSS), total organic carbon (TOC), and hardness. Recent studies have shown that the higher the TSS, the TOC, and the hardness concentrations, the lower the aluminum toxicity. Aluminum adsorbs on solids, decreasing its availability in the dissolved fraction and only a part of the dissolved fraction is bioavailable. Studies at low pH values showed that calcium hardness can decrease the toxicity of aluminum. The tests used to set the National Criteria were conducted at low calcium hardness which increases the toxicity of aluminum. The aluminum criteria should be hardness dependent as are the other metals in the National Criteria.

- Metals toxicity relates to the dissolved fraction and EPA is issuing dissolved metals criteria using the dissolved metal concentrations measured during the same tests used to develop the National Criteria. Dissolved aluminum was not measured during these tests and a site-specific aluminum criterium cannot be developed applying the chemical translator ratio (CTR) used for other metals.

- The references cited in EPA's aluminum criteria document concluded that aluminum could be toxic to aquatic life. The regulated community does not object to discharge limits when they are based on sound scientific data that demonstrate the need for and benefit derived from the criteria. Establishing a criteria that does not provide any measurable environmental benefit, but raises compliance costs, cannot be justified. Alum, an aluminum-bearing chemical, is commonly used by municipalities to treat drinking water and by industry to treat process and effluent water. Establishing an unjustifiably low limit that cannot be achieved will surely have an adverse impact on the ability of the affected firms to survive in a competitive environment, especially when many firms operate at the brink of loss.

- In the absence of specific aluminum criteria, discharges must comply with acute and chronic toxicity limits. Since the toxicity tests would determine

Continued . . .

whether the effluent contains compounds toxic to aquatic life, the aluminum limit is effectively redundant. Chemicals may have synergistic, antagonistic, or additive effects which are indicated by toxicity tests. The effects of chemical-specific testing are generally unpredictable and the toxicity testing specified in permits should be the regulatory requirement.

I hope that these comments are useful in EPA's reevaluation of the aluminum criteria and in developing a criteria based on sound scientific evidence.

Please call if you have any questions or if you would like to discuss the aluminum criteria issues.

Very truly yours,

EDER ASSOCIATES

Kyriacos M. Pierides, Ph.D.
Project Engineer

KMP/bl

cc: C. Delos
B. Cleveland
L. Eder

BL1194

TABLE 1

MORTALITY (%) AND STANDARD DEVIATIONS, IN PARATHESES, OF STRIPED BASS EXPOSED TO Al AT VARIOUS pHs FOR SEVEN DAYS

Age and pH	Nominal Al Concentration, $\mu g/\ell^{(a)}$		
	0	300	100
11 day-old			
7.2	28 (16)	100[(b)] (0)	–
5.5	100[(b)] (0)	100[(b)] (0)	–
5.0	100[(b)] (0)	100[(b)] (0)	–
13 day-old			
7.2	20 (11)	–	75[(b)] (20)
6.5	52[(b)] (20)	–	97[(b)] (5)
5.5	100[(b)] (0)	–	100[(b)] (0)

NOTES:

(a) Measured values averaged 130.9 percent of nominal.

(b) Significantly greater than pH 7.2 control treatment ($p \leq 0.05$).

TABLE 2

MORTALITY (%) AND STANDARD DEVIATIONS, IN PARATHESES, OF STRIPED BASS EXPOSED TO Al AT VARIOUS pHs FOR SEVEN DAYS

Age (days)	Nominal Al concentration ($\mu g/\ell$)[a] and pH					
	pH 7.2		pH 6.5		pH 5.5	
	0	300	0	300	0	300
159	0 (0)	0 (0)	0 (0)	0 (0)	22[b] (11)	100[b] (0)
195	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	100[b] (0)

NOTES:

(a) Measured values averaged 130.1 percent of nominal.

(b) Significantly greater than pH 7.2 control treatment ($p \leq 0.05$).

TABLE 3

MORTALITY (%) AND STANDARD DEVIATIONS, IN PARATHESES, OF STRIPED BASS EXPOSED TO Al AT VARIOUS pHs FOR SEVEN DAYS

Age and pH	Nominal Al concentration, $\mu g/\ell$[(a)]					
	0	25	50	100	200	400
11 day-old						
7.2	26 (13)	16 (6)	20 (9)	14 (8)	26 (10)	96[(b)] (6)
6.5	21 (13)	58[(b)] (29)	80[(b)] 20	36[(b)] (12)	97[(b)] (7)	–
6.0	98[(b)] (4)	94[(b)] (15)	100[(b)] (0)	99[(b)] (2)	100[(b)] (0)	–
160 day-old						
7.2	0 (0)	0 (0)	0 (0)	0 (0)	2 (4)	100[(b)] (0)
6.5	0 (0)	8 (11)	0 (0)	0 (0)	58[(b)] (32)	–
6.0	2 (4)	0 (0)	38[(b)] (4)	98[(b)] (4)	100[(b)] (0)	–

NOTES:

(a) Measured values averaged 89.5 and 87.2 percent of nominal, for tests with 11- and 160-old fish, respectively.

(b) Significantly greater then pH 7.2 control treatment ($p \leq 0.05$).

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

RECEIVED AT EA
MAY 2 1 1996

670-15

OFFICE OF WATER

MAY 10 1996

Kyriacos M. Pierides, Ph.D.
Eder Associates
Environmental Scientists and Engineers
480 Forest Avenue
P.O. Box 707
Locust Valley, NY 11560-0707

Dear Mr. Pierides:

Thank you for your letter of June 6, 1995, regarding the aquatic life criterion for aluminum. You have expressed concern about the appropriateness of the aluminum criterion, when applied to situations where the pH, hardness, and other water quality parameters differ from those occurring in toxicity tests used to set the criterion.

The basis for the aluminum criterion is presented in the "Ambient Water Quality Criteria for Aluminum - 1988" (EPA 440/5-86-008). If the Agency had relied on the toxicity tests tabulated in Tables 1 and 2 (and summarized in Table 3) of the document, the Final Chronic Value would have been 748 µg/L, as indicated on page 22. For the more sensitive species, all of the toxicity tests in Tables 1 and 2 were performed at hardness above 45 mg/L. A few of the tests were performed at pH 6.5-6.6. These test results, however, were averaged with other tests conducted at pH 7 or higher.

Table 6 of the document presents data from toxicity tests that were non-standard in some way, generally because the test duration, observed endpoint, or dilution water were unusual. As discussed on page 6 of the document, two sets of tests, by Cleveland et al. and by Buckler et al., using brook trout and striped bass, respectively, in very soft, acidic water (hardness <10-12, pH 6.5-6.6), indicated substantial toxicity occurring at concentrations around 170 µg/L, but little toxicity at 87 µg/L. To protect these recreationally or commercially important species, the Final Chronic Value was lowered to 87 µg/L, EPA's current chronic criterion.

Subsequent testing of rainbow trout by Don Mount, for the purpose of determining Water-Effect Ratios at certain sites, has tended to support the Cleveland et al. and Buckler et al. results, indicating substantially enhanced toxicity at very low hardness and pH. Consequently, we believe that the chronic criterion should ordinarily be appropriate for waters of such low hardness and pH, provided that the aluminum is not occluded in or sorbed by minerals, clays, or sand, or other particulate matter, as discussed on page 11 of the criteria document.

Available data indicate that aluminum is less toxic in waters having more typical hardness and neutral or higher pH, than in soft acidic waters. We are hoping to obtain sufficient data to rigorously account for this phenomenon. We have been talking with Donald Mount and Dominic DiToro, who represent a consortium of dischargers interested in generating data that EPA can use to revise its aluminum criterion. We are hopeful that through this cooperative effort we will be able to produce a criterion that can be applied with confidence across a wider range of hardness and pH, without need for major site-specific criteria adjustments. If sufficient data are available to account for other water quality parameters, such as organic carbon, we will consider this information as well.

During the course of this work, we intend to maintain an open process, through which the public and the states can communicate their concerns and submit additional data for consideration. We will thus keep you informed about future progress on the aluminum criterion. If you have questions, do not hesitate to continue calling Charles Delos of my staff at 202-260-7039.

Sincerely,

Margaret J. Stasikowski, Director
Health and Ecological Criteria Division

Summary of State Aluminum Criteria

STATE	ALUMINUM ACUTE (ug/l)	ALUMINUM CHRONIC (ug/l)	DESCRIPTION OR QUALIFIERS
Region 1			
Connecticut	N/A	N/A	
Maine	N/A	N/A	
Massachusetts	N/A	N/A	
New Hampshire	750	87	
Rhode Island	750	87	for waters with pH between 6.5 and 9
Vermont	N/A	N/A	
Region 2			
New Jersey	750	87	for the Delaware River Estuary
New York	N/A	100	ionic (dissolved)
Region 3			
Delaware	750	87	
Maryland	N/A	N/A	
Pennsylvania	750	N/A	
Virginia	N/A	N/A	
Washington, DC	N/A	N/A	
West Virginia	750	87	dissolved
Region 4			
Alabama	N/A	N/A	
Florida	N/A	N/A	
Georgia	N/A	N/A	
Kentucky	N/A	N/A	
Mississippi	N/A	N/A	
North Carolina	N/A	N/A	
South Carolina	N/A	N/A	
Tennessee	N/A	N/A	
Region 5			
Illinois	N/A	N/A	
Indiana	N/A	N/A	
Michigan	N/A	N/A	
Minnesota	750	87	for Class 2A
	1072	125	for Class 2B
Ohio	N/A	N/A	
Wisconsin	N/A	N/A	
Region 6			
Arkansas	N/A	N/A	
Louisiana	N/A	N/A	
New Mexico	750	87	dissolved
Oklahoma	N/A	N/A	
Texas	991	N/A	dissolved
Region 7			
Iowa	1106	87	for coldwaters
	4539	388	for warmwaters
Kansas	N/A	N/A	
Missouri	750 ug/l	N/A	dissolved
Nebraska	750	87	dissolved

STATE	ALUMINUM		DESCRIPTION OR QUALIFIERS
	ACUTE	CHRONIC	
Region 8			
Colorado	750	87	dissolved
Montana	N/A	N/A	Has 3 temporary site specific WQS
North Dakota	N/A	N/A	
South Dakota	N/A	N/A	
Utah	750	87	dissolved; 87 ug/l will not apply when pH >1 and hardness > 50 ppm as $CaCO_3$
Wyoming	750	87	87 ug/l will not apply when pH >7 and hardness > 50 ppm as $CaCO_3$; proposed to convert to dissolved
Region 9			
Arizona	N/A	N/A	
California	N/A	N/A	has site specific site criteria
Hawaii	750	260	dissolved
Nevada	N/A	N/A	
Region 10			
Alaska	750	87	
Idaho	N/A	N/A	
Oregon	N/A	N/A	Not yet been approved by EPA
Washington	N/A	N/A	

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

AUG 0 2 2001

Honorable David E. Hess
Pennsylvania Department of Environmental Protection
Rachel Carson State Office Building
P. O. Box 2063
Harrisburg, PA 17105-2063

Dear Secretary Hess:

The Pennsylvania Department of Environmental Protection (PADEP) finalized new and revised water quality standards by publishing the revised regulation in the *Pennsylvania Bulletin* on November 18, 2000. Pennsylvania's Independent Regulatory Review Commission had approved the new regulations on August 24, 2000. The Department of Environmental Protection's Office of Chief Counsel certified on December 13, 2000, that these regulatory changes were adopted pursuant to the Commonwealth's legal procedures, and that the Office of Attorney General and the Governor's Office of General Counsel had also approved the final regulatory changes for form and legality. The revised water quality standards and supporting material were forwarded to the United States Environmental Protection Agency (EPA) for review in accordance with Clean Water Act (CWA) Section 303(c)(2)(A) on December 15, 2000. This package was received by EPA Region III on December 20, 2000.

EPA Region III has completed its review of Pennsylvania's new or revised water quality standards. EPA hereby approves the Pennsylvania WQS submission as consistent with the requirements of the CWA and 40 CFR Part 131. EPA is impressed with the scope of this submission, and would like to commend especially the Department for its revisions to address the way that ambient concentrations and natural background levels are considered with regard to water quality criteria. EPA also appreciates Pennsylvania's change in rounding so that criteria are now rounded to two significant digits. Enclosures 1 (Chapter 93) and 2 (Chapter 16) to this letter list all sections of the new and revised regulations that are being approved in accordance with CWA Section 303(c)(3) and 40 CFR Part 131. Enclosure 3 provides additional detail on several approved provisions.

At this time, EPA is approving Pennsylvania's revision to its bacteria criteria, which are more stringent than its previous bacteria criteria and, therefore, consistent with Section 303(c) of the CWA requirements. However, the Commonwealth should be aware that in 1986, EPA published the *Ambient Water Quality Criteria for Bacteria*, which recommended that *Escherichia coli (E. coli)* and enterococci are the best indicators to determine potential risk from acute gastrointestinal disease. EPA is pursuing a national effort to have states adopt these indicators. In addition, the new Beach Act amendment to the CWA requires states with coastal and Great

Lakes waters to adopt these indicators by 2004. We ask that Pennsylvania enter into a management agreement with EPA Region III to accomplish this goal as soon as possible.

With its triennial review, Pennsylvania submitted the new Chapter 96 (Water Quality Standards Implementation) for our reference and general information, rather than for EPA review. As this chapter was not submitted for our review, we will not be approving or disapproving specific provisions. However, we do have several comments on this chapter that EPA will be providing to the Commonwealth under a separate letter.

As part of EPA's obligation under the Endangered Species Act (ESA), EPA prepared a biological evaluation to determine if our approval of the new and revised sections of the water quality standards will adversely affect threatened and endangered species and their critical habitat in Pennsylvania. Our biological evaluation found that our approval action would not adversely affect threatened or endangered species. We have shared this biological evaluation with the Fish and Wildlife Service and the National Marine Fisheries Service and they concurred with our finding on May 21, 2001 and May 15, 2001, respectively. We are enclosing a copy of the evaluation (Enclosure 4) for your information. The completion of the biological evaluation and concurrence from the Services fulfills our obligation under Section 7 of the ESA on this federal action.

We are looking forward to working with you and your staff on the management agreement regarding Pennsylvania's revisions to its bacteria criteria and on the Commonwealth's next triennial review. If you have any questions, please feel free to contact me or have your staff contact Cynthia Yu-Robinson at (215) 814-5557.

Sincerely,

Rebecca W. Hanmer

Rebecca W. Hanmer, Director
Water Protection Division

Enclosures (4)

cc: Larry Tropea (PADEP)
Terry Fabian (PADEP)
Fred Marrocco (PADEP) ✓
Edward Brezina (PADEP)
Carol Young (PADEP)
David Densmore (US FWS)
Tim Goodger (NMFS)

EPA has decided to approve the Pennsylvania adoption of the aquatic life criterion for mercury as inorganic. The main basis for our decision is that, regardless of the form of the criterion that is specified, at this time all EPA-approved methods for monitoring mercury measure for total mercury. According to a March 16, 2001, letter from the Commonwealth, no translator procedures or other methodology is used to reduce the analytical monitoring results in any way. Therefore, EPA finds that Pennsylvania will be applying its mercury criterion in a protective manner.

We would like to continue discussions with Pennsylvania on this topic, and will pass along information as to the toxic effects of methyl mercury as it becomes available. Should additional methods become available which allow for distinguishing between total and inorganic mercury, EPA would revisit this approval.

Aquatic Life Aluminum

In 1994, EPA disapproved Pennsylvania's aluminum criteria. In order to address that disapproval, Pennsylvania adopted EPA's recommended aquatic life criterion for protection from acute exposures. EPA had requested that the Commonwealth adopt the chronic number as well, or provide a rationale as to why it did not. The Commonwealth did not adopt the chronic criterion, and in response expressed their discomfort with the EPA chronic recommendation, citing the chronic toxicity test results that showed inconsistencies within tests and between studies. Pennsylvania also objected to the lowering of the final chronic value based on the protection of brook trout and striped bass, noting that EPA had previously asserted that these data should not be used in the criterion development.

Aluminum is considered a non-priority pollutant by EPA, and on that basis and the basis that EPA Region III recognizes the uncertainty surrounding the chronic aquatic life criteria, we will not recommend to the Administrator that she use her discretionary authority and promulgate the chronic aluminum aquatic life criterion at this time. However, should additional information become available, or if there are indications that aquatic species in the Commonwealth are being impacted by chronic levels of aluminum, EPA Region III may reconsider this position.

Appendix A: Water Quality Criteria for Toxic Substances

With the exception of a few parameters noted below, this biological evaluation will not address the appropriateness of aquatic life criteria established based on EPA recommendations. All of these parameters will be considered under the national consultation on water quality criteria called for under the recent ESA MOA. As stated in the ESA MOA, separate consultation on criteria that are identical to or more stringent than the existing 304(a) criteria, will not be necessary, subject to requirements related to reinitiation of consultation under 50 CFR 402.16. EPA's approval action on these criteria is subject to revision based on the results of the consultation.

Aluminum

This criterion had been previously disapproved by EPA when it was located in Chapter 93. In order to address the disapproval, Pennsylvania adopted EPA's acute aquatic life recommendation in Chapter 16. Pennsylvania adopted the EPA recommendation for the protection of aquatic life from acute exposures (the appropriateness of the acute criterion will be addressed under the national consultation), but did not adopt EPA's chronic recommendation. The Department believes that the federal aluminum chronic criterion of 87ug/l should not be adopted because it is based on chronic toxicity test results that show inconsistencies within tests and between studies, and it question the supporting data on which the chronic criterion has been based. Pennsylvania indicates that the chronic studies described in the 1988 Ambient Water Quality Criteria for Aluminum do not reveal a consistent pattern of toxicological response to the different exposure concentrations within and/or between the various tests described, and that the final chronic value should be equal to the Criterion Maximum Concentration (CMC) since, based on available acute-chronic ratios, the final FACR should be 0.9958. According to EPA's criteria development guidance, the FACR cannot be less than two so that a final chronic value cannot exceed the CMC. However, EPA lowered the final chronic value to 87 ug/l, saying it was necessary to protect brook trout and striped bass.

The issues surrounding the chronic aluminum criterion are not new, and EPA Region III is not taking issue with Pennsylvania's lack of a criterion at this time. We do not believe that the absence of the chronic criterion will be adversely affect threatened and endangered species in Pennsylvania. Our reasoning is that the two specific species that the chronic criterion was lowered to protect, brook trout and striped bass, are not threatened or endangered. Also, if Pennsylvania finds that other species are being adversely effected by chronic exposures to aluminum, they could use the general criteria to develop a protective criterion.

Mercury

Pennsylvania has adopted EPA recommendations to protect aquatic life from mercury. EPA specifies in its ***National Recommended Water Quality Criteria-Correction*** (April 1999) that while the mercury criterion was developed based upon data for only inorganic mercury, it should be applied to total mercury. If not, depending upon the amount of organic mercury in the water

RULES AND REGULATIONS

Title 25--ENVIRONMENTAL PROTECTION

ENVIRONMENTAL QUALITY BOARD

[25 PA. CODE CHS. 92, 93 AND 95--97]

Water Quality

[30 Pa.B. 6059]

The Environmental Quality Board (Board) is amending Chapters 92, 93, 95 and 97, and adding new Chapter 96, as set forth in Annex A. This notice is given under Board order at its meeting of June 20, 2000.

A. *Effective Date*

These amendments will be effective upon publication in the *Pennsylvania Bulletin* as final rulemaking.

B. *Contact Persons*

For further information on Chapters 92 and 97 (relating to National Pollutant Discharge Elimination System; and industrial wastes), contact Milton Lauch, Chief, Division of Wastewater Management, Bureau of Water Quality Management, 11th Floor, Rachel Carson State Office Building, P. O. Box 8465, Harrisburg, PA 17105-8465, (717) 787-8184, or William J. Gerlach and William S. Cummings, Jr., Assistant Counsels, Bureau of Regulatory Counsel, 9th Floor, Rachel Carson State Office Building, P. O. Box 8464, Harrisburg, PA 17105-8464, (717) 787-7060.

For further information on Chapters 93, 95 and 96 (relating to water quality standards; wastewater treatment requirements; and water quality standards implementation), contact Edward R. Brezina, Chief, Division of Water Quality Assessment and Standards, Bureau of Watershed Conservation, 10th Floor, Rachel Carson State Office Building, P. O. Box 8555, Harrisburg, PA 17105-8555, (717) 787-9637 or William J. Gerlach, Assistant Counsel, Bureau of Regulatory Counsel, 9th Floor, Rachel Carson State Office Building, P. O. Box 8464, Harrisburg, PA 17105-8464, (717) 787-7060.

Persons with a disability may use the AT&T Relay Service by calling (800) 654-5984 (TDD users) or (800) 654-5988 (voice users) and request that the call be relayed. These final-form regulations are available electronically through the Department of Environmental

Protection's (Department) website (http://www.dep.state.pa.us).

C. *Statutory Authority*

These amendments are made under the authority of the following acts: sections 5(b)(1) and 402 of The Clean Streams Law (35 P. S. §§ 691.5(b)(1) and 691.402) and section 1920-A of The Administrative Code of 1929 (71 P. S. § 510- 20), which grant to the Board the authority to develop and adopt rules and regulations to implement the provisions of The Clean Streams Law (35 P. S. §§ 691.1--691.1001).

D. *Background and Summary*

This final rulemaking revises water quality management regulations including Chapters 92, 93, 95 and 97, and creates a new Chapter 96 to incorporate Total Maximum Daily Loads (TMDLs) into the regulatory calculus, all as part of the Regulatory Basics Initiative (RBI). The RBI is a multistep process to evaluate regulations considering several factors including whether requirements are more stringent than Federal regulations without good reason; impose economic costs disproportionate to the environmental benefit; are prescriptive rather than performance-based; inhibit green technology and pollution prevention strategies; are obsolete or redundant; lack clarity; or are written in a way that causes significant noncompliance.

These regulatory revisions streamline and clarify regulatory requirements, update the regulations to be consistent with Federal regulatory changes where indicated, consolidate certain chapters, and preserve Pennsylvania-specific requirements to serve the citizens of this Commonwealth. These final-form regulations may affect persons who discharge wastewater into surface waters of this Commonwealth or otherwise conduct activities which may impact these waters.

The Air and Water Quality Technical Advisory Committee (AWQTAC) and its successor committee, the Water Resources Advisory Committee (WRAC), provided input on the proposed amendments. The proposal was adopted by the Board as proposed rulemaking at its June 16, 1998, meeting. The proposal appeared at 28 Pa.B. 4431 (August 29, 1998), with provisions for a 60-day public comment period and three public hearings. The public comment period concluded on October 28, 1998. In response to the public comments received on the proposal, the Department revised the proposal in the form of an Advance Notice of Final Rulemaking (ANFR) proposal. Notice of the availability of the ANFR appeared at 29 Pa.B. 4872 (September 18, 1999) with provisions for a public comment period open until November 17, 1999, and three public meetings/hearings. The Department received approximately 1,500 public comments on the ANFR. The comments received on the proposed regulations and on the draft final regulations are summarized in Section E of the Preamble.

The Board has considered all of the public comments received on both its proposed rulemaking and the Department's ANFR in preparing these final-form regulations. Those portions of the draft final-form regulations that would potentially affect agriculture were presented to the Agricultural Advisory Board (AAB) on February 16, 2000. Following the meeting, the AAB sent a letter to Secretary Seif in opposition to the existing regulatory requirements concerning public hearings for individual NPDES permit applications for existing concentrated animal feeding operations (CAFOs) in High Quality and Exceptional

Value Waters. The draft final-form regulations were discussed with and approved by WRAC on March 8, 2000. WRAC also submitted minutes of its meeting to document its comments on the regulations. The valuable input from the public and the collective knowledge and experience drawn from advisory committees and others on these proposals has been utilized to develop a regulation which carefully balances the needs of citizens and the regulated community in assuring the protection of this Commonwealth's waters.

E. *Summary of Comments and Responses on the Proposed Rulemaking and the ANFR*

These regulatory revisions streamline, clarify and consolidate the regulatory requirements. Specifically, Chapter 92 has been modified to incorporate portions from other chapters to address the permitting of wastewater discharges into surface waters. The water quality standards implementation provisions in Chapter 93 and portions of Chapter 95 are moved to Chapters 96 and 92, as appropriate. Chapter 96 incorporates existing and modified provisions of Chapters 93, 95 and 97, and includes language describing TMDLs and individual water quality-based effluent limitations. The provisions of Chapter 97 have been relocated to Chapters 92, 95 and 96.

The preamble to the proposed rulemaking asked for comment on three specific issues. 1) A few comments were received on the question of additional public participation for NPDES permitting. The comments were split on the issue, and no change has been made to the current requirements. 2) The question of whether or not the potable water supply use should continue to be a Statewide use, or if it should be changed so that applicable water quality criteria are only applied at existing or planned potable water supply intakes, received several comments on both sides. Some comments stated that additional burdens were placed on dischargers to meet criteria more stringent than necessary, and other comments believed that protection of human health and water supplies were the most important factors in the decision. Based on an analysis of public comments and on the basis that the potable water supply use has been protected Statewide for many years and will impose no new requirements on dischargers, no change is being made to the potable water supply use, and the current language is retained. 3) No one commented on the request seeking alternative methods of analysis for color.

Because portions of this regulatory package constitute the Triennial Review of Water Quality Standards mandated by Environmental Protection Agency (EPA) regulations in 40 CFR Part 131 (relating to water quality standards), the following considerations were made. Part of the review requires that states reexamine waterbody segments that do not meet the fishable or swimmable uses specified in section 101(a)(2) of the Federal Clean Water Act (33 U.S.C.A. § 1251(a)(2)). The Department evaluated the two waterbodies where the uses are not met: (1) the Harbor Basin and entrance channel to Outer Erie Harbor/ Presque Isle Bay and (2) several zones in the Delaware Estuary.

The swimmable use designation was deleted from the Harbor Basin and entrance channel demarcated by United States Coast Guard buoys and channel markers on Outer Erie Harbor/Presque Isle Bay because boat and shipping traffic pose a serious safety hazard in this area. This decision was based on a use attainability study in 1985. Because the same conditions exist today, no change to the designated use for Outer Erie Harbor/Presque Isle Bay is made.

The Department cooperated with the Delaware River Basin Commission (DRBC), EPA and other DRBC signatory states on a comprehensive use attainability study in the lower

Delaware River and Delaware Estuary. This study resulted in appropriate recommendations relating to the swimmable use, which the DRBC included in water use classifications and water quality criteria for portions of the tidal Delaware River in May 1991. Criteria for enterococcus and changes in application to the fecal coliform criteria in this area reflect the use. The changes were incorporated into §§ 93.9e and 93.9g (relating to Drainage Lists E and G) in 1994. The primary water contact use remains excluded from the designated uses for river miles 108.4 to 81.8 because of continuing significant impacts from combined sewer overflows.

The Department is also incorporating §§ 92.8a(c), 92.13(b), 92.21(b)(5) and 92.55 into its water quality standards. This clarifies the Department's ability to incorporate schedules of compliance in NPDES permits when a Federal statutory deadline has passed pursuant to the decision in *In the Matter of Star-Kist Caribe, Inc.*, NPDES Appeal No. 88-5, 1990 NPDES LEXIS 4 (April 16, 1990).

In addition, an error in § 93.9p (relating to Drainage List P) for Tunungwant Creek in McKean County, which states that the water contact sport use (WC) should be deleted for the main stem portion from the confluence of the East and West Branches to the PA-NY State border, has been corrected. The Department conducted a use attainability study for Tunungwant Creek in 1985 and concluded that, while there were existing land use and man-made activities adversely affecting the quality of water and limiting recreational uses in the stream, these man-induced conditions were not considered irretrievable. Accordingly, the water contact sports use was added as a designated use to Tunungwant Creek at the November 15, 1988, Board meeting, and this final-form rulemaking was published at 17 Pa.B. 968 (March 11, 1989). This regulatory revision was not, however, incorporated into the *Pennsylvania Code* until now.

A detailed description of the revisions to the proposal by chapter and section follows:

General

Many comments objected that the proposal weakened water quality protection in this Commonwealth and that the comment period was insufficient to address the wide scope of changes. In response, the Department prepared an ANFR and offered an additional comment period and a series of three public informational meetings and public hearings. The change of most concern in Chapter 92 was § 92.81(a)(5) (relating to toxic or hazardous pollutants and general NPDES permits). In response to comments, the current language of the section, prohibiting the use of general NPDES permits in High Quality and Exceptional Value Waters, is retained.

Other comments suggested that the Department should make its water quality standards more stringent than Federal regulations or as stringent as practicable. The RBI only allows for more stringent standards when a compelling state interest is established.

A commentator stated that State regulations cannot become effective until receipt of EPA approval, based on a Federal case in Alaska. First, this case applied only to water quality standards, and not other State regulations which regulate water quality in some way, such as implementation regulations. Moreover, the Commonwealth has the duty and obligation under State statutes to promulgate and implement regulations, including water quality standards regulations, to protect this Commonwealth's water quality regardless of Federal action, delay or inaction. The revisions to the Federal regulations which became final on April 27, 2000 (64 Fed. Reg. 37072) only apply to water quality standards "for Clean Water Act" (CWA) purposes. The Commonwealth will continue to issue NPDES permits based on the best available scientific information in its water quality standards, which may or may not be included in a water quality standards regulation approved by the EPA for CWA purposes. The Department, not the EPA, must defend the permits it issues in this Commonwealth, and has an obligation to apply applicable State water quality standards regulations in issuing the permits. The EPA has the legal right to object to an NPDES permit if they believe the state water quality standard used as a basis for the permit limit is insufficient for CWA purposes.

Concern was expressed that the public comment period was insufficient. The Department provided an additional 60-day public comment period following the 30-day comment period to obtain additional input on the regulations. Over 300 commentators took advantage of the extended comment period.

Chapter 92. National Pollutant Discharge Elimination System

The provisions of this chapter incorporate by reference portions of Federal regulations. This was done to limit the verbatim transfer of lengthy Federal regulations into this chapter. For this reason, it may be necessary for permittees to refer to Chapter 92 and 40 CFR Parts 122, 124 and 125 (relating to EPA administered permit programs: the National Pollutant Discharge Elimination System; procedures for decisionmaking; and criteria and standards for the National Pollutant Discharge Elimination System) to determine applicable requirements.

§ 92.1. Definitions.

The following definitions contained in the proposal were deleted in the final-form regulations: "average annual discharge limitation," "average monthly discharge limitation," "average weekly discharge limitation," "bypass," "complete application," "LA-Load allocation," "loading capacity," "major facility," "natural quality," "operator," "owner," "separate storm sewer overflow," "TMDL" and "WLA-Wasteload allocation." Deletions were based on comments received regarding the need for or clarity of these definitions.

Definitions for "agricultural operation," "AEU--animal equivalent unit (AEU)," "CAO--concentrated animal operation," "indirect discharger," "intermittent stream," "perennial stream" and "small municipal separate storm sewer system" were added and the proposed definition of "CAFO--concentrated animal feeding operation" was modified based on comments recommending that the Department's CAFO Strategy be incorporated in the final-form regulations.

Commentators recommended that a number of definitions be modified to be more consistent with Federal definitions. A number of definitions were modified in the final rule as follows:

The definition of "BAT--Best available technology" was modified to make the definition more consistent with the Federal definition.

The definition of "BMPs--Best Management Practices" was modified by deleting the phrase "pollution prevention measures; source reduction procedures; water conservation practices; erosion and sedimentation control plans, stormwater management measures; and" to be more consistent with the Federal definition.

The definition of "conventional pollutant" has been modified by deleting "nitrites, nitrate nitrogen and phosphorous" to make the definition consistent with the Federal definition.

The term "facility or activity" is modified to be consistent with the Federal definition.

The word "used" has been deleted from the definition of "effluent limitation guideline" to make the definition consistent with the Federal definition.

The eight permit categories listed within the definition of "point source" were deleted to simplify the definition. The word "or" was deleted and "and" inserted in lieu thereof to make the definition more consistent with the Federal definition.

Commentators proposed revisions to definitions for clarity. The following changes were made to definitions in the final-form regulations:

The definition of "CCW--Contact cooling water" was amended by deleting the phrase ", or which otherwise has the potential to become contaminated" because it was unclear.

The definition of "CSO--Combined sewer overflow" was amended to make it clear that these overflows occur "prior to reaching the headworks of the sewage treatment facility."

Definitions for "intermittent stream" and "perennial stream" were added because these terms are used in the definition of surface waters.

The definition of "NPDES reporting form" is clarified by deleting "which includes" from the definition and adding "and" in lieu thereof.

The last sentence in the definition of "process wastewater" was deleted as unnecessary.

The definition of "stormwater discharges associated with construction activities" was revised to provide consistency with the definition of "NPDES permit for stormwater discharges associated with construction activities" in § 102.1 (relating to definitions).

Recommended changes to the definitions of "best available technology," "applicable effluent limitations" and "toxic pollutant" were not made because the definitions are based on Federal definitions.

§ 92.2. Incorporation of Federal regulations by reference.

A commentator stated that incorporation of Federal regulations by reference violates State law. This practice is not a violation of any State law and has been done before.

In response to comments requesting clarity, the last sentence of § 92.2(a) (relating to incorporation of Federal regulations by reference) has been deleted and new language added to clarify that if there is a conflict among Federal and State regulatory provisions, the provision in Chapter 92 shall be used unless the Federal provision is more stringent.

A typographical error was corrected by changing "(h)(1)" to "(h), (i)(2), (j), (k), (l)" in subsection (b)(5).

In response to comments received, subsection (b)(6) was deleted in the final-form regulations to incorporate the Department's CAFO Strategy into the regulations. The Federal references are inconsistent with the strategy.

Several commentators suggested sections of the Federal regulations that should have been incorporated by reference because they are not addressed in Chapter 92. Subsection (b)(19), (22) and (23) was added in the final-form regulations to identify these additional Federal provisions incorporated by reference.

Commentators questioned the meaning of the qualifying term "substantive and procedural." Subsection (c) was amended in the final-form regulations by deleting the words "substantive or procedural" to make the section more clear.

§ 92.2a. Treatment requirements.

Subsection (a) was modified in the final-form regulations by deleting the last sentence limiting treatment requirements and effluent limits to those established under the Federal Clean Water Act (33 U.S.C.A. §§ 1251--1376).

Commentators questioned the protection of threatened species not yet listed in the Pennsylvania Natural Diversity Inventory but included on Federal listings. The reference to the "Pennsylvania Natural Diversity Inventory" (PNDI) in subsection (c) has been deleted to allow for consideration of threatened species not yet included on that list, but established as threatened when someone identifies and documents the presence of these to the Department. The PNDI will still be used as the source of information for threatened species in this Commonwealth.

§ 92.2b. Pollution prevention.

The proposed pollution prevention amendments were deleted based on comments questioning the inclusion of guidelines that are not regulatory requirements, and the potential for these recommendations to take on regulatory meaning. This section was revised to provide that the Department will encourage pollution prevention and provide assistance to permittees in the consideration of pollution prevention measures. Comments were received opposing this change during the ANFR comment period. Commentators stated that the change weakened the regulations. The changes to this section proposed during the ANFR were retained in the final-form regulations. The Department believes that the regulations should place the burden of encouraging pollution prevention on the Department and that this program functions best when a voluntary approach is used. Recommendations related to pollution prevention activities for permittees are not appropriate for regulation. The language in this section is based on language in recent revisions to Chapter 91 that became effective on January 29, 2000. See 30 Pa.B. 521 (January 29, 2000).

§ 92.2c. Minimum Sewage and Industrial Waste Treatment Requirement.

Subsection (a) was modified to specify that secondary treatment is applicable to all sewage discharges, except sanitary sewer overflows (SSOs) which are prohibited in accordance with § 92.73(8), and combined sewer overflows (CSOs), which need not attain secondary treatment if they implement Department-approved nine minimum controls (NMCs) and a long-term control plan (LTCP).

The phrase "after direct application or encouragement of pollution prevention approaches, including in-process recycling and reuse" was deleted in subsection (b)(4) to be consistent with the changes to § 92.2b, relating to pollution prevention. Additionally, subsection (b)(4) was changed to reference and clarify the applicability of provisions for quality standards and oil-bearing wastewater to NPDES discharges.

A new subsection (c), providing a cross reference to § 95.2 (relating to quality standards and oil-bearing wastewaters) has been added to the final-form regulations. This change was not included in the proposed rulemaking.

§ 92.2d. Technology-based standards.

Paragraph (3)(i)(C) is modified in the final-form regulations by deleting the phrase "other pollution prevention approaches" to be consistent with the changes made to § 92.2b discussed previously.

Some commentators supported the retention of 0.5 mg/l effluent limitation for discharges of total residual chlorine while others felt the regulations were too stringent and suggested a lesser residual chlorine limit. Others objected to the dechlorination provisions in paragraph (3)(iii) in special protection waters. These provisions were modified in the final-form regulations as a result of terminology changes in the Department's antidegradation regulations in § 93.4c(b)(1)(iii).

There were objections to the transfer of provisions from Chapter 97 to Chapter 92 regarding oils creating a sheen. These provisions were determined to apply to both NPDES and non-NPDES discharges and were consequently moved to Chapter 95 in the final-form regulations. A reference to § 95.2 was added to paragraph (4) of the final-form regulations. Comments were received in support of this change.

§ 92.4. Exclusions from Permit Requirements.

There was a request that natural gas and oil producing activities receive a permit exemption because it was asserted that these operations are similar to agricultural and silviculture activities that have such a permit exemption. The exemptions are based on Federal regulations and they do not include oil and gas producing activities. The change was not made.

A commentator objected to the proposed pollution prevention language in subsection (a)(6). The phrase was deleted for reasons described in a response related to § 92.2b. Other clarifying changes were also made to this provision.

§ 92.5a. Concentrated animal feeding operations.

As proposed, this section would have authorized a "permit by rule" for CAFOs meeting certain requirements. The Department issued a "Final Strategy for Meeting Federal

Requirements for Controlling the Water Quality Impacts of Concentrated Animal Feeding Operations" in March 1999. A notice of the availability of that strategy was published at 29 Pa.B. 1439 (March 13, 1999). The strategy does not provide for coverage under a permit by rule. Commentators recommended incorporation of the final strategy into the regulations. Accordingly, the proposed language of § 92.5a was deleted and replaced in the final-form regulations with regulations consistent with the published strategy.

§ 92.6a. Persons required to apply.

The proposed language was supported by one commentator, while another recommended it be changed to require the person with financial control over the operation to be the permittee. This entire provision was deleted in the final-form regulations as unnecessary. The Department will continue to permit persons with point source discharges, which includes owners, operators and others, as appropriate, as it has done for many years.

§ 92.7. New or increased discharges or change of wastestreams.

The final-form regulations replace the word "director" with the word "Department" for clarity. Commentators objected to the lack of clarity of the phrase "or which would include any new pollutant not covered by the NPDES permit" at the end of the last sentence in the section as part of the ANFR. The language has been amended in the final-form regulations to more clearly limit this requirement to those pollutants not identified in a previous permit application.

§ 92.8a. Changes in treatment requirements.

The proposed pollution prevention language in the last sentences of subsections (a) and (b) has been deleted to be consistent with the changes made to § 92.2b.

A commentator asserted that the provisions of subsection (a) are violations of due process protections, more stringent than Federal regulations and beyond the power of the Department. This provision was transferred intact from two other chapters that were previously approved as to form and legality by the Office of the Attorney General. Actions taken under these provisions may be appealable to the Environmental Hearing Board (EHB). The provisions were retained in the final-form regulations.

Commentators expressed concern regarding the proposed 90-day time period to complete an extensive report. They suggested 180 days and opposed the language allowing the Department to unilaterally shorten the time frame without any regulatory restraints or procedures. Subsection (b) has been modified in the final-form regulations rule to increase the time allowed for submission of the required report from 90 to 180 days. In addition, the phrase "or within a lesser period as the Department may specify" was deleted. The last part of the following sentence was also changed to ensure consistency with a previous reference in the sentence to water quality standards by inserting the word "standards" following the phrase "water quality."

A commentator was concerned that this section did not include authority to impose permit modifications with compliance schedules. Subsection (c) was modified in the final-form regulations to add a phrase that provides the option of imposing permit modifications with compliance schedules to achieve compliance.

§ 92.11. Duration of standards for certain new sources.

A commentator suggested the more stringent standard of performance be for the lesser of 10 years or during the depreciation period. This suggested change was not made because this regulation is based on Federal regulatory requirements.

Proposed rulemaking included a deletion of the phrase "standards of performance shall" and insertion of the phrase "requirements will" in lieu thereof. The final-form regulations reestablishes the original language based on comments opposing the new language as unclear.

§ 92.13. Reissuance or renewal of permits.

With respect to subsection (a), commentators expressed concern that the Department's Money-Back Guarantee time limits are inconsistent with the regulatory permit review limits. The Money-Back Guarantee does not influence the Department's ability to process permits in a shorter time frame. No changes were made to this section.

Some commentators suggested that recent case law would require incorporation of a broad compliance review for all permitting activities. The scope of the compliance evaluation in subsection (b)(1) was expanded in the final-form regulations to include all Department issued permits, regulations and orders. A reference to other appropriate regulations was included at the end of the subsection to allow consideration of compliance schedules outside of the requirements of Chapter 92.

§ 92.21. Applications.

Some commentators requested the reinsertion of the phrase "not less than" in the final-form regulations to eliminate a perception that the proposed language required submittal at exactly 180 days. The recommended phrase has been reinserted in the final rule to provide clarity. Other commentators expressed concern that the time limits in the regulation were inconsistent with Department's Money-Back Guarantee. No change was made because the Money-Back Guarantee does not impact the Department's ability to process applications in a shorter period of time.

Based on comments received, a new paragraph (5) is added in the final-form regulations which includes a requirement for documentation that the applicant is in compliance with all existing Department permits, regulations, orders and schedules of compliance, consistent with similar changes made in § 92.13 (relating to reissuance or renewal of permits). Commentators suggested requiring the newspaper publication in subsection (b)(3) only for major modifications of the facility. No change was made because The Clean Streams Law requires this.

Subsection (c)(2) was deleted in the final-form regulations to be consistent with the revisions made to § 92.2b (relating to pollution prevention).

Comments on subsection (c) stated that some of the required information for a new facility application is generally available only after the commencement of a discharge, not when an application for a facility is being prepared. Accordingly, the provisions of subsection (c)(3)--(5) were transferred to a new subsection (d) which states that the

Department may require an applicant for a modification, renewal or reissuance of a permit under § 92.13, or when required under 40 CFR Part 122 to provide this information. In addition, proposed subsection (c)(6) is renumbered as subsection (c)(2) and proposed subsections (d)--(f) are renumbered as subsections (e)--(g).

§ 92.21a. Additional application requirements for classes of discharges.

A commentator requested that the provisions related to the determination that aquatic communities are excluded be clarified. Subsection (e) has been modified in the final-form regulations to state that water quality data confirming a lack of improvement will be the measure of the exclusion of aquatic communities.

Subsection (d) is clarified to cross reference the requirements in Chapter 102 for stormwater dischargers associated with construction activities.

Subsection (e)(2)(iii) is revised by providing a cross reference to the definition of "TMDL" in § 96.1 to provide clarity.

Proposed language in subsection (f) relating to discharges with approved pretreatment programs was deleted in the final rule. Subsections (g) and (h) of the proposal were renumbered as subsections (f) and (g) respectively.

Commentators stated that the elimination of CSOs is impossible, that the time required is too extensive to make this requirement a prerequisite to a permit renewal, that identifying all points of influent is impossible, and that elimination should only be required where the discharge will not meet water quality based effluent limitations. Subsection (f) of the final-form regulations includes provisions to allow for submitting a long-term control plan to "minimize" or "eliminate" CSO discharges. These changes are consistent with Department's published CSO Strategy. Additional revisions delete proposed subsections (g)(3)(i)--(v) and, in lieu thereof, reference a Federal publication rather than listing its content in summary in the regulations. Subparagrah (vi) was renumbered (ii) and a requirement for an implementation schedule was added to the final-form regulations (third element of an approvable CSO program). The provisions relating to the identification of points of inflow into combined sewers is retained in the final-form regulations. This activity is a necessary part of compliance with the nine minimum controls related to the minimization or elimination of CSOs.

Editorial changes were made to subsection (h) (now (g)) in the final-form regulations.

§ 92.22. Application fees.

A new subsection (f) was added to provide an exemption from permit fees for certain CAFOs consistent with the Department's CAFO Strategy. Existing subsection (f) was renumbered as (g).

§ 92.25. Incomplete applications or notice of intent.

A minor editorial change to the proposal is made. The proposal references a notice of intent "to participate in" an NPDES general permit. The phrase "participate in" is replaced with "be covered by" since that is a more accurate description of the general permit process.

§ 92.31. Effluent limitations or standards.

An editorial change was made to subsection (a). Subsection (a)(9) was added to cross reference water quality protection requirements in Chapter 96 and subsection (a)(10) was added to cross reference antidegradation requirements.

§ 92.41. Monitoring.

A number of commentators objected to the addition of proposed subsection (b), asserting that the provisions allow arbitrary requirements and time limits to be set by the Department. The proposed subsection was proposed for deletion in the ANFR. After reconsideration, this language was rewritten to eliminate those portions of the provision on which objections were received. References to requests for additional information by the Department, which were perceived as arbitrary were deleted, and provisions retained which establish monitoring and reporting requirements to be incorporated in permit documents. The last two sentences of proposed subsection (b) (relating to monitoring pollutants not limited in the permit) are deleted in the final-form regulations. Commentators asserted that these provisions were overly broad, inconsistent with Federal requirements or not in the spirit of the RBI.

The amendments to subsections (c) and (g) make it clear that the monitoring requirements of subsection (g) also apply to stormwater discharges associated with construction activities and that subsection (c) is not applicable to stormwater discharges associated with industrial activity. No comments were received on this change. The proposed change is retained in the final-form regulations.

§ 92.51. Standard conditions in permits.

Some commentators suggested that the language in proposed paragraph (6) was confusing and should be simplified to say that compliance with all water quality standards is required. The proposed subsection was clarified in the ANFR by breaking it up into two sentences. Additional comments were received asserting that the changes made the provisions less clear. The final-form regulations incorporate the provisions into a single sentence and retains language that is consistent with the intent of the original regulation. A new paragraph (7) was added to the final-form regulations in response to comments to clearly state that dischargers must comply with applicable water quality standards.

§ 92.52a. Site specific permit conditions.

The final-form regulations delete the last sentence proposing pollution prevention measures. This change is consistent with the position described in response to comments made on § 92.2b. Commentators stated that the proposed provisions were too broad and that BMPs should be established through the regulatory process. The final-form regulations includes a provision that requires permittees to identify BMPs reasonably necessary to achieve effluent limitations and standards or to carry out the purpose and intent of the Federal Act (the Clean Water Act) and to implement toxic reduction activities, effluent limitations based on WETT and other measures which eliminate or substantially reduce pollutants at their source. These final-form regulations provide the permittee with the opportunity to take an active role in establishing sufficient BMPs to achieve protection of surface waters.

§ 92.61. Public notice of permit application and public hearing.

WRAC recommended that the Department seek public comment on the need for an additional public notice when an NPDES application is renewed or when an applicant intends to apply for an NPDES permit, before an application is completed. Comments on this issue ranged from support for the notice of intent to support for no additional public notice. The Department believes the existing requirements for public notice are sufficient and no change has been made in the final-form regulations.

A new subsection (a)(9) was added to cross reference regulations promulgated at 29 Pa.B. 3720 (July 17, 1999) which provide that the notice shall include the antidegradation classification of the receiving surface water.

§ 92.71a. Transfer of permit.

Based on comments received regarding the need to include compliance evaluations as a part of permit actions, a new paragraph (4) has been added to the final-form regulations that requires compliance with all Department permits prior to approval of permit transfers.

§ 92.72a. Cessation of discharge.

Commentators stated that the 180-day notice should be reduced to 90 days to be consistent with State mandated notification requirements. The final-form regulations establishes the 90-day notification requirement.

§ 92.73. Prohibition of certain discharges.

This section is revised to provide that a permit will not be issued, modified, renewed or reissued under any of the conditions enumerated.

Paragraph (8) of the proposal provided that a permit will not be issued to a "discharger with a sanitary sewer overflow unless the discharger can demonstrate that it is taking measures to eliminate any overflows as soon as practicable, including, but not limited to a complete evaluation of the sanitary sewer system, the reduction of infiltration and inflow into the sanitary sewer system, the elimination of illegal hookups to the system, the institution of a ban or prohibition on sewer hookups to the sanitary sewer, and any other measures which will eliminate the overflows." The quoted portion of this subsection was deleted in the final rule because it is inconsistent with applicable State and Federal policy. The final-form regulations states that a permit will not be issued for a sanitary sewer overflow, except as provided for in the Federal regulations.

§ 92.81. General NPDES permits.

A large number of commentators objected to the proposed revisions to subsection (a)(5) because of a perception that this provision would allow discharge of toxic substances under a general permit. While the Department had no such intent when these amendments were drafted, the existing language prohibiting issuance of an NPDES general permit for the discharges has been reinstated in the final-form regulations.

Subsection (a)(8) of the proposal would have authorized issuance of a general permit for discharges to High Quality Waters, but not to Exceptional Value Waters. A large number of commentators objected to this provision at proposed rulemaking. Accordingly, as part of the ANFR it was proposed to reinstate existing language that prohibits the issuance of general NPDES permits for activities in High Quality Waters. In response to the ANFR, the Department received a very large number of comments on both sides of this issue. The final-form regulations retain the reinstated (or existing) language prohibiting the issuance of general permits in High Quality Waters. This provision supports the Department's overriding State interest in the protection of High Quality Waters and in the provision of a broad opportunity for public comment when permit applications are received for facilities proposed in these watersheds. In addition, a recently developed individual NPDES permit for existing CAFOs in High Quality Waters clearly demonstrates the ability to create a simplified permit application process under the individual NPDES regulations while protecting the environment. A conforming change was made in § 92.83(b)(9) (relating to denial of coverage under a general NPDES permit).

The Board received comments objecting to the proposed deletion of a provision that general NPDES permits are to comply with of §§ 92.59 and 92.83(a)(1) (relating to documentation of permit conditions; and inclusion of individual discharges in general NPDES permits) that dischargers "certify" rather than "demonstrate" that the discharge will not result in a violation of an applicable water quality standard. Accordingly, the reference to § 92.59 was reinstated in § 92.81(b) and the existing term "demonstrate" reinserted in lieu of "certify" in § 92.83(a)(1) in the final-form regulations.

Some commentators opposed the proposed revisions to subsections (c) and (d) because they believed some of the options eliminated the opportunity for public comment. Two subsections proposed the inclusion of language from the Federal regulations that would have allowed discharges to commence: (1) on a date specified in the general permit; and (2) upon receipt of the notice of intent by the Department. These proposals have been deleted in the final-form regulations because they create circumstances that would make it impossible for the Department to keep a record of these discharges and they would have provided no opportunity for public comment. In addition, the proposal provided that a discharge under a general NPDES permit would be authorized after a waiting period specified in the general permit. This provision is retained, but clarifying language is added stating that the discharge may only commence following receipt of a Notice of Intent (NOI) by the Department. In addition, the provision authorizing the commencement of discharges "upon receipt of the notification of inclusion by the Department" is revised in the final rule to provide that the discharge may commence upon receipt of notification of approval of coverage under the general NPDES permit from the Department. Subsection (d) of the proposal relating to when an NOI would not be required was deleted in the final-form regulations for the same reasons outlined. Proposed subsection (e) was renumbered as subsection (d).

Commentators questioned the need for proposed subsection (e). This section was modified as subsection (d) in the final-from regulations to provide that the Department "will" notify a discharger that it is "or is not" covered under a general NPDES permit. In addition, the clause, "even if the discharger has not submitted a notice of intent to be covered" was deleted.

§ 92.83. Inclusion of individual dischargers in general NPDES permits.

Subsection (a)(3)(iii) has been deleted because it would have, consistent with the approach allowed under the Federal regulations, authorized the Department to provide no public notice of applications for general permits or approvals of coverage. This provision was not carried forward in the final-form regulations because it did not allow for sufficient public notice. Subsection (a)(1) was amended to clarify applicable requirements for NOIs.

A number of commentators commented that the EHB recently issued a ruling stating that compliance history review is not limited to prior NPDES permits, but to all permits issued by the Department. A commentator also asserted that the list of items to be considered was inconsistent with The Clean Streams Law. Accordingly, subsection (b) was revised to include violations of Department-issued permit as grounds for denial of the general permit coverage and to reference the entire list of items to be considered under The Clean Streams Law. The remainder of the subsection was renumbered.

§ 92.92. Method of seeking civil penalty.

A commentator objected to the regulation on the basis that it removes a right to a prehearing for alleged violations. A discussion of the due process protections provided by the procedures established in the regulation is provided in the comment and response document.

§ 92.93. Procedure for civil penalty assessments.

There were several comments requesting clarifying language regarding delivery of notices, the specifics of the hearing procedure, the scheduling of hearings, posting notice, and provision of notice from the Department concerning EHB rules of practice. A change was made in the final rule to subsection (c) regarding the posting of notice. An explanation is provided in the comment and response document regarding the remaining comments.

Also in subsection (c), a clause is added clarifying that a person requesting a hearing has a right to be represented by counsel, and a change is made providing that the Department need not make a decision at the hearing.

§ 92.94. Disbursement of funds pending resolution of appeal.

Subsection (a) of the final-form regulations has been modified to replace the word "law" with "section 605 of The Clean Streams Law (35 P. S. § 691.605)."

A commentator stated that preclusion of permit issuance should only be imposed on a specific facility when a company has more than one facility in this Commonwealth. This provision is not mandatory and would be imposed only when there is a continued pattern of failure to pay final assessments. No change was made in the final-form regulations.

Chapter 93. Water Quality Standards

Section 93.4. Statewide water uses.

WWF (warm water fishes) has been reinserted in Table 2 as the default aquatic life protection because several comments made the point that there would be no default aquatic life protection of waters inadvertently not listed in the chapter.

Many comments addressed the question of retaining the Statewide potable water supply use, some offering distinct reasons why it should be eliminated, but many others expressing support for keeping it. The use is retained without change.

A few comments suggested that the aesthetic water quality criteria for manganese and dissolved iron be applied at the point of potable water intake, as are other aesthetic criteria, under § 96.3 (relating to general water quality). The Department will analyze the impacts/benefits of this issue as part of its next triennial review of water quality standards.

A few comments were directed toward the Department adopting amended wildlife protection and protection of hydrologic regimes and habitat. At this time, there is no National guidance to assist the Department in moving forward with changes to wildlife protection. The Department is working with the Fish and Boat Commission on new habitat and stream flow criteria development, but it is premature to make changes at this time. These issues are all likely to be considered in future water quality standards reviews.

Section 93.7. Specific water quality criteria.

Comments concerning Table 3 included the following:

Alkalinity--The site-specific exception to the alkalinity criterion was reinserted because it was noted that many of this Commonwealth's streams may naturally violate the criterion, and without the exception, there would have to be regulation changes made for a very large number of site-specific criteria to amend the listings in §§ 93.9a--93.9z if the language were removed.

Aluminum--In the proposal, the aluminum criterion was amended and moved to Table 1, Chapter 16--Water Quality Toxics Management Strategy--Statement of Policy, where other water quality criteria for toxics are listed. The EPA and others commented that there was not adequate justification for the Commonwealth to not also adopt the chronic criterion. The Department believes that the chronic criterion of 87 μg/l should not be adopted because it is based on chronic toxicity test results that show inconsistencies within tests and between studies. The chronic studies described in the EPA's 1988 Ambient Water Quality Criteria for Aluminum document do not show a consistent pattern of toxicological response to the different exposure concentrations within or between the various tests described. The final chronic value developed following the EPA's procedures and based on available acute-chronic ratios is 750 μg/l, the same value as the acute criterion. However, the EPA then lowered the final chronic value to 87 μg/l, claiming it to be necessary to protect brook trout and striped bass. The EPA's justification for this adjustment was data derived from studies that the EPA later described as data that should not be used in the criteria development. The EPA staff have agreed that the aluminum toxicity is very complex due, in part, to the complexity of its chemistry and interactions with local water quality conditions and biological community. The EPA also agrees that the studies that were used in driving the derivation of the chronic criterion are limited in their application and should receive additional review. The Department cannot adopt the flawed chronic criterion for use in this Commonwealth without better justification. As recently as December 1999, the EPA reiterated that aluminum criteria issues are not a priority for the agency. Therefore, the Department believes that aluminum toxicity to fish and aquatic life will be adequately managed using the acute criterion of 750 μg/l. The Department will also continue to monitor the scientific literature and the EPA's evaluations of aluminum toxicity and amend the criterion or add a chronic criterion, if indicated. The criterion is unchanged from the proposal.

Ammonia--The ammonia criteria is not changed to match the new the EPA criteria finalized in December 1999, but will be considered in the next Triennial Review.

Bacteria--In response to an EPA comment, language is added to Bac1 which limits to no more than 10% the samples that may exceed 400 fecal coliform per 100 ml in a 30-day period for the criteria to be attained.

DO (dissolved oxygen)--The language for DO_3 (for trout stocking fishes (TSF)) is clarified to state that the criteria for lakes, ponds and impoundments apply to the epilimnion in response to a comment.

Phenolics--To respond to comments expressing concern for protecting water supplies, the Statewide criterion for phenolics (Phen - 0.005 mg/l) is retained. This criterion is applied under new § 96.3(d).

Temperature--Language inadvertently struck from the new listing of temperature criteria in the proposal was reinserted to assure protection of aquatic life. The language states that in addition to the temperature criteria, wastes may not cause more than a 2°F rise in temperature in any 1-hour period.

Subsection (e), which was proposed to be deleted, is reinserted as (b) and the accompanying table is renamed Table 4 in response to comments that pointed out that the Table provides a ready reference to the criteria applicable to aquatic life uses, including High Quality and Exceptional Value Waters. The table has been modified to acknowledge the removal of the list of Statewide criteria (former Table 4) and the numbering change to DO criteria.

Accordingly, numbering changes are made to the remaining subsections. Subsection (c) is amended to the original language that provides that additional criteria will (not may as proposed) be developed using best scientific information. New subsection (d) is clarified to state that when the Department determines that the natural quality of a surface water is lower than the applicable aquatic life water quality criterion, the natural quality will become the aquatic life criterion for that segment following public notice and comment.

Section 93.9. Designated water uses and water quality criteria.

Section 93.9e (relating to Drainage List E) is modified to correct the turbidity criteria symbols from Tur 3 and 4 to Tur 1 and 2. The change is not substantive.

In § 93.9o (relating to Drainage List O), several comments on the proposal and ANFR addressed the issue of the color criterion for the Codorus Creek in York County. Some comments gave lengthy reasons why 50 pcu was the appropriate criterion and should remain in place, and others questioned the scientific basis for that criterion, stating the Statewide criterion should apply. Following consideration of all the comments, the site-specific color criterion for the Main Stem, Codorus Creek in York County is removed and the Statewide color criterion (75 platinum cobalt units) will apply to the stream. When it is achieved, the criterion will enhance water quality in the stream.

In § 93.9p (relating to Drainage List P), an error for Tunungwant Creek in McKean County, which deleted the water contact sport use (WC) for the main stem from the confluence of the East and West Branches to the PA-NY State border, has been corrected. The Department conducted a use attainability study in 1985 which supported the correction and the water contact sports use was added as a designated use at the November 15, 1988, Board meeting, and published at 17 Pa.B. 968 (March 11, 1989). This regulatory revision was not, however, incorporated into the *Pennsylvania Code* until now.

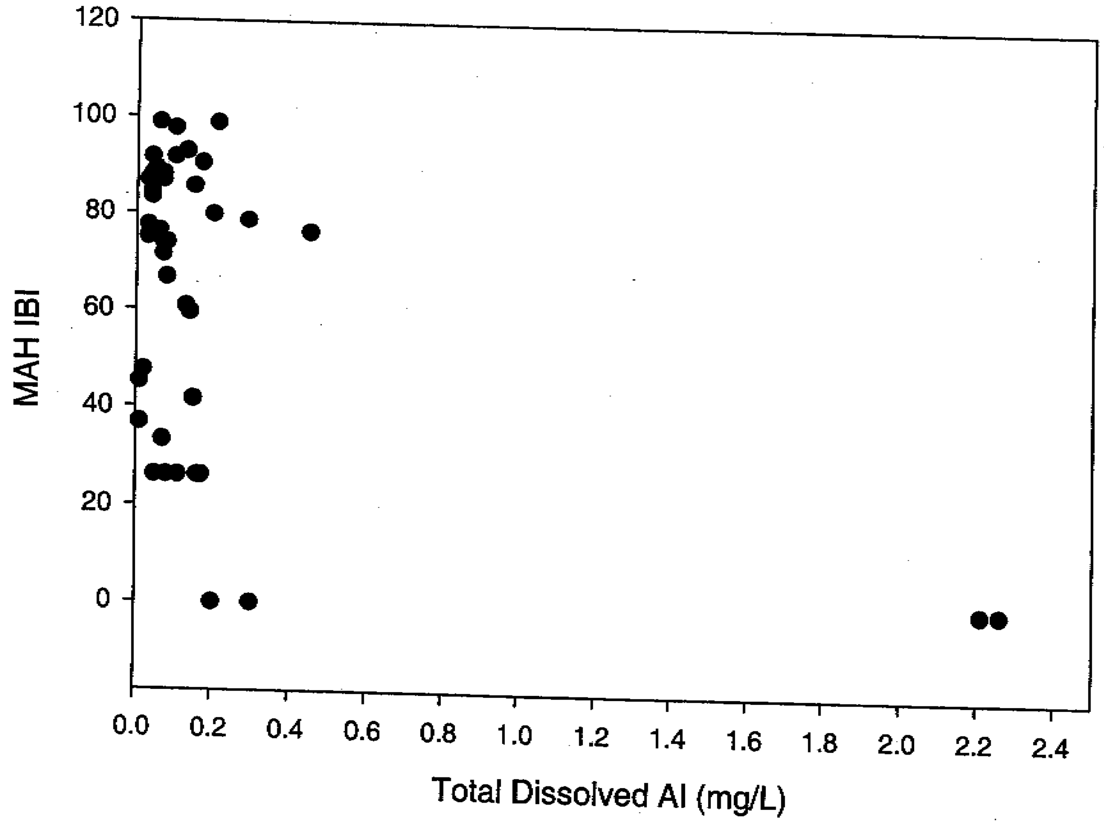
Chapter 95. Wastewater Treatment Requirements

Section 95.1 (relating to special protections), which has recently been amended at 29 Pa.B. 3720 (July 17, 1999) is deleted as unnecessary in light of the inclusion of the language in § 92.2a(a).

Commentators objected to the incorporation of provisions in § 97.15 into § 95.2 of the final-from regulations. These provisions incorporate quality standards for industrial wastes including the prohibition of discharges that are acid, a pH requirement and an iron limit of no more than 7 milligrams per liter of dissolved iron. These provisions were retained in the final-form regulations as necessary to protect water quality from pollutants not regulated as point sources under the NPDES regulations.

Commentators objected to the elimination of §§ 95.4 and 95.5 from proposed rulemaking. This error occurred at the Legislative Reference Bureau, and was corrected at 28 Pa.B. 577 (November 7, 1998).

[Continued on next Web Page]



MAH IBI is a fish based index of biotic integrity for the Mid-Atlantic Highlands region.

Data are from 48 streams scattered throughout the Cheat River watershed.

Relationship between Al and fish is poor primarily because there are many bad streams with almost no Al in them. These streams received mine effluent, but pH is high enough for the Al to precipitate. A good reason why field based relationships should not be used to set water quality criteria. Also evidence that water quality criteria alone do not ensure ecological integrity.

All Wapbase samples with Dissolved Al > 0.087 (n=1454)

[illegible]	[illegible]	[illegible]	Date	[illegible]	[illegible]	pH		[illegible]		[illegible]		[illegible]	Watershed	WVSCI
WVMC-60-D-2.5	0.2	Lindy Run	5/15/01	0.47	0.49	3.91		0.4		0.18		1	Cheat	71.33
WVKG-34-H-11.5	0	Carpenter Run	9/23/03	0.45	0.44	3.91		0.53			<	3	Gauley	
WVKG-34-H-11.5	0	Carpenter Run	9/9/03	0.399	0.394	4.31		0.56			<	3	Gauley	
WVMC-60-F-3	1.2	Moore Run/Otter Creek	5/15/01	0.3	0.4	4.04		0.57		0.27		1	Cheat	66.69
WVKG-34-H-8	0	Windy Run	9/23/03	0.32	0.33	4.19		0.58				3	Gauley	
WVMC-60-D-7	0.2	Yellow Creek	6/12/01	0.21	0.34	3.51		0.59		0.29		1	Cheat	58.35
WVKG-34-H-9	0	Armstrong Run	9/23/03	0.32	0.33	4.12		0.67			<	3	Gauley	
WVKG-34-H-11.5	0	Carpenter Run	1/13/04	0.48	0.46	4.34		0.7			<	3	Gauley	
WVKG-34-H-9	0	Armstrong Run	9/9/03	0.32	0.38	4.43		0.7			<	3	Gauley	
WVMC-60-O-5	0.6	Little Stonecoal Run	6/3/03	0.28	0.29	4.15		0.7		0.4	<	3	Cheat	79.67
WVKG-34-H-11.5	0	Carpenter Run	3/4/04	0.65	0.72	3.42		0.71				4	Gauley	
WVKG-34-H-11.5	0	Carpenter Run	11/18/03	0.42	0.44	4.00		0.73			<	3	Gauley	
WVKG-34-H-8	0	Windy Run	3/4/04	0.52	0.58	3.84		0.73			<	3	Gauley	
WVKG-34-H-8	0	Windy Run	11/18/03	0.34	0.36	4.30		0.75			<	3	Gauley	
WVKG-34-H-9	0	Armstrong Run	11/18/03	0.39	0.39	4.30		0.8			<	3	Gauley	
WVKG-34-H-9	0	Armstrong Run	1/31/04	0.4	0.4	4.82		0.8			<	3	Gauley	
WVMCS-35		Fall Run	5/9/01	0.31	0.32	3.92		0.8	<	0.5	<	5	Cheat	62.37
WVMC-60-F-7		Yellow Creek/Otter Creek	4/30/01	0.39	0.64	4.12		0.82		0.36		2	Cheat	67.47
WVKG-34-H-9	0	Armstrong Run	12/15/03	0.39	0.39	4.20		0.84			<	3	Gauley	
WVKG-34-H-9	0	Armstrong Run	3/4/04	0.52	0.57	3.72		0.86			<	3	Gauley	
WVPC-7-L	0.1	Meadow Run	6/21/00	0.13	0.25	4.86		0.87		0.61		18	Cacapon	64.2
WVKG-34-H-8	0	Windy Run	4/7/04	0.38	0.42	4.76		0.88			<	3	Gauley	
WVMCS-36		Red Run	5/9/01	0.24	0.3	4.17		0.9		0.5	<	5	Cheat	70.83
WVKG-34-H-8	0	Windy Run	1/13/04	0.34	0.34	4.81		0.97			<	3	Gauley	
WVKG-34-H-9	0	Armstrong Run	4/7/04	0.39	0.42	4.75		0.97			<	3	Gauley	
WVMC-60-D-5-H	0	UNT/Beaver Creek RM 11.0	6/11/02	0.14	0.2	4.83		1.06		0.5	<	3	Cheat	60.14
WVMT-42-E	0.6	UNT/Roaring Creek RM 11.0	6/11/02	0.19	0.23	4.68		1.09		0.5	<	3	Tygart Valley	73.37
WVMC-60-O	7.5	Red Creek/Dry Fork	6/5/01	0.24	0.36	3.79		1.43		0.41		1	Cheat	54.53
WVMTB-32-I-1		Phillips Camp Run	9/15/97	0.132	0.098	5.10		1.6		0.5	<	5	Tygart Valley	79.63
WVMC-18-A	0.2	Lick Run/Roaring Creek	5/22/01	0.64	0.78	4.35		1.61		0.76		1	Cheat	66.36
WVMC-60-O-4		South Fork/Red Creek	6/5/01	0.36	0.51	3.63		1.68		0.51	<	1	Cheat	80.53
WVMC-17	10.2	Muddy Creek	6/26/01	0.097	0.234		<	1.763		1.75	<	3.143	Cheat	83.26
WVPSB-1.9	0.2	UNT/South Branch Potomac RM	6/26/01	0.098	0.203	7.44	<	1.763		9.14		11	South Branch	58.11
WVMC-60-F-8		Condon Run	4/30/01	0.33	0.74	4.46		2.18		0.64		2	Cheat	75.58
WVMT	98.9	Tygart Valley River	10/14/02	0.11	0.35	7.41		2.26		14		5	Tygart Valley	
WVMT-64	12.7	Mill Creek	5/20/03	0.0954	0.123	7.19		2.39	<	0.1		1	Tygart Valley	81.44
WVMC-12-A-1	2.2	Little Laurel Run	5/23/01	0.2	0.34	4.66		2.44		1.31		2	Cheat	70.31
WVMC-17-B	0	Jump Rock Run	5/16/01	0.38	0.54	5.09		2.48		0.69		1	Cheat	73.19
WVMCS-50		First Fork/Shavers Fork	4/2/01	0.1	0.14	7.09		2.6		0.62	<	5	Cheat	81.71
WVMC-6-A-2	0	UNT/Clay Run RM 1.0	5/22/01	0.11	0.16	5.40		2.83		1.5		2	Cheat	74.12

[illegible]	Mile Point	Stream Name	Date	Diss Al mg/L	Total Al mg/L	pH	[illegible]		Mg mg/L		TSS mg/L	Watershed	WVSCI
WVKGC-23	1	South Fork/Cranberry River	5/28/03	0.11	0.33	6.68	3.1		0.7		6	Gauley	81.31
WVMC-12-B-5-C	0.9	UNT/Cherry Run	5/8/01	0.11	0.29	4.66	3.11		1.46		2	Cheat	68.21
WVPSB-28-EE	4	Big Run/North Fork	7/11/01	0.12	0.23	7.14	3.34		0.82	<	5	South Branch	90.04
WVPSB-21-E	1.3	Stump Run/South Fork/South	6/21/01	0.15	0.32	6.44	3.4		2.3	<	5	South Branch	82.9
WVMC-6-A	1.8	Clay Run	5/21/01	0.09	0.18	5.29	3.44		1.73		1	Cheat	81.65
WVPSB-21-E	1.3	Stump Run/South Fork/South	6/21/01	0.17	0.32		3.5		2.4	<	5	South Branch	92.24
WVMC-60-D-3-C	1.2	Snyder Run	6/11/01	0.18	0.42	6.36	4		0.72		2	Cheat	61.19
WVMT	75.9	Tygart Valley River	10/14/02	0.13	0.38	7.51	4.31		16.7		8	Tygart Valley	
WVKGC	15.2	Cranberry River	5/28/03	0.11	0.16	6.96	4.4		0.6	<	3	Gauley	92.6
WVM-8-B.2	0.7	UNT/Deckers Creek RM 8.8	7/9/03	0.16	0.77	5.82	4.63		0.93		6	Monongahela	65.4
WVOG-137-C	0.7	Wiley Spring Branch	9/11/00	0.24	0.28	7.23	4.65		2.32		1	Upper	80.73
WVMT	65.1	Tygart Valley River	10/14/02	0.18	0.41	7.65	4.74		18.6		5	Tygart Valley	
WVMT-41	1	Grassy Run	9/15/97	14.246	0.05	3.10	5.9		1.5	<	5	Tygart Valley	
WVMC-60-D-3-C	0	Snyder Run	6/6/01	0.13	0.306	7.56	6.1		1.3		5	Cheat	90.71
WVKE-6	5.6	Mill Creek	7/3/97	0.16	0.55	6.90	6.6		2.5		6	Elk	69.09
WVOG-137-B	0.5	Bluff Fork/Devils Creek	9/11/00	0.26	0.29	7.10	7.2		5.26		2	Upper	73.76
WVMW-13-I-2		Cherrycamp Run	3/21/01	0.133	5.74	7.24	7.5		2.78		145	West Fork	
WVMTB-7-C	0.32	UNT/Sand Run	9/4/97	0.089	0.14	7.60	7.7		1.9		6	Tygart Valley	78.87
WVOGC-16-J-1	0.6	Tom Bailey Branch	8/29/00	0.13	0.22	7.68	7.82		3.13		3	Upper	54.63
WVMW-13-I-3		Patterson Fork	3/21/01	0.129	6.07	7.19	7.92		2.82		121	West Fork	
WVOG-134-E		Old Slab Fork	8/30/00	0.13	0.2	7.50	8.1		2.82		5	Upper	75.97
WVMW-13-F-1		Little Rockcamp Run	3/21/01	0.095	6.49	7.38	8.83		2.99		137.6	West Fork	
WVMW-13-F	0.1	Rockcamp Run	3/21/01	0.089	10.2	7.39	8.94		3.52		238	West Fork	
WVMC	41.4	Cheat River	6/18/01	0.13	0.33	7.35	9.08		1.51		2	Cheat	
WVMW-36-D	0	Right Fork/Freeman Creek	3/21/01	0.121	2.86	7.14	9.45		2.51		364	West Fork	
WVMC-12-C-5	0.2	5th UNT/Hazel Run	5/15/01	0.09	0.12	7.43	9.57		1.91		1	Cheat	72.12
WVMC	72.6	Cheat River	6/18/01	0.16	0.22	7.40	9.83		1.55		1	Cheat	
WVKE	107	Elk River	7/8/02	0.19	0.2	7.79	10.6		3.32	<	3	Elk	
WVKE	89.5	Elk River	11/4/02	0.15	0.18	7.32	11		2.88	<	3	Elk	
WVMC	32.9	Cheat River	6/18/01	0.09	0.68	7.27	11.1		2.24		2	Cheat	
WVKE	89.5	Elk River	7/8/02	0.21	0.26	7.75	11.2		3.5	<	3	Elk	
WVKE	56.3	Elk River	11/6/02	0.25	0.53	7.33	11.5		0.2		8	Elk	
WVKN-22-K	5.3	Mill Creek	4/22/02	0.28	0.44	4.29	11.5		7.11		8.8	Lower New	57.58
WVKE	56.3	Elk River	8/6/02	0.16	0.16	7.79	11.6		4.12	<	3	Elk	
WVKE	107	Elk River	11/4/02	0.16	0.18	7.27	12.3		3.2	<	3	Elk	
WVKE	107	Elk River	9/3/02	0.14	0.22	7.42	12.3		3.58	<	3	Elk	
WVKE	107	Elk River	8/5/02	0.14	0.17	7.62	12.4		3.51	<	3	Elk	
WVKE	56.3	Elk River	10/8/02	0.13	0.15	7.83	12.4		3.97	<	3	Elk	
WVKE	89.5	Elk River	9/3/02	0.17	0.22	7.73	12.5		3.78	<	3	Elk	
WVOG-134	7.8	Slab Fork	9/6/00	0.095	0.414	7.24	12.6		6.74		25	Upper	67.01
WVKE	27.2	Elk River	11/6/02	0.24	0.43	7.18	12.8		0.28		3	Elk	
WVMC	20.9	Cheat River	6/18/01	0.12	0.5	7.44	13		2.61		3	Cheat	
WVMTM	2.8	Middle Fork River	7/23/02	0.12	0.15	7.74	13		1.46	<	3	Tygart Valley	

WVKE	27.2	Elk River	8/6/02	0.16	0.24	7.57		13.2		5.8	<3	Elk	
WVMTM	2.8	Middle Fork River	8/12/02	0.17	0.33	7.90		13.2		2.56	<3	Tygart Valley	
WVOGC-16-C	0.1	Cabin Branch/Laurel Fork	8/29/00	0.12	0.22	7.62		13.5		5.52	5	Upper	48.15
WVMTB-18	11.2	French Creek	9/3/97	0.147	0.15	7.40		14		2.8	10	Tygart Valley	60.07
WVO-2-Q-8-A	2.8	Left Fork/Camp Creek	4/24/02	0.09	0.26	7.37		14.1		3.69	<3	Twelvepole	78.12
WVMW-13-N		Coburn Fork	3/21/01	0.177	16	7.48		15.1		5.2	492	West Fork	
WVKE	56.3	Elk River	9/4/02	0.21	0.24	7.91		15.5		4.53	<3	Elk	
WVMT	98.9	Tygart Valley River	9/6/02	0.17	0.2	7.56		15.5		2.4	<3	Tygart Valley	
WVMC-60-D	0.8	Blackwater River	6/13/01	0.43	1.48	7.52		15.6		3.4	<5	Cheat	67.5
WVKE	27.2	Elk River	9/4/02	0.2	0.28	7.48		15.7		6.62	<3	Elk	
WVKE-76	11.9	Birch River	11/4/02	0.12	0.24	7.48		16.2		8	<3	Elk	
WVMT	98.9	Tygart Valley River	7/24/02	0.25	0.33	7.50		16.7		2.17	3	Tygart Valley	
WVMT	6.5	Tygart Valley River	8/12/02	0.25	0.26	8.28		17		3.74	<3	Tygart Valley	
WVKE	4.4	Elk River	9/4/02	0.14	0.18	7.53		17.1		7.2	<3	Elk	
WVMW-13-N-1		Shaw Run	3/21/01	0.143	52.3	7.45		17.1		10.3	1732	West Fork	
WVMC-60-D	8.2	Blackwater River	6/12/02	0.13	0.27	7.67		17.4		2.5	<3	Cheat	75.4
WVMT	6.5	Tygart Valley River	9/5/02	0.25	0.25	7.68		17.4		3.42	<3	Tygart Valley	
WVKE-23	0.9	Big Sandy Creek	11/6/02	0.14	1.77	7.35		17.8		0.31	40	Elk	
WVOG-134	0.3	Slab Fork	9/5/00	0.165	0.868	7.56		17.9		8.23	12	Upper	60.19
WVO-2	9.6	Twelvepole Creek	4/17/00	0.12	2.2	7.05		18		5	50	Twelvepole	
WVMT	98.9	Tygart Valley River	8/13/02	0.18	0.11	7.58		18.3		2.86	<3	Tygart Valley	
WVMT	75.9	Tygart Valley River	7/24/02	0.13	0.23	7.68		18.3		2.6	<3	Tygart Valley	
WVKC-31-B.4	0.8	UNT/Laurel Fork RM 3.6	4/24/03	1.88	1.88	4.34		18.6		27.2	<3	Coal	70.87
WVMT	6.5	Tygart Valley River	7/23/02	0.13	0.16	8.02		18.9		3.38	<3	Tygart Valley	
WVKE	4.4	Elk River	10/9/02	0.14	0.21	7.55		19.2		7.13	<3	Elk	
WVOG-131	5.2	Barkers Creek	9/6/00	0.16	0.19	7.75		19.35		7.29	3	Upper	55.58
WVMTM	2.8	Middle Fork River	9/5/02	0.21	0.26	7.87		19.7		3.78	<3	Tygart Valley	
WVK-49-B	1.6	Spring Fork	7/19/01	0.13	0.72	7.26		20.9		10.5	22	Upper Kanawha	
WVMC	35.6	Cheat River	5/1/01	4.76	5.67	3.24		21		5.3	<1	Cheat	
WVK	1.5	Kanawha River	10/23/02	0.14	0.28	7.43		21.1		7.75	<3	Lower Kanawha	
WVKC-10-U-7	4.3	West Fork	9/18/97	0.3	0.38	8.50		22		12	<5	Coal	50.98
WVK	44	Kanawha River	10/23/02	0.15	0.24	7.55		22.3		6.29	8	Lower Kanawha	
WVMT	65.1	Tygart Valley River	7/24/02	0.19	0.32	7.71		22.3		5.18	<3	Tygart Valley	
WVKC-10-U-7	2.3	West Fork	4/30/03	0.17	0.22	8.53		22.5		13.9	<3	Coal	66.26
WVKE-23	0.9	Big Sandy Creek	7/9/02	0.17	0.18	7.59		22.7		5.52	<3	Elk	
WVMC-60-D-3-A		Long Run/North Fork/Blackwater	6/12/01	6.91	8.37	3.14		22.7		5.62	2	Cheat	27.86
WVMT	47.7	Tygart Valley River	7/23/02	0.19	0.21	7.63		23.2		2.82	<3	Tygart Valley	
WVMT	75.9	Tygart Valley River	8/13/02	0.25	1.09	6.88		23.3		4.79	<3	Tygart Valley	
WVMT	47.7	Tygart Valley River	8/12/02	0.28	0.3	7.51		23.7		4.31	<3	Tygart Valley	
WVKE-26-A	0.16	Left Fork/Morris Creek	7/9/97	8.26	7.3	3.50		24		12	<5	Elk	
WVKP	5.2	Pocatalico River	8/7/02	0.14	0.22	7.69		24.2		4.94	14	Lower Kanawha	
WVKE-23	0.9	Big Sandy Creek	8/6/02	0.25	0.31	7.51		24.8		5.67	4	Elk	
WVOG	126	Guyandotte River	8/28/00	0.1	0.11	6.84		24.9		10.98	6	Upper	

AN Code	Mile Point	Stream Name	Date	Dis Al (mg/L)	Total Al (mg/L)	pH	Q	Total Ca (mg/L)	Q	Dis Mg (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVO-2-Q-8-A		Left Fork/Camp Creek	5/3/00	2.7	5.9	4.80		25		11				
WVMT	65.1	Tygart Valley River	8/13/02	0.3	0.38	7.67		25.2		5.44			Twelvepole	81.3
WVKP	45	Pocatalico River	8/21/02	0.15	0.88	6.97		25.5		4.9	<	3	Tygart Valley	
WVOG-131	0.6	Barkers Creek	9/6/00	0.12	0.15	7.89		25.8		8.97		30	Lower Kanawha	68.95
WVMW-23	4.1	Browns Creek	3/21/01	0.093	2.86	7.66		26.4		5.81		4	Upper	56.33
WVKE-23	0.9	Big Sandy Creek	9/4/02	0.23	0.27	7.41		26.9		6.96		43	West Fork	
WVM-1	21.4	Dunkard Creek	6/6/00	0.09	3.86	7.72		26.9		6.14		5	Elk	
WVMT-42	7.7	Roaring Creek	9/16/97	1.866	1.8			27		13		96	Dunkard	
WVM-1-A	3.5	Dolls Run	5/30/00	0.1	0.11	7.72		27.4		6.54	<	3	Tygart Valley	50.18
WVMT	75.9	Tygart Valley River	9/6/02	0.28	1.99	6.44		27.8		6.11		20	Dunkard	77.65
WVOG	142	Guyandotte River	9/7/00	0.13	0.26	8.14		27.9		12.1		5	Tygart Valley	
WVKE-50	0.7	Buffalo Creek	11/6/02	0.2	0.35	7.30		28.2		1.25		4	Upper	
WVMT	65.1	Tygart Valley River	9/6/02	0.3	0.33	7.54		28.2		6.08		6	Elk	
WVOG	120	Guyandotte River	9/6/00	0.2	0.25	8.38		28.2		13.5	<	3	Tygart Valley	
WVMTB	0.7	Buckhannon River	8/12/02	0.13	0.14	7.76		28.6		3.91		5	Upper	
WVMT	47.7	Tygart Valley River	9/5/02	0.3	0.32	7.74		28.8		5.55	<	3	Tygart Valley	
WVKN-22-G	3.36	White Oak Creek	4/1/02	2.45	3.15	5.05		29.9			<	3	Tygart Valley	
WVMW-31-B		West Run/Hackers Creek	3/19/01	0.108	0.347	7.67		30		6.42		13.2	Lower New	
WVO-2-Q-8		Camp Creek	5/3/00	0.83	3.8	4.98		30		11		12.5	West Fork	
WVOG	138	Guyandotte River	9/7/00	0.1	0.26	8.14		30.15		12.04			Twelvepole	63.93
WVK-73	2.7	Armstrong Creek	5/2/03	0.09	0.36	7.74		32		20.9		3	Upper	
WVMC-17	3.36	Muddy Creek	6/18/01	1.19	2.6	4.62		32		11.6	<	3	Upper Kanawha	69.08
WVOG-138-E		Mullens Branch/Winding Gulf	9/11/00	0.93	1.2	8.21		32		17		14	Cheat	76.6
WVMTB	0.7	Buckhannon River	7/23/02	0.15	0.23	8.23		32.2		3.13		10	Upper	53.18
WVKE-76	11.9	Birch River	7/8/02	0.25	0.29	7.88		33		11.5	<	3	Tygart Valley	
WVKE-50	0.7	Buffalo Creek	8/6/02	0.17	0.32	7.60		33.4		19.4	<	3	Elk	
WVKE-76	11.9	Birch River	8/5/02	0.15	0.22	8.14		33.4		15.1	<	3	Elk	
WVOG-131-C		Mill Branch/Barkers Creek	9/6/00	0.17	0.34	7.56		33.9		14.92	<	3	Elk	
WVOG-138	0.7	Winding Gulf	9/6/00	0.175	0.354	8.12		34.2		16.6		5	Upper	54.16
WVOG-131-F		Gooney Otter Creek	9/5/00	0.19	0.38	8.13		34.8		11.46		16	Upper	62.14
WVOG-131-B		Hickory Branch/Barkers Creek	9/6/00	0.15	0.23	7.61		35.7		17.14		3	Upper	64.93
WVMT-18-E	0.4	Little Sandy Creek	9/4/97	10.06	10	3.53		36		9.5		7	Upper	68.8
WVMT-37	2.8	Beaver Creek	9/15/97	0.318	0.44	5.10		36		11	<	5	Tygart Valley	45.23
WVBST-24	13.5	Pigeon Creek	5/7/03	0.1	0.23	8.25		38.3		19.2		8	Tygart Valley	67.76
WVMTB	0.7	Buckhannon River	9/5/02	0.24	0.25	7.99		39		6.13		4	Tug Fork	46.9
WVMW-2	0.2	Booths Creek	3/19/01	0.096	0.256	7.56		39.4		10.1	<	3	Tygart Valley	
WVKE-76	11.9	Birch River	9/3/02	0.2	0.27	7.85		40.6		18.2		2.8	West Fork	
WVKG-19-V-4	0	Cutlip Branch	7/24/03	0.12	1.27	7.53		44.1			<	3	Elk	
WVPNB-17-B		Mill Run	8/13/97	0.1	0.05	7.80		45				10	Gauley	
WVKE-50	15.7	Buffalo Creek	9/11/02	0.75	0.78	4.82		49.1		25.9	<	5	North Branch	84.13
WVKE-50	15.7	Buffalo Creek	9/11/02	0.75	0.78			50.6		26.2	<	3	Elk	43.42
WVMT-12	10.2	Three Fork Creek	9/2/97	3.836	7.3	4.30		51		16	<	3	Elk	33.47
WVK-61-J-5	0.6	UNT/Cane Fork RM 1.5	5/17/02	7.63	7.63	3.79		52.6		33.6	<	5	Tygart Valley	36.66
											<	3	Upper Kanawha	63.17

ANC Code	Mile Point	Stream Name	Date	Dis Al (mg/L)	Total Al (mg/L)	pH	Q	Total Ca (mg/L)	Q	Total Mg (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVKG-19-V-4	0	Cutlip Branch	10/20/03	0.12	1.98	7.60		52.8				10	Gauley	
WVKE-50	0.7	Buffalo Creek	10/8/02	0.13	0.13	7.58		53.6		36.7	<	3	Elk	
WVMW-15-H		Jerry Run	3/19/01	0.146	0.24	8.51		55.4		14.7		1.4	West Fork	
WVPNB-16-A	0.8	Emory Run	8/14/97	1.812	1.8	4.70		59		28	<	5	North Branch	55.73
WVMW-7-B		Long Run	8/2/00	0.13	0.41	8.21		59.8		16.1		1	West Fork	60.41
WVK-75	0.9	Jarrett Branch	6/17/02	0.12	0.39	9.25		60.4		28.9		14	Upper Kanawha	47.61
WVPNB-16-C		Laurel Run	8/19/97	5.657	5.4	4.70	#	62	#	32		10	North Branch	54.09
WVMW-9.5		UNT/West Fork RM 13.9	3/22/01	0.122	1.38	7.04		62.4		18.3		11	West Fork	
WVMC-17-A-1	1	Glade Run	5/24/01	11.9	14.8	3.53		62.8		33.1		2	Cheat	15.57
WVPNB-16	18.1	Abrams Creek	8/18/97	1.064	0.82	3.90		63		24	<	5	North Branch	46.89
WVKC-35	3	White Oak Creek	10/8/97	0.13	0.26	7.80		66		53	<	5	Coal	51.08
WVKN-22-G-{3.6}-Discharge		Refuse Pile Discharge into White Oak Creek	4/1/02	10.3	11.3	4.21		67				8.4	Lower New	
WVPNB	52	North Branch Potomac River	8/27/97	0.206	0.44	7.50		67		13		15	North Branch	26
WVKG-19-V-4	0	Cutlip Branch	11/3/03	0.13	1.81	7.54		68.7				6	Gauley	
WVMW-24		Coburns Creek	3/21/01	0.094	13.3	7.60		70.8		16		384	West Fork	
WVMW-13-E		Katys Lick Creek	3/21/01	0.135	1.85	7.95		73.7		18.6		46	West Fork	
WVPNB-16	5.4	Abrams Creek	8/14/97	0.601	0.71	5.10		75		23	<	5	North Branch	41.5
WVKE-50	0.7	Buffalo Creek	9/4/02	0.16	0.18	7.68		77.1		52	<	3	Elk	
WVMC-17	0	Muddy Creek	6/25/01	9.27	10.2	3.44		77.2		29.8		5	Cheat	
WVKG-19-V-4	0	Cutlip Branch	9/3/03	0.17	1.48	7.60		78.6				7	Gauley	
WVMW-22		Davisson Run/West Fork	3/21/01	0.158	30	7.65		80.1		17.6		1168	West Fork	
WVMW-15	6.6	Simpson Creek	3/20/01	0.089	0.466	8.10		81		21.9		5.7	West Fork	
WVMC-17-A-0.5	3	Fickey Run	5/1/01	15.1	17.7	2.95		82.3		21.8	<	1	Cheat	41.41
WVMW-15	0.4	Simpson Creek	3/20/01	0.149	0.463	8.07		85.1		22.9		1.7	West Fork	
WVMW-7.1		UNT/West Fork River RM 11.44	3/22/01	0.098	1.26	7.01		86.7		31.9		10.5	West Fork	
WVMW-11-F		6th UNT/Shinns Run	3/20/01	7.08	7.25	3.51		93.3		29.3		9.8	West Fork	
WVMW-2-C		Sweep Run	3/21/01	0.122	4.86	7.41		94.7		27.4		72	West Fork	
WVMC-17	2	Muddy Creek	7/1/03	11.2	13.4	4.38		97.6		37.2		34	Cheat	36.58
WVMW-15	17.2	Simpson Creek	3/19/01	0.089	1.15	7.44		100.2		28		12.5	West Fork	
WVOG-75-L		Middle Fork/Buffalo Creek	8/28/00	0.95	6.68	4.99		113.4		58.16		5	Upper	38.81
WVMW-11	3.8	Shinns Run	3/19/01	3.57	5.48	4.05		118.4		32.4		21	West Fork	
WVMW-15-J.5		UNT/Simpson Creek RM 21.92	3/20/01	0.088	0.736	7.98		119.5		40.1		18	West Fork	
WVMW-15	25.4	Simpson Creek	3/19/01	0.121	2.42	7.84		122.7		33		36	West Fork	
WVMW-15-K.7		UNT/Simpson Creek RM 23.1	8/8/00	0.11	0.18	7.45		124		37.7		2	West Fork	52.95
WVMW-15-L		West Branch/Simpson Creek	3/20/01	0.138	1.53	7.78		125		34.6		16	West Fork	
WVMW-11	3	Shinns Run	3/19/01	0.873	4.5	5.43		127.8		35.7		29.5	West Fork	
WVMW-11	6.07	Shinns Run	7/31/00	1.41	5.25	4.63		128		34.4		32	West Fork	
WVMW-11	6.06	Shinns Run	3/20/01	6.47	7.04	4.25		135.7		40.6		29	West Fork	
WVMW-15-N		UNT/Simpson Creek RM 26.94	3/19/01	0.144	0.916	7.76		139.9		42.6		19.5	West Fork	
WVMW-11	5.5	Shinns Run	3/20/01	0.154	3.33	5.86		140.6		38.8		19	West Fork	
WVMW-15	0.4	Simpson Creek	8/1/00	0.27	0.54	8.20		142		39.9	<	1	West Fork	38.5
WVMW-11	3.8	Shinns Run	7/31/00	1.73	5.15	4.78		143		50.6		19	West Fork	20.58

AN Code	Mile Point	Stream Name	Date	Dis Al (mg/L)	Total Al (mg/L)	pH	[illegible]	Total Ca (mg/L)	[illegible]	Total Mg (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVMW-15-L		West Branch/Simpson Creek	8/8/00	0.13	0.66	7.93		148		40.1		10	West Fork	56.45
WVMW-11	6.06	Shinns Run	7/31/00	0.48	3.32	5.82		157		45.3		24	West Fork	51.62
WVMT-42-B-1	1.3	UNT/Flatbush Fork	8/25/97	19.604	0.42	3.30		160		27	<	5	Tygart Valley	35.08
WVMW-11-E-{0.1}-Mine		Mine Discharge into Nixon Run	3/20/01	11.7	12.1	3.33		163.8		42.6		2	West Fork	
WVMW-11-D.5		UNT/Shinns Run	3/19/01	14.3	15.1	3.65		173.9		56.9		4	West Fork	
WVMW-11-D.5		UNT/Shinns Run	7/31/00	14.6	16.3	3.18		179		60.6	<	1	West Fork	
WVMW-21-E		Turkey Run/Elk Creek	3/20/01	0.096	0.212	7.96		179.9		39.7		16.3	West Fork	
WVMW-15-0.5A		UNT/Simpson Creek RM 1.23	8/1/00	4.57	5.03	4.60		189		53.2		4	West Fork	25.76
WVMW-15-0.5A		UNT/Simpson Creek RM 1.23	3/20/01	5.53	5.91	4.55		192.9		55.8		8.2	West Fork	
WVMW-31	24.2	Hackers Creek	3/19/01	0.127	0.287	7.94		193.3		50.2		11.8	West Fork	
WVMW-21-Q		Isaacs Run	3/20/01	0.089	0.109	7.95		196.6		62.9	<	1	West Fork	
WVMW-11-E	0.1	Nixon Run	8/2/00	11.8	13.9	2.91		201		51.8		2	West Fork	14.59
WVMW-11	6.43	Shinns Run	3/20/01	27.4	27.7	3.04		202.2		70.3		12	West Fork	
WVMW-15-J-0.3		UNT/Right Fork RM 1.97/Simpson	3/20/01	13	13	3.48		202.4		52.2		2.4	West Fork	
WVMC-17-A	2.4	Martin Creek	6/20/01	3.33	3.92	4.02		203		74.4		2	Cheat	
WVMW-15-B		Smith Run/Simpson Creek	3/20/01	3.95	7.88	5.24		208.4		57.2		48	West Fork	
WVPNB	88.9	North Branch Potomac River	8/11/97	0.14	0.05	7.80		210		34		8	North Branch	53.97
WVMW-12	2.6	Robinson Run	3/20/01	0.092	0.506	7.74		217.7		48.1		11	West Fork	
WVMW-16-B	0.1	UNT/Lambert Run RM 2.8	8/15/00	0.27	3.09	6.92		219		61		23	West Fork	49.82
WVMW-15-J-0.3		UNT/Right Fork RM 1.97/Simpson	8/8/00	14.8	15.5	3.35		222		56.3		1	West Fork	33.25
WVMW-13-0.5A		Jack Run/Tenmile Creek	8/1/00	0.09	1.45	7.36		224		44.9		24	West Fork	43.06
WVMW-15-J-1		Buck Run	8/7/00	0.16	3.82	6.65		230		69.2		1	West Fork	48.77
WVMW-11-F		6th UNT/Shinns Run	8/3/00	13.3	14.1	2.84		231		62.5		8	West Fork	24.45
WVMW-11-E	0.1	Nixon Run	3/20/01	32.8	34.3	2.82		233.1		75		2	West Fork	
WVMW-11-{6.06}-Mine		Mine Discharge into Shinns Run	7/31/00	0.35	0.69	4.09		239		80.5		13	West Fork	
WVMW-9.5		UNT/West Fork RM 13.9	8/1/00	0.53	5.12	5.39		242		55.8		27	West Fork	43.04
WVMW-11	6.43	Shinns Run	8/2/00	18.7	22.1	3.06		254		75.6		62	West Fork	
WVMW-15-B		Smith Run/Simpson Creek	8/1/00	2.21	4.63	4.92		259		76.7		18	West Fork	24.52
WVMW-15-N		UNT/Simpson Creek RM 26.94	8/8/00	5.85	6.56	4.51		281		66.4		3	West Fork	43.72
WVPNB-17-D-{13.2}-Discharge		Laurel Run Mine Pond Discharge	8/18/03	0.196	0.27	8.25		282		52.1		3	North Branch Potomac	
WVPNB-17-D-{13.2}-Discharge		Laurel Run Mine Pond Discharge	8/22/03	0.169	0.274	8.09		283		51.2		9	North Branch Potomac	
WVMW-15-N		UNT/Simpson Creek RM 26.94	8/8/00	5.66	6.55			300		66.8		4	West Fork	44.3
WVMW-21-A	0.7	Murphy Run	6/26/02	8.65	8.65	4.65		318		66.3		21.2	West Fork	46.56
WVO-91		Harrison Run	7/19/00	0.31	0.47	7.98		410		97			Upper Ohio	27.86
WVMC-17-A-{2.2}-Mine	0.2	Mine Channel into Martin Creek	6/20/01	10.6	11.5	3.39		427		265	<	1	Cheat	
WVBST-24	16.8	Pigeon Creek	9/22/03	0.15	0.2	8.47						5	Tug Fork	54.55
WVBST-24	21.8	Pigeon Creek	9/16/03	0.16	0.21	8.52					<	3	Tug Fork	55.96
WVBST-24	21.8	Pigeon Creek	9/16/03	0.16	0.196	8.52						4	Tug Fork	58.66
WVBST-24	23.4	Pigeon Creek	3/30/04	0.12	1.05	8.54						37	Tug Fork	
WVBST-24	23.4	Pigeon Creek	3/15/04	0.15	0.22	8.63						3	Tug Fork	
WVBST-24	23.4	Pigeon Creek	4/29/04	0.15	0.28	9.00						4	Tug Fork	

AN Code	Mile Point	Stream Name	Date	Dis Al (mg/L)	Total Al (mg/L)	pH		Total Ca (mg/L)		Total Mg (mg/L)		TSS (mg/L)	Watershed	WVSCI
WVBST-40	3.5	Mate Creek	9/24/03	0.1	0.15	7.86						3	Tug Fork	59.54
WVBST-40	3.2	Mate Creek	4/1/04	0.09	0.44	8.13						5	Tug Fork	
WVBST-40	3.2	Mate Creek	4/27/04	0.1	0.33	8.34					<	3	Tug Fork	
WVK	54.4	Kanawha River	1/21/03	0.16	0.2	7.39					<	3	Lower Kanawha	
WVK	32.2	Kanawha River	4/22/03	0.1	0.63	7.45						11	Lower Kanawha	
WVK-41	3.4	Twomile Creek	4/2/03	0.16	0.31	7.70						5	Lower Kanawha	
WVK-41	3.4	Twomile Creek	5/13/03	0.12	0.28	8.44					<	3	Lower Kanawha	
WVK-41-D.5	1	Rich Fork	2/26/03	13.2	13.6	3.58						4	Lower Kanawha	
WVK-41-D.5	1	Rich Fork	4/2/03	9.1	9.4	4.32					<	3	Lower Kanawha	
WVK-41-D.5	1	Rich Fork	5/14/03	9.24	10.2	4.36						3	Lower Kanawha	
WVK-41-D.5	1	Rich Fork	4/18/03	8.67	8.81	4.61						15	Lower Kanawha	
WVK-41-D.5	1	Rich Fork	12/18/02	5.67	6.11	4.61						6	Lower Kanawha	
WVK-41-D.5	1	Rich Fork	1/21/03	7.02	7.05	4.87					<	3	Lower Kanawha	
WVK-41-D.5	1	Rich Fork	11/21/02	3.44	3.73	4.96						9	Lower Kanawha	
WVK-41-D.5	0	Rich Fork	2/26/03	5.14	5.97	5.04						17	Lower Kanawha	
WVK-41-D.5	1	Rich Fork	10/16/02	1.14	3.24	5.22						30	Lower Kanawha	
WVK-41-D.5	1	Rich Fork	11/6/02	1.06	3.61	5.40						33	Lower Kanawha	
WVK-41-D.5	0	Rich Fork	12/16/02	0.3	1.9	7.20						18	Lower Kanawha	
WVK-41-D.5	0	Rich Fork	10/16/02	0.09	1.94	7.42						49	Lower Kanawha	
WVK-41-D.5-3	0	UNT/Rich Fork RM 1.0	2/26/03	4.69	5.21	5.00						15	Lower Kanawha	
WVK-49	10.2	Campbells Creek	7/30/01	0.13	1.1	6.95						29	Upper Kanawha	
WVK-49	0.2	Campbells Creek	9/24/01	0.174	0.289	7.56					<	5	Upper Kanawha	
WVK-49	5.4	Campbells Creek	9/26/01	0.093	0.178	7.71					<	5	Upper Kanawha	
WVK-49	3	Campbells Creek	9/25/01	0.118	0.175	7.87					<	5	Upper Kanawha	
WVK-49-A	0	Dry Branch	8/1/01	0.11	0.54	7.12						8	Upper Kanawha	
WVK-49-A	0.1	Dry Branch	12/6/01	7.58	9.56	7.28					<	5	Upper Kanawha	
WVK-49-A	0	Dry Branch	9/24/01	0.213	0.328	7.79						7	Upper Kanawha	
WVK-49-A-{0.1}-Mine		Mine Discharge into Dry Branch	9/24/01	0.165	0.23	7.22					<	5	Upper Kanawha	
WVK-49-B	0.2	Spring Fork	8/1/01	0.11	0.26	7.35						8	Upper Kanawha	
WVK-49-B	1.6	Spring Fork	9/24/01	0.192	2.88	7.47						43	Upper Kanawha	
WVK-49-B	0.2	Spring Fork	9/24/01	0.201	0.834	7.93						8	Upper Kanawha	
WVK-49-B-2-A	0	UNT/Left Fork RM 0.2/Spring Fork	9/25/01	0.105	0.605	7.14						17	Upper Kanawha	
WVK-49-F	1.2	Pointlick Fork	9/25/01	0.117	0.161	7.26					<	5	Upper Kanawha	
WVK-49-F	2.3	Pointlick Fork	9/25/01	0.12	0.12	7.28						7	Upper Kanawha	
WVK-49-F	0	Pointlick Fork	9/25/01	0.136	0.136	7.54					<	5	Upper Kanawha	
WVK-49-F-4	0	UNT/Pointlick Fork RM 2.4	9/25/01	0.16	0.846	7.64						29	Upper Kanawha	
WVK-49-I	0	Rattlesnake Hollow	9/26/01	0.14	0.16	7.45					<	5	Upper Kanawha	
WVK-49-J	0	UNT/Campbells Creek RM 7.5	7/30/01	0.11	1.34	7.09						35	Upper Kanawha	
WVK-53	3.8	Lens Creek	10/10/01	0.163	0.164	8.11						5	Upper Kanawha	
WVK-53-A	0	Left Fork/Lens Creek	10/10/01	0.113	0.113	8.05					<	5	Upper Kanawha	
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	6/3/02	27.3	27.3	3.23					<	3	Upper Kanawha	
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	9/6/01	10.4	10.4	3.29					<	5	Upper Kanawha	

AnCode	Mile Point	Stream Name	Date	Dis Al (mg/l)	Total Al (mg/l)	pH	Q	Total Ca (mg/l)	Q	Total Mg (mg/l)	Q	TSS (mg/l)	Watershed	WVSCI
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	8/14/01	7.81	7.87	3.79					<	5	Upper Kanawha	
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	10/15/01	4.5	5.72	4.12					<	5	Upper Kanawha	
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	12/5/01	2.5	3.16	4.26						27	Upper Kanawha	
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	11/19/01	3.04	3.89	4.40					<	5	Upper Kanawha	
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	3/29/02	3.62	4	4.64						5.2	Upper Kanawha	
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	3/13/02	2	2.19	4.87					<	3	Upper Kanawha	
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	2/20/02	2.77	2.95	4.98					<	3	Upper Kanawha	
WVK-53-A-0.4	0	UNT/Left Fork RM 1.8/Lens Creek	1/23/02	0.268	1.41	5.93						32.4	Upper Kanawha	
WVK-57	5.1	Witcher Creek	7/30/01	0.4	0.94	4.61					<	5	Upper Kanawha	
WVK-57	5.1	Witcher Creek	7/18/01	0.6	0.67	4.91						5	Upper Kanawha	
WVK-57	5.1	Witcher Creek	5/7/02	0.32	0.95	5.33						17.6	Upper Kanawha	
WVK-57	5.1	Witcher Creek	2/26/02	0.63	0.68	5.71					<	3	Upper Kanawha	
WVK-57	5.1	Witcher Creek	3/6/02	0.46	0.49	5.73					<	3	Upper Kanawha	
WVK-57	5.1	Witcher Creek	4/8/02	0.34	0.42	5.94					<	3	Upper Kanawha	
WVK-57	5.1	Witcher Creek	12/20/01	0.517	0.656	6.10					<	5	Upper Kanawha	
WVK-57	5.1	Witcher Creek	1/24/02	0.3	1.12	6.11						26.4	Upper Kanawha	
WVK-57	0.7	Witcher Creek	7/30/01	0.12	1	6.91						21	Upper Kanawha	
WVK-57	0.7	Witcher Creek	9/24/01	0.144	0.217	7.53					<	5	Upper Kanawha	
WVK-57-A	0	Dry Branch	7/30/01	0.13	0.59	6.99						9	Upper Kanawha	
WVK-57-A	0	Dry Branch	9/24/01	0.15	0.232	7.82					<	5	Upper Kanawha	
WVK-57-C	0	Left Fork/Witcher Creek	7/30/01	0.14	1.09	5.79						15	Upper Kanawha	
WVK-57-D.5	0	UNT/Witcher Creek RM 5.2	7/30/01	0.34	0.98	4.87						19	Upper Kanawha	
WVK-57-D.5	0	UNT/Witcher Creek RM 5.2	7/18/01	0.14	0.42	5.15						6	Upper Kanawha	
WVK-58	0.2	Fields Creek	3/15/02	0.1	0.26	6.93					<	3	Upper Kanawha	
WVK-58	0.2	Fields Creek	2/25/02	0.31	0.4	6.97						3.2	Upper Kanawha	
WVK-58	0.2	Fields Creek	6/12/02	0.1	0.14	7.72					<	3	Upper Kanawha	
WVK-58	5.9	Fields Creek	10/10/01	0.09	0.103	8.35					<	5	Upper Kanawha	
WVK-58	3.5	Fields Creek	10/10/01	0.12	0.12	8.76					<	5	Upper Kanawha	
WVK-58	1.5	Fields Creek	10/10/01	0.111	0.216	9.21					<	5	Upper Kanawha	
WVK-58	0.2	Fields Creek	2/25/02	0.33	0.53						<	3	Upper Kanawha	
WVK-58	0.2	Fields Creek	6/12/02	0.11	0.13						<	3	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	9/5/01	11.3	11.5	4.09					<	5	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	1/29/02	6.52	6.54	4.25					<	3	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	12/14/01	15.1	19.4	4.25						28	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	6/12/02	13.3	13.3	4.29					<	3	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	8/15/01	9.6	10	4.36					<	5	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	7/18/01	11	10.7	4.52					<	5	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	11/14/01	14.2	18.9	4.61						6	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	4/8/02	3.59	3.68	4.72					<	3	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	5/1/02	2.46	2.46	4.77					<	3	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	2/25/02	11.9	12.3	4.93					<	3	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	3/15/02	11.2	11.3	5.26					<	3	Upper Kanawha	
WVK-58-B.1	0	Wolfpen Branch	10/10/01	11.2	13	5.52					<	5	Upper Kanawha	

AnCode	Mile Point	Stream Name	Date	Dis Al (mg/L)	Total Al (mg/L)	pH	Q	Total Ca (mg/L)	Q	Total Mg (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVK-58-B.8	0	Mill Branch	6/12/02	0.1	0.33	7.80						13.2	Upper Kanawha	
WVK-58-B.8	0	Mill Branch	10/10/01	0.089	0.127	8.34						10	Upper Kanawha	
WVK-59	1.6	Carroll Branch	6/3/02	10.4	10.4	3.26						3	Upper Kanawha	
WVK-59	1.6	Carroll Branch	7/30/01	5.7	5.7	3.27					<	5	Upper Kanawha	
WVK-59	1.6	Carroll Branch	5/6/02	8.98	8.98	3.34						18.4	Upper Kanawha	
WVK-59	1.6	Carroll Branch	9/4/01	7.17	7.52	3.49						5	Upper Kanawha	
WVK-59	1.6	Carroll Branch	12/6/01	7.58	9.56	3.53					<	5	Upper Kanawha	
WVK-59	1.6	Carroll Branch	7/18/01	5.63	5.69	3.56					<	5	Upper Kanawha	
WVK-59	1.6	Carroll Branch	3/15/02	7.83	7.96	3.60					<	3	Upper Kanawha	
WVK-59	1.6	Carroll Branch	4/1/02	4.36	4.48	3.60						8.4	Upper Kanawha	
WVK-59	1.6	Carroll Branch	1/22/02	7.5	7.763	3.61					<	3	Upper Kanawha	
WVK-59	1.6	Carroll Branch	2/19/02	8.13	8.15	3.76					<	3	Upper Kanawha	
WVK-59	1.6	Carroll Branch	11/13/01	7.46	10.3	3.86					<	5	Upper Kanawha	
WVK-59	0.1	Carroll Branch	6/13/02	4.8	5.5	4.69						7.6	Upper Kanawha	
WVK-59	0.1	Carroll Branch	5/6/02	4.16	4.33	4.77						4.4	Upper Kanawha	
WVK-59	1.6	Carroll Branch	10/11/01	8.01	8.98	5.01						13	Upper Kanawha	
WVK-59	0.1	Carroll Branch	4/1/02	0.2	1.62	5.71						25.6	Upper Kanawha	
WVK-59	0.1	Carroll Branch	7/18/01	0.11	2.77	5.81						20	Upper Kanawha	
WVK-59	0.1	Carroll Branch	7/30/01	0.1	2.02	6.22						35	Upper Kanawha	
WVK-59	0.1	Carroll Branch	2/19/02	0.09	1.55	6.91						3.2	Upper Kanawha	
WVK-59	0.1	Carroll Branch	10/11/01	0.19	9.22	8.68						1217	Upper Kanawha	
WVK-59	0.1	Carroll Branch	4/1/02	0.19	1.59							30.8	Upper Kanawha	
WVK-60	4.3	Slaughter Creek	10/10/01	0.136	0.244	6.58					<	5	Upper Kanawha	
WVK-60	3	Slaughter Creek	10/9/01	0.091	0.091	7.05					<	5	Upper Kanawha	
WVK-60	0.3	Slaughter Creek	6/13/02	0.11	0.17	7.07					<	3	Upper Kanawha	
WVK-60	3	Slaughter Creek	6/13/02	0.09	0.57	7.07					<	3	Upper Kanawha	
WVK-60	0.3	Slaughter Creek	10/10/01	0.107	0.167	7.97						7	Upper Kanawha	
WVK-60-A	0	Little Creek	3/14/02	1.07	5.9	4.89						23.6	Upper Kanawha	
WVK-60-A	0.8	Little Creek	5/1/02	1.57	1.84	5.07					<	3	Upper Kanawha	
WVK-60-A	0	Little Creek	4/2/02	1.04	1.61	5.13						9.2	Upper Kanawha	
WVK-60-A	0	Little Creek	5/1/02	3.86	3.86	5.14					<	3	Upper Kanawha	
WVK-60-A	0.8	Little Creek	4/4/02	1.44	1.79	5.18						3.2	Upper Kanawha	
WVK-60-A	0	Little Creek	2/25/02	1.5	2.98	5.18						8.4	Upper Kanawha	
WVK-60-A	0	Little Creek	1/28/02	1.45	2.09	5.20						6	Upper Kanawha	
WVK-60-A	0.8	Little Creek	1/28/02	0.901	1.45	5.41					<	3	Upper Kanawha	
WVK-60-A	0.8	Little Creek	3/14/02	0.18	1.68	5.87						4.8	Upper Kanawha	
WVK-60-A	0.8	Little Creek	2/25/02	0.33	1.68	6.34						6.4	Upper Kanawha	
WVK-60-A	0	Little Creek	6/13/02	0.12	0.58	6.99					<	3	Upper Kanawha	
WVK-60-A	0.8	Little Creek	10/9/01	0.227	0.273	7.65					<	5	Upper Kanawha	
WVK-60-A	0	Little Creek	10/9/01	0.205	0.352	7.85					<	5	Upper Kanawha	
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	3/14/02	11.7	11.8	4.04					<	3	Upper Kanawha	

[illegible] Site	Mile Point	Stream Name	Date	Dis Al (mg/L)	Total Al (mg/L)	pH	Q	Total Ca (mg/L)	Q	Total Mg (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	9/4/01	22.1	21.1	4.11					<	5	Upper Kanawha	
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	6/13/02	13.6	14.2	4.29					<	3	Upper Kanawha	
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	1/28/02	6.71	6.79	4.33						5.6	Upper Kanawha	
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	2/25/02	12	12.2	4.38					<	3	Upper Kanawha	
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	12/13/01	21.1	26.8	4.39					<	5	Upper Kanawha	
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	11/13/01	34.3	34.7	4.40						10	Upper Kanawha	
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	10/9/01	12.5	26.2	4.43						10	Upper Kanawha	
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	5/1/02	1.26	1.91	4.44					<	3	Upper Kanawha	
WVK-60-A-1	0	UNT/Little Creek RM 0.4 (Little Branch)	4/2/02	2.72	3.43	4.50					<	3	Upper Kanawha	
WVK-60-B	0	Bradley Fork	3/14/02	0.88	1.14	4.95					<	3	Upper Kanawha	
WVK-60-B	0	Bradley Fork	2/21/02	1.11	1.22	5.30					<	3	Upper Kanawha	
WVK-60-B	0	Bradley Fork	1/28/02	0.79	1.08	5.34					<	3	Upper Kanawha	
WVK-60-B	0	Bradley Fork	4/2/02	0.18	0.76	5.58						8	Upper Kanawha	
WVK-60-B	0	Bradley Fork	12/12/01	0.158	0.31	5.96					<	5	Upper Kanawha	
WVK-60-B	0	Bradley Fork	10/9/01	0.095	0.287	6.76						5	Upper Kanawha	
WVK-60-B	0	Bradley Fork	6/12/02	0.13	1.3	7.12						4.8	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	9/6/01	6.16	6.47	4.12					<	5	Upper Kanawha	
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	9/6/01	5.64	8.25	4.24					<	5	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	3/14/02	10.9	11	4.25					<	3	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	6/13/02	18.9	18.9	4.26					<	3	Upper Kanawha	
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	3/14/02	10.8	11.7	4.28					<	3	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	8/7/01	14	14.7	4.32					<	5	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	10/10/01	18.6	23	4.41					<	5	Upper Kanawha	
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	10/10/01	17.3	22.1	4.41					<	5	Upper Kanawha	
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	7/25/01	19.3	20.4	4.43					<	5	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	4/2/02	9.29	9.38	4.44					<	3	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	12/12/01	11.1	16.4	4.44					<	5	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	5/1/02	13.9	14.6	4.46					<	3	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	11/26/01	12.1	14.7	4.48					<	5	Upper Kanawha	
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	11/26/01	11.3	14.8	4.49					<	5	Upper Kanawha	
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	12/12/01	12.1	16	4.55					<	5	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	1/28/02	8.65	9.26	4.57					<	3	Upper Kanawha	
WVK-60-B.1	0.1	UNT/Slaughter Creek RM 3.1	2/21/02	8.64	9.11	4.59						3.2	Upper Kanawha	
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	2/21/02	7.94	8.24	4.68					<	3	Upper Kanawha	
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	1/28/02	8.4	8.92	4.70					<	3	Upper Kanawha	

AnCode	Mile Point	Stream Name	Date	Dis Al (mg/L)	Total Al (mg/L)	pH	Q	Total Ca (mg/L)	Q	Total Mg (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	4/2/02	1.98	8.92	4.71						19.6	Upper Kanawha	
WVK-60-B.1	0	UNT/Slaughter Creek RM 3.1	8/7/01	0.79	17.8	8.72						79	Upper Kanawha	
WVK-60-C	0	Dotson Fork	4/2/02	0.15	0.8	5.79						14	Upper Kanawha	
WVK-61	14.1	Cabin Creek	9/13/01	0.22	3.71	6.02						38	Upper Kanawha	
WVK-61	10.1	Cabin Creek	6/5/02	0.11	2.12	6.57						16.8	Upper Kanawha	
WVK-61	7.3	Cabin Creek	9/13/01	0.13	0.54	6.89						6	Upper Kanawha	
WVK-61	9.9	Cabin Creek	9/13/01	0.17	1.51	7.13						12	Upper Kanawha	
WVK-61	17.5	Cabin Creek	10/10/01	0.217	6.06	7.26						33	Upper Kanawha	
WVK-61	10.1	Cabin Creek	9/13/01	0.3	1.3	7.28						15	Upper Kanawha	
WVK-61	6.4	Cabin Creek	9/13/01	0.19	0.46	7.35						10	Upper Kanawha	
WVK-61	15.2	Cabin Creek	10/10/01	0.101	4.36	7.35						40	Upper Kanawha	
WVK-61	14.1	Cabin Creek	10/10/01	0.126	3.36	7.38						35	Upper Kanawha	
WVK-61	9.9	Cabin Creek	6/5/02	0.12	2.1	7.41						17.6	Upper Kanawha	
WVK-61	10.1	Cabin Creek	10/10/01	0.143	1.02	7.57						16	Upper Kanawha	
WVK-61	12.7	Cabin Creek	9/13/01	0.22	1.99	7.58						16	Upper Kanawha	
WVK-61	12.7	Cabin Creek	10/10/01	0.112	1.63	7.61						20	Upper Kanawha	
WVK-61	9.9	Cabin Creek	10/11/01	0.128	1.07	7.65					<	5	Upper Kanawha	
WVK-61	12.7	Cabin Creek	5/1/02	0.09	1.38	7.71						20.4	Upper Kanawha	
WVK-61	12.7	Cabin Creek	6/7/02	0.1	1.85	7.71						30	Upper Kanawha	
WVK-61	19.8	Cabin Creek	10/11/01	0.111	0.132	7.75						7	Upper Kanawha	
WVK-61	7.3	Cabin Creek	6/5/02	0.13	1.36	7.78						12	Upper Kanawha	
WVK-61	4.7	Cabin Creek	10/10/01	0.099	0.179	7.80					<	5	Upper Kanawha	
WVK-61	0.9	Cabin Creek	10/10/01	0.197	0.275	7.82					<	5	Upper Kanawha	
WVK-61	6.4	Cabin Creek	10/9/01	0.108	0.29	7.83						5	Upper Kanawha	
WVK-61	7.3	Cabin Creek	10/9/01	0.145	0.427	7.84						7	Upper Kanawha	
WVK-61	6.4	Cabin Creek	6/5/02	0.14	1.13	7.85						8.4	Upper Kanawha	
WVK-61	17.8	Cabin Creek	10/10/01	0.112	0.112	7.88					<	5	Upper Kanawha	
WVK-61	2.6	Cabin Creek	10/10/01	0.122	0.181	8.06						5	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	9/4/01	14.8	15.5	3.97						21	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	7/31/01	15	18	4.37						27	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	12/13/01	16.3	20.6	4.45						11	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	12/13/01	16.3	20.6	4.45						11	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	7/17/01	13.2	14.5	4.50						20	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	4/8/02	12.5	13.7	4.62						49.2	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	11/13/01	13	19.3	4.67						89	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	4/30/02	8.51	11.5	4.73						16.8	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	3/12/02	5.86	11.9	5.11						91.6	Upper Kanawha	
WVK-61.5	0	Hicks Hollow	10/11/01	15.4	19.8	5.53						36	Upper Kanawha	
WVK-61-B	0	Dry Branch	6/7/02	0.11	0.26	7.73						4.8	Upper Kanawha	
WVK-61-B-1	0	UNT/Dry Branch RM 0.7 (Coalburg Branch)	6/7/02	1.06	1.92	5.17						20.4	Upper Kanawha	
WVK-61-B-1	0	UNT/Dry Branch RM 0.7 (Coalburg Branch)	5/7/02	0.82	2.52	5.20						80.4	Upper Kanawha	

WVCode	Mile Point	Stream Name	Date	[illegible]	[illegible]	pH	Q	Total [illegible] (mg/L)	Q	Total [illegible] (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVK-61-B-1	0	UNT/Dry Branch RM 0.7 (Coalburg Branch)	3/28/02	1.04	1.2	5.28						6.4	Upper Kanawha	
WVK-61-B-1	0	UNT/Dry Branch RM 0.7 (Coalburg Branch)	2/28/02	0.24	0.61	7.18						4.8	Upper Kanawha	
WVK-61-B-1	0	UNT/Dry Branch RM 0.7 (Coalburg Branch)	1/23/02	0.255	0.694	7.41						12.4	Upper Kanawha	
WVK-61-B-1	0	UNT/Dry Branch RM 0.7 (Coalburg Branch)	3/5/02	0.22	0.4	7.92						4	Upper Kanawha	
WVK-61-E	0	Paint Branch	10/9/01	0.1	0.119	7.82					<	5	Upper Kanawha	
WVK-61-F	0	Longbottom Creek	10/9/01	0.1	0.1	7.76					<	5	Upper Kanawha	
WVK-61-F	0.8	Longbottom Creek	10/9/01	0.093	0.05	7.78					<	5	Upper Kanawha	
WVK-61-G	0	Greens Branch	10/9/01	0.153	0.479	7.74					<	5	Upper Kanawha	
WVK-61-H	4.8	Coal Fork	10/2/01	0.192	0.338	6.61					<	5	Upper Kanawha	56.6
WVK-61-H	0	Coal Fork	10/9/01	0.123	0.123	7.33					<	5	Upper Kanawha	
WVK-61-H	0	Coal Fork	9/24/01	0.29	0.666	7.34						12	Upper Kanawha	
WVK-61-H-1	0	Laurel Fork/Coal Fork	10/9/01	0.141	0.164	7.14					<	5	Upper Kanawha	
WVK-61-H-1	0	Laurel Fork/Coal Fork	9/24/01	0.231	0.527	7.38						25	Upper Kanawha	
WVK-61-H-3	0	UNT/Coal Fork RM 4.6	5/1/02	0.68	3.13	5.43						34	Upper Kanawha	
WVK-61-H-3	0	UNT/Coal Fork RM 4.6	10/1/01	0.139	0.492	6.83						10	Upper Kanawha	
WVK-61-H-3	0	UNT/Coal Fork RM 4.6	6/5/02	0.11	0.18	7.66						4.8	Upper Kanawha	
WVK-61-I	0.1	Bear Hollow	1/22/02	0.552	0.819	5.28						4	Upper Kanawha	
WVK-61-I	0.1	Bear Hollow	12/18/01	0.597	0.888	5.32					<	5	Upper Kanawha	
WVK-61-I	0.1	Bear Hollow	2/25/02	0.4	0.67	5.35					<	3	Upper Kanawha	
WVK-61-I	0.1	Bear Hollow	3/12/02	0.47	0.74	5.58					<	3	Upper Kanawha	
WVK-61-I	0.1	Bear Hollow	3/29/02	0.37	0.57	5.68					<	3	Upper Kanawha	
WVK-61-I	0.1	Bear Hollow	5/2/02	0.1	0.37	5.98						8	Upper Kanawha	
WVK-61-I-1	0	UNT/Bear Hollow RM 0.3	12/18/01	2.47	3.44	4.86					<	5	Upper Kanawha	
WVK-61-I-1	0	UNT/Bear Hollow RM 0.3	3/13/02	2.15	2.58	4.91						3.2	Upper Kanawha	
WVK-61-I-1	0	UNT/Bear Hollow RM 0.3	2/25/02	2.08	2.71	4.93					<	3	Upper Kanawha	
WVK-61-I-1	0	UNT/Bear Hollow RM 0.3	5/2/02	0.29	0.6	5.18						6	Upper Kanawha	
WVK-61-I-1	0	UNT/Bear Hollow RM 0.3	1/22/02	2.13	2.43	5.47						8	Upper Kanawha	
WVK-61-I-1	0	UNT/Bear Hollow RM 0.3	11/26/01	0.236	0.332	5.95					<	5	Upper Kanawha	
WVK-61-I-1	0	UNT/Bear Hollow RM 0.3	4/4/02	0.38	0.56	6.16						3.2	Upper Kanawha	
WVK-61-I-1	0	UNT/Bear Hollow RM 0.3	3/13/02	2.23	2.56						<	3	Upper Kanawha	
WVK-61-J	0	Cane Fork	8/9/01	13.4	13.2	3.03					<	5	Upper Kanawha	
WVK-61-J	0.4	Cane Fork	8/9/01	20.9	21.2	3.15						5	Upper Kanawha	
WVK-61-J	0	Cane Fork	4/4/02	23.5	23.6	3.24						16.4	Upper Kanawha	
WVK-61-J	0	Cane Fork	9/13/01	6.69	7.28	3.31					<	5	Upper Kanawha	
WVK-61-J	0.4	Cane Fork	9/13/01	6.31	6.61	3.36						6	Upper Kanawha	
WVK-61-J	0	Cane Fork	4/30/02	8.8	9.15	3.46						8	Upper Kanawha	
WVK-61-J	0	Cane Fork	7/19/01	6.49	6.73	3.54						8	Upper Kanawha	
WVK-61-J	0	Cane Fork	6/5/02	7.53	7.53	3.54						4.4	Upper Kanawha	
WVK-61-J	0	Cane Fork	2/20/02	7.93	8.58	3.56						5.6	Upper Kanawha	

AWCode	Mile Point	Stream Name	Date	Dis Al (mg/L)	Total Al (mg/L)	pH	Q	Total Fe (mg/L)	Q	Total Mg (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVK-61-J	0	Cane Fork	3/8/02	9.13	9.75	3.67					<	3	Upper Kanawha	
WVK-61-J	0	Cane Fork	10/11/01	5.83	7	3.69					<	5	Upper Kanawha	
WVK-61-J	0	Cane Fork	11/26/01	5.06	6.44	3.78					<	5	Upper Kanawha	
WVK-61-J	0	Cane Fork	1/22/02	5.13	5.62	3.80					<	3	Upper Kanawha	
WVK-61-J	0	Cane Fork	12/18/01	2.54	3.1	4.40					<	5	Upper Kanawha	
WVK-61-J-1	0	UNT/Cane Fork RM 0.4	8/9/01	11.5	11.7	2.97					<	5	Upper Kanawha	
WVK-61-J-5	0	UNT/Cane Fork RM 1.5	7/19/01	1.48	3.31	5.18						7	Upper Kanawha	
WVK-61-K	0	Toms Fork	11/2/01	11.3	14.8	7.55					<	5	Upper Kanawha	
WVK-61-K	0	Toms Fork	10/11/01	0.104	0.234	7.71					<	5	Upper Kanawha	
WVK-61-L	0	Tenmile Fork	1/17/02	0.093	0.419	7.76						10	Upper Kanawha	
WVK-61-L	2.5	Tenmile Fork	4/2/02	0.1	0.65	7.79						26.8	Upper Kanawha	
WVK-61-L	0	Tenmile Fork	12/18/01	0.0893	0.984	7.85						49	Upper Kanawha	
WVK-61-L	2.5	Tenmile Fork	5/1/02	0.19	1.01	7.97						20.8	Upper Kanawha	
WVK-61-L	0	Tenmile Fork	7/19/01	0.13	0.6	7.97						26	Upper Kanawha	
WVK-61-L	0	Tenmile Fork	5/1/02	0.09	0.19	7.99						16	Upper Kanawha	
WVK-61-L	4.7	Tenmile Fork	10/10/01	0.148	0.208	8.05					<	5	Upper Kanawha	
WVK-61-L	0	Tenmile Fork	2/25/02	0.13	0.32	8.08					<	3	Upper Kanawha	
WVK-61-L	0	Tenmile Fork	10/11/01	0.275	0.457	8.11						5	Upper Kanawha	
WVK-61-L	0	Tenmile Fork	6/4/02	0.25	0.62	8.12						10.8	Upper Kanawha	
WVK-61-L	2.5	Tenmile Fork	9/10/01	0.103	0.49	8.13						10	Upper Kanawha	
WVK-61-L	0	Tenmile Fork	3/12/02	0.12	0.38	8.13						9.6	Upper Kanawha	
WVK-61-L	2.5	Tenmile Fork	6/4/02	0.28	0.72	8.15						12	Upper Kanawha	
WVK-61-L	2.5	Tenmile Fork	2/25/02	0.13	0.49	8.17					<	3	Upper Kanawha	
WVK-61-L	2.5	Tenmile Fork	7/19/01	0.22	0.78	8.18						40	Upper Kanawha	
WVK-61-L	2.5	Tenmile Fork	3/12/02	0.11	0.39	8.22						7.2	Upper Kanawha	
WVK-61-L	2.5	Tenmile Fork	10/10/01	0.19	0.456	8.23						9	Upper Kanawha	
WVK-61-L	0	Tenmile Fork	11/20/01	0.097	0.209	8.24					<	5	Upper Kanawha	
WVK-61-L	2.5	Tenmile Fork	2/25/02	0.12	0.49							3.6	Upper Kanawha	
WVK-61-L-0.5	0	UNT/Tenmile Fork RM 1.2	10/10/01	0.211	0.466	7.58						12	Upper Kanawha	
WVK-61-L-0.5	0	UNT/Tenmile Fork RM 1.2	10/4/01	0.33	0.58	7.60						17	Upper Kanawha	39.93
WVK-61-L-0.5	0	UNT/Tenmile Fork RM 1.2	3/8/02	0.1	0.34	7.95						3.2	Upper Kanawha	
WVK-61-L-0.5	0	UNT/Tenmile Fork RM 1.2	6/4/02	0.09	0.2	7.98					<	3	Upper Kanawha	
WVK-61-O	0.2	Fifteenmile Fork	12/17/01	0.427	9.04	5.09						36	Upper Kanawha	
WVK-61-O	0.2	Fifteenmile Fork	10/11/01	2.77	10.3	5.21						44	Upper Kanawha	
WVK-61-O	0.2	Fifteenmile Fork	11/15/01	1.3	8.28	5.30						47	Upper Kanawha	
WVK-61-O	0.2	Fifteenmile Fork	9/11/01	0.173	7.98	5.86						38	Upper Kanawha	
WVK-61-O	2.9	Fifteenmile Fork	2/19/02	0.1	7.27	7.70						26.4	Upper Kanawha	
WVK-61-O	1.3	Fifteenmile Fork	4/30/02	0.12	2.92	7.76						16.4	Upper Kanawha	
WVK-61-O	1.3	Fifteenmile Fork	4/4/02	0.11	1.4	7.78						14	Upper Kanawha	
WVK-61-O-1	0	Abbott Creek	12/17/01	9.2	10.8	3.27					<	5	Upper Kanawha	
WVK-61-O-1	0	Abbott Creek	11/14/01	8.07	10.3	3.40					<	5	Upper Kanawha	
WVK-61-O-1	0	Abbott Creek	10/11/01	1.82	4.66	5.50						21	Upper Kanawha	
WVK-61-O-1	0	Abbott Creek	1/16/02	2.2	3.3	6.06					<	5	Upper Kanawha	

AN Code	Mile Point	Stream Name	Date	Dis Al mg/l	Tot Al mg/L	pH	Q	Total Ca mg/L	Q	Total Mg mg/L	Q	TSS mg/L	Watershed	WVSCI
WVK-62	0	Watson Branch	7/31/01	3.15	3.2	3.57					<	5	Upper Kanawha	
WVK-62	0	Watson Branch	4/8/02	13.1	13.2	3.60					<	3	Upper Kanawha	
WVK-62	0	Watson Branch	4/30/02	8.97	9.58	3.65					<	3	Upper Kanawha	
WVK-62	0	Watson Branch	2/21/02	5.75	6.63	4.69					<	3	Upper Kanawha	
WVK-62	0	Watson Branch	1/24/02	2.09	2.75	4.99						29.6	Upper Kanawha	
WVK-63	0	Mile Branch	7/31/01	0.142	0.83	6.07					<	5	Upper Kanawha	
WVK-63	0	Mile Branch	4/8/02	0.12	1.37	7.48						6	Upper Kanawha	
WVK-63	0	Mile Branch	6/12/02	0.09	0.38	8.15					<	3	Upper Kanawha	
WVK-70	2.4	Morris Creek	11/16/01	0.906	1.65	4.40						10	Upper Kanawha	
WVK-70	0.2	Morris Creek	11/13/01	0.208	0.619	5.99						6	Upper Kanawha	
WVK-70	3.3	Morris Creek	8/1/01	0.11	0.44	6.64						10	Upper Kanawha	
WVK-70-A	0	Schuyler Fork	9/4/01	1.01	1.47	4.91					<	5	Upper Kanawha	
WVK-70-A	0	Schuyler Fork	7/31/01	0.36	0.87	4.97						6	Upper Kanawha	
WVK-70-A	0	Schuyler Fork	7/16/01	0.88	1.44	5.06					<	5	Upper Kanawha	
WVK-70-A	0	Schuyler Fork	6/14/02	0.31	0.93	5.20						5.6	Upper Kanawha	
WVK-70-A	0	Schuyler Fork	4/4/02	0.39	0.74	5.58						4.8	Upper Kanawha	
WVK-70-A	0	Schuyler Fork	10/17/01	2.71	3.58	5.65					<	5	Upper Kanawha	
WVK-70-A	0	Schuyler Fork	2/19/02	0.09	0.34	6.77					<	3	Upper Kanawha	
WVK-70-A	0	Schuyler Fork	5/1/02	0.16	0.63	7.07						4.4	Upper Kanawha	
WVK-71	0	Staten Run	10/11/01	0.191	0.211	8.26						16	Upper Kanawha	
WVK-72	0	Smithers Creek	9/13/01	0.27	0.64	6.80					<	5	Upper Kanawha	
WVK-72	1.7	Smithers Creek	9/13/01	0.1	0.19	7.28					<	5	Upper Kanawha	
WVK-72	1.7	Smithers Creek	10/10/01	0.108	0.108	7.87					<	5	Upper Kanawha	
WVK-72	0	Smithers Creek	11/19/01	0.107	0.281	7.96					<	5	Upper Kanawha	
WVK-72	0	Smithers Creek	2/21/02	0.1	0.17	8.13					<	3	Upper Kanawha	
WVK-72	0	Smithers Creek	12/10/01	0.102	0.23	8.16					<	5	Upper Kanawha	
WVK-72	0	Smithers Creek	3/14/02	0.13	0.21	8.18						5.2	Upper Kanawha	
WVK-72	0	Smithers Creek	10/11/01	0.163	0.683	8.31					<	5	Upper Kanawha	
WVK-72-A	0	Blake Branch	10/11/01	0.162	0.22	7.56						5	Upper Kanawha	
WVK-72-A	0	Blake Branch	9/12/01	0.25	0.252	7.59					<	5	Upper Kanawha	
WVK-72-A	0	Blake Branch	2/21/02	0.12	0.26	7.87					<	3	Upper Kanawha	
WVK-72-A	0	Blake Branch	6/11/02	0.13	0.4	7.93						48.4	Upper Kanawha	
WVK-72-A	0	Blake Branch	3/14/02	0.19	0.31	8.04					<	3	Upper Kanawha	
WVK-72-A	1.2	Blake Branch	9/13/01	0.2	0.23	8.12						10	Upper Kanawha	
WVK-72-A-{0.9}-Mine		Mine Discharge into Blake Branch	8/15/01	1.88	1.95	4.90					<	5	Upper Kanawha	
WVK-72-A-{0.9}-Mine		Mine Discharge into Blake Branch	6/11/02	0.63	1.62	5.17						18.4	Upper Kanawha	
WVK-72-A-{0.9}-Mine		Mine Discharge into Blake Branch	4/30/02	0.66	1.14	5.34						8.8	Upper Kanawha	
WVK-72-A-{0.9}-Mine		Mine Discharge into Blake Branch	9/13/01	0.21	0.22	6.12					<	5	Upper Kanawha	
WVK-72-A-{0.9}-Mine		Mine Discharge into Blake Branch	10/11/01	1.32	1.59	6.40						9	Upper Kanawha	
WVK-72-A-{0.9}-Mine		Mine Discharge into Blake Branch	11/20/01	0.633	0.991	6.88						8	Upper Kanawha	
WVK-72-A-{0.9}-Mine		Mine Discharge into Blake Branch	4/3/02	0.1	1.13	7.18						42	Upper Kanawha	
WVK-72-A-{0.9}-Mine		Mine Discharge into Blake Branch	12/10/01	0.161	0.242	7.82					<	5	Upper Kanawha	
WVK-72-A-1	0	Fishhook Fork	1/24/02	4.24	6.3	4.90						132	Upper Kanawha	

AnCode	Mile Point	Stream Name	Date	Dis Al mg/L	Total Al mg/L	pH		Total Ca mg/L		Total Mg mg/L		TSS mg/L	Watershed	WVSCI
WVK-72-A-1	0	Fishhook Fork	6/11/02	0.11	0.24	8.12					<	3	Upper Kanawha	
WVK-72-A-1	0	Fishhook Fork	9/13/01	0.12	0.12	8.34						5	Upper Kanawha	
WVK-72-A-1	0	Fishhook Fork	10/11/01	0.163	0.168	9.04					<	5	Upper Kanawha	
WVK-72-B	0	Bullpush Fork	9/13/01	0.22	0.22	6.85					<	5	Upper Kanawha	
WVK-72-B	0	Bullpush Fork	10/10/01	0.104	0.134	7.42						7	Upper Kanawha	
WVK-72-B	1.4	Bullpush Fork	10/9/01	0.102	0.219	8.31						5	Upper Kanawha	
WVK-72-B-2	0	Burnett Hollow	10/10/01	0.123	0.181	7.76					<	5	Upper Kanawha	
WVK-72-B-2	0	Burnett Hollow	9/12/01	0.19	0.8	8.03					<	5	Upper Kanawha	
WVK-73	8.6	Armstrong Creek	9/24/01	0.196	5.2	5.60						247	Upper Kanawha	
WVK-73	3.3	Armstrong Creek	3/7/02	0.09	0.35	6.28						3.6	Upper Kanawha	
WVK-73	4.4	Armstrong Creek	4/30/02	0.09	0.28	6.54						5.2	Upper Kanawha	
WVK-73	1.6	Armstrong Creek	4/30/02	0.09	0.56	6.71						10	Upper Kanawha	
WVK-73	5.9	Armstrong Creek	4/30/02	0.1	0.44	6.89						9.6	Upper Kanawha	
WVK-73	3.3	Armstrong Creek	4/30/02	0.09	0.62	6.96						12	Upper Kanawha	
WVK-73	0.3	Armstrong Creek	8/6/01	0.13	1.23	7.16						30	Upper Kanawha	
WVK-73	0.3	Armstrong Creek	7/24/01	0.64	0.67	7.60						25	Upper Kanawha	
WVK-73	3.3	Armstrong Creek	7/19/01	0.1	0.43	7.61						20	Upper Kanawha	
WVK-73	4.4	Armstrong Creek	8/6/01	0.1	0.71	7.63						22	Upper Kanawha	
WVK-73	0.3	Armstrong Creek	6/14/02	0.22	0.29	7.77						4.4	Upper Kanawha	
WVK-73	3.3	Armstrong Creek	6/11/02	0.22	0.32	8.04					<	3	Upper Kanawha	
WVK-73	5.9	Armstrong Creek	6/11/02	0.11	0.2	8.17					<	3	Upper Kanawha	
WVK-73	1.6	Armstrong Creek	6/11/02	0.24	0.3	8.24					<	3	Upper Kanawha	
WVK-73-A	0	Tucker Hollow	2/19/02	0.91	1.16	5.22					<	3	Upper Kanawha	
WVK-73-A	0	Tucker Hollow	3/7/02	1.35	1.5	5.25						4	Upper Kanawha	
WVK-73-A	0	Tucker Hollow	1/14/02	0.786	1.05	5.32					<	5	Upper Kanawha	
WVK-73-A	0	Tucker Hollow	4/3/02	0.22	0.45	5.71					<	3	Upper Kanawha	
WVK-73-A	0	Tucker Hollow	4/30/02	0.14	0.46	6.15					<	3	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	8/1/01	4.3	4.8	4.05					<	5	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	9/6/01	2.4	3.07	4.58					<	5	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	6/12/02	3.51	3.51	4.65					<	3	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	2/19/02	1.67	1.88	4.79					<	3	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	4/30/02	1.19	1.95	4.86						14	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	11/14/01	5.97	6.03	4.91					<	5	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	12/6/01	5.42	6.99	4.92					<	5	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	1/15/02	1.92	2.44	4.96						5	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	3/7/02	1.71	2.29	4.99						5.6	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	4/3/02	1.36	1.93	5.02						18.8	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	7/19/01	0.44	1.36	5.28						21	Upper Kanawha	
WVK-73-D	0	Jenkins Fork	10/17/01	2.97	3.82	6.15					<	5	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	8/1/01	2.9	3.2	3.81						7	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	9/6/01	5.96	7.68	3.91					<	5	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	6/12/02	6.35	6.35	3.97					<	3	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	3/7/02	3.24	3.33	4.06					<	3	Upper Kanawha	

AnCode	Mile Point	Stream Name	Date	Dissolved Al mg/L	Total Al mg/L	pH	Q	Diss Cl mg/L	Q	Total Mg mg/L	Q	TSS mg/L	Watershed	WVSCI
WVK-73-D-1	0	Craig Hollow	1/14/02	3.35	4.26	4.06					<	5	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	12/11/01	13.2	16.1	4.07					<	5	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	2/19/02	2.65	2.65	4.11					<	3	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	7/19/01	2.38	2.77	4.19						34	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	11/14/01	11.6	15.2	4.21					<	5	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	4/30/02	1.84	2.17	4.52						5.2	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	10/17/01	9.56	11.8	4.53					<	5	Upper Kanawha	
WVK-73-D-1	0	Craig Hollow	4/4/02	1.9	2.09	4.63						7.2	Upper Kanawha	
WVK-73-E	0.4	Powellton Fork	12/6/01	0.0889	0.238	7.00					<	5	Upper Kanawha	
WVK-73-E	0.4	Powellton Fork	8/6/01	0.14	0.7	7.35						7	Upper Kanawha	
WVK-73-E	2.6	Powellton Fork	8/6/01	0.1	0.5	7.37					<	5	Upper Kanawha	
WVK-73-E	0.4	Powellton Fork	6/14/02	0.14	0.28	7.58					<	3	Upper Kanawha	
WVK-73-E	0.4	Powellton Fork	9/5/01	0.115	0.301	7.60						11	Upper Kanawha	
WVK-73-E.9	0	Laurel Branch/Armstrong Creek	9/24/01	0.158	0.188	6.48					<	5	Upper Kanawha	
WVK-73-E-2	0	Woodrum Branch	4/1/02	2.26	4.64	4.74						105	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	1/16/02	6.17	7.14	4.30					<	5	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	2/19/02	4.56	4.68	4.42					<	3	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	6/12/02	4.5	4.5	4.45					<	3	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	7/23/01	1.72	1.77	4.48					<	5	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	3/11/02	3.76	4.77	4.65					<	3	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	12/11/01	2.71	3.5	4.70					<	5	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	4/4/02	1.46	1.58	4.72					<	3	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	10/15/01	2.14	2.69	4.73					<	5	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	4/30/02	1.03	1.21	4.77						5.6	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	8/7/01	1.3	1.42	4.82					<	5	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	11/13/01	2.4	3	4.91					<	5	Upper Kanawha	
WVK-73-F	0	Right Fork/Armstrong Creek	9/24/01	2.21	2.55	5.07					<	5	Upper Kanawha	
WVK-73-G	0	Left Fork/Armstrong Creek	9/24/01	0.13	7.84	6.64						420	Upper Kanawha	
WVK-74	0.7	Boomer Branch	9/12/01	0.13	0.18	7.91					<	5	Upper Kanawha	
WVK-74	0.7	Boomer Branch	6/10/02	0.13	0.21	7.93					<	3	Upper Kanawha	
WVK-74	0.7	Boomer Branch	4/29/02	0.26	1.71	7.94						30.8	Upper Kanawha	
WVK-74	0.1	Boomer Branch	9/12/01	0.17	0.28	8.00					<	5	Upper Kanawha	
WVK-74	0.1	Boomer Branch	4/29/02	0.3	1.66	8.03						22	Upper Kanawha	
WVK-74	0.1	Boomer Branch	6/10/02	0.25	0.35	8.11					<	3	Upper Kanawha	
WVK-74	0.1	Boomer Branch	3/14/02	0.1	0.14	8.20					<	3	Upper Kanawha	
WVK-74	0.7	Boomer Branch	2/20/02	0.09	0.13	8.29					<	3	Upper Kanawha	
WVK-74	0.7	Boomer Branch	10/9/01	0.211	0.23	8.41					<	5	Upper Kanawha	
WVK-74	0.1	Boomer Branch	10/9/01	0.257	0.439	8.65					<	5	Upper Kanawha	
WVK-75	1.3	Jarrett Branch	10/9/01	0.153	0.163	6.72					<	5	Upper Kanawha	
WVK-75	0.3	Jarrett Branch	4/29/02	0.23	2.12	8.85						35.2	Upper Kanawha	
WVK-75	0.3	Jarrett Branch	10/9/01	0.092	0.159	9.84						24	Upper Kanawha	
WVK-75-A	0	UNT/Jarrett Branch RM 1.1	8/14/01	12.4	12.4	4.47						5	Upper Kanawha	
WVK-75-A	0	UNT/Jarrett Branch RM 1.1	6/10/02	5.85	6.45	4.61					<	3	Upper Kanawha	

AN Code	Mile Point	Stream Name	Date	Dis Al (mg/L)	Total Al (mg/L)	pH	Q	Total Ca (mg/L)	Q	Total Mg (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVK-75-A	0	UNT/Jarrett Branch RM 1.1	10/9/01	0.123	0.294	6.80						6	Upper Kanawha	
WVK-75-A	0	UNT/Jarrett Branch RM 1.1	9/12/01	0.13	0.6	8.20						25	Upper Kanawha	
WVK-76-C-1	0	Dempsey Branch	9/26/01	0.209	0.209	7.56					<	5	Upper Kanawha	
WVK-76-C-1-A	0	Coleman Branch	9/26/01	0.095	0.102	7.53						34	Upper Kanawha	
WVK-76-D	0	Beards Fork	3/6/02	0.1	0.15	7.38					<	3	Upper Kanawha	
WVK-76-D	0	Beards Fork	9/27/01	0.11	0.11	7.59					<	5	Upper Kanawha	
WVK-76-D	0	Beards Fork	6/11/02	0.14	0.18	8.44					<	3	Upper Kanawha	
WVK-76-J	0	Camp Branch	9/25/01	0.163	1.09	8.55						16	Upper Kanawha	
WVK-76-K	0.6	Ingram Branch	9/3/02	0.9	0.99	4.71					<	3	Upper Kanawha	69.25
WVK-76-K	0	Ingram Branch	8/8/01	0.77	1.12	4.96					<	5	Upper Kanawha	
WVK-76-K	0	Ingram Branch	9/3/02	0.36	0.39	5.17					<	3	Upper Kanawha	27.41
WVK-76-K	0.6	Ingram Branch	10/16/01	0.551	0.703	5.19					<	5	Upper Kanawha	
WVK-76-K	0	Ingram Branch	12/13/01	0.499	0.648	5.20					<	5	Upper Kanawha	
WVK-76-K	0	Ingram Branch	11/15/01	0.64	0.893	5.25					<	5	Upper Kanawha	
WVK-76-K	0	Ingram Branch	3/26/02	0.36	0.78	5.26						6	Upper Kanawha	
WVK-76-K	0	Ingram Branch	2/13/02	0.61	0.668	5.31					<	3	Upper Kanawha	
WVK-76-K	0	Ingram Branch	6/10/02	2.07	2.07	5.32					<	3	Upper Kanawha	
WVK-76-K	0	Ingram Branch	1/14/02	0.529	1.75	5.33					<	5	Upper Kanawha	
WVK-76-K	0	Ingram Branch	10/16/01	0.755	0.945	5.36					<	5	Upper Kanawha	
WVK-76-K	0.6	Ingram Branch	11/14/01	0.576	1.56	5.45						12	Upper Kanawha	
WVK-76-K	0.6	Ingram Branch	12/13/01	0.403	0.69	5.46					<	5	Upper Kanawha	
WVK-76-K	0	Ingram Branch	3/6/02	0.63	0.68	5.87					<	3	Upper Kanawha	
WVK-76-K	0.6	Ingram Branch	1/22/02	0.096	0.362	5.89						5.2	Upper Kanawha	
WVK-76-K	0.6	Ingram Branch	9/25/01	0.238	0.701	5.94						5	Upper Kanawha	
WVK-76-K	0.6	Ingram Branch	3/26/02	0.11	0.74	6.13						5.6	Upper Kanawha	
WVK-76-K	0.6	Ingram Branch	2/13/02	0.118	0.457	6.27						4	Upper Kanawha	
WVK-76-K	0.6	Ingram Branch	3/6/02	0.12	0.54	6.36						5.6	Upper Kanawha	
WVK-76-K	0	Ingram Branch	9/25/01	1.36	1.89	6.50					<	5	Upper Kanawha	
WVK-76-K	0.6	Ingram Branch	6/10/02	0.56	0.86	7.11						4.4	Upper Kanawha	
WVK-76-M	0	Open Fork	9/26/01	0.12	0.134	6.74					<	5	Upper Kanawha	
WVKC-10-H	0.3	Little Hewitt Creek	4/28/03	0.1	1.31	5.68						44	Coal	
WVKC-10-H	0.3	Little Hewitt Creek	3/13/03	0.22	0.26	5.73					<	3	Coal	
WVKC-10-H	0.3	Little Hewitt Creek	4/15/03	0.16	0.24	5.91					<	3	Coal	
WVKC-10-I-8	0	Rich Hollow	10/16/02	0.22	0.5	8.72						13	Coal	
WVKC-10-J	2.5	Little Horse Creek	2/4/03	0.27	0.32	7.29						6	Coal	
WVKC-10-T	4.6	Spruce Fork	3/19/03	0.12	0.19	7.18					<	3	Coal	
WVKC-10-T	18.1	Spruce Fork	3/17/03	0.1	0.34	7.59					<	3	Coal	
WVKC-10-T	4.6	Spruce Fork	4/17/03	0.1	0.19	8.00					<	3	Coal	
WVKC-10-T	0.3	Spruce Fork	3/18/03	0.11	0.19	8.19					<	3	Coal	
WVKC-10-T	4.6	Spruce Fork	8/28/02	0.15	0.18	8.27					<	3	Coal	
WVKC-10-T	0.3	Spruce Fork	8/31/02	0.1	0.11	8.28					<	3	Coal	
WVKC-10-T	0.3	Spruce Fork	8/31/02	0.09	0.1							3.6	Coal	
WVKC-10-T-11	3.5	Spruce Laurel Fork	3/19/03	0.11	0.16	7.78					<	3	Coal	

AN Code	Mile Point	Stream Name	Date	Dis Al (mg/L)	Total Fe (mg/L)	pH	Q	Total Se (mg/L)	Q	Total Mg (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVKC-10-T-11	3.5	Spruce Laurel Fork	10/30/02	0.09	0.8	7.94						44	Coal	
WVKC-10-T-11	0.2	Spruce Laurel Fork	6/2/03	0.09	0.26	8.22					<	3	Coal	
WVKC-10-T-11	3.5	Spruce Laurel Fork	4/16/03	0.11	0.47	8.26						5.6	Coal	
WVKC-10-T-11	3.5	Spruce Laurel Fork	12/9/02	0.09	0.24	8.38						6	Coal	
WVKC-10-T-11	0.2	Spruce Laurel Fork	4/16/03	0.1	0.28	8.38						5.2	Coal	
WVKC-10-T-11	0.2	Spruce Laurel Fork	6/2/03	0.09	0.27							8	Coal	
WVKC-10-T-22.5	0	Little White Oak Branch	2/24/03	0.12	0.21	8.66						4	Coal	
WVKC-10-T-25	0	Laurel Fork	8/26/02	0.25	1.27	5.71						13	Coal	
WVKC-10-T-5	0.1	Hunters Branch	4/17/03	0.57	1.16	5.19						5	Coal	
WVKC-10-T-5	0.1	Hunters Branch	2/26/03	1	1.15	5.42						6	Coal	
WVKC-10-T-5	0.1	Hunters Branch	1/30/03	0.37	0.88	6.57						6	Coal	
WVKC-10-T-5	0.1	Hunters Branch	3/19/03	0.28	1	6.94						5.6	Coal	
WVKC-10-T-9	0	Hewett Creek	8/28/02	2.46	9.86	5.24						56.8	Coal	
WVKC-10-T-9	0	Hewett Creek	7/16/02	0.24	0.42	7.94					<	3	Coal	
WVKC-10-T-9	0	Hewett Creek	8/28/02	2.49	9.67							60.8	Coal	
WVKC-10-T-9-B	0	Missouri Fork	10/8/02	0.09	0.1	8.37					<	3	Coal	
WVKC-10-U	0.3	Pond Fork	4/18/03	0.09	0.21	7.87					<	3	Coal	
WVKC-10-U	32.3	Pond Fork	7/8/02	0.09	0.52	7.89						5.2	Coal	
WVKC-10-U	6.3	Pond Fork	5/8/03	0.09	0.11	8.03					<	3	Coal	
WVKC-10-U	15.8	Pond Fork	3/18/03	0.16	1.52	8.04						4.4	Coal	
WVKC-10-U	6.3	Pond Fork	4/18/03	0.11	0.29	8.05						4	Coal	
WVKC-10-U	6.3	Pond Fork	11/20/02	0.12	0.22	8.16						4	Coal	
WVKC-10-U	0.3	Pond Fork	11/4/02	0.11	0.14	8.26					<	3	Coal	
WVKC-10-U	6.3	Pond Fork	3/17/03	0.13	0.19	8.37					<	3	Coal	
WVKC-10-U	0.3	Pond Fork	3/18/03	0.12	0.17	8.37					<	3	Coal	
WVKC-10-U	6.3	Pond Fork	8/31/02	0.09	0.1	8.44					<	3	Coal	
WVKC-10-U-12	0	Cow Creek	2/14/03	0.1	0.65	8.35						24	Coal	
WVKC-10-U-21	0	Lacey Branch	10/16/02	0.17	0.99	7.61						186	Coal	
WVKC-10-U-3	0	Robinson Creek	5/8/03	0.09	0.26	7.57					<	3	Coal	
WVKC-10-U-3	0	Robinson Creek	4/18/03	0.09	0.49	7.70						8	Coal	
WVKC-10-U-3	0	Robinson Creek	7/17/02	0.12	0.13	8.11					<	3	Coal	
WVKC-10-U-3	0	Robinson Creek	8/31/02	0.22	0.23	8.37						4	Coal	
WVKC-10-U-7	0.5	West Fork	5/9/03	0.14	0.19	8.26					<	3	Coal	
WVKC-10-U-7	0.5	West Fork	3/17/03	0.18	0.47	8.32						4.8	Coal	
WVKC-10-U-7	0.5	West Fork	7/9/02	0.13	0.17	8.33					<	3	Coal	
WVKC-10-U-7	0.5	West Fork	4/19/03	0.24	0.37	8.47					<	3	Coal	
WVKC-10-U-7	0.5	West Fork	8/31/02	0.15	0.17	8.50						3.2	Coal	
WVKC-10-U-7-A	0	Roach Branch	10/16/02	0.11	0.73	7.32						79	Coal	
WVKC-10-U-7-D	0	Browns Branch	4/20/03	1.68	2.49	4.89						3	Coal	
WVKC-10-U-7-D-{0.2}-Discharge		Mine Discharge into Browns Branch	4/20/03	2.36	3.06	4.74					<	3	Coal	
WVKC-31	4.9	Laurel Creek	5/28/03	0.1	0.4	7.78						6	Coal	
WVKC-31	4.9	Laurel Creek	7/30/02	0.14	0.22	7.85					<	3	Coal	

AMCode	Mile Point	Stream Name	Date	Dis Al mg/L	Tot Al mg/L	pH	Q	Total Fe mg/L	Q	Total Mn mg/L	Q	TSS mg/L	Watershed	WVSCI
WVKC-32	0	Horse Branch	10/9/02	6.78	6.78	3.96					<	3	Coal	
WVKC-32	0	Horse Branch	8/26/02	7.02	7.02	4.20						10	Coal	
WVKC-32	0	Horse Branch	11/14/02	2.58	2.58	4.25					<	3	Coal	
WVKC-32	0	Horse Branch	3/30/03	3.77	3.88	4.35					<	3	Coal	
WVKC-32	0	Horse Branch	10/30/02	2.64	2.7	4.57						4	Coal	
WVKC-32	0	Horse Branch	3/19/03	2.98	4.53	4.75						5.2	Coal	
WVKC-32	0	Horse Branch	7/30/02	2.84	3.44	4.85						8	Coal	
WVKC-32	0	Horse Branch	12/17/02	3.06	3.19	4.88						8	Coal	
WVKC-32	0	Horse Branch	5/29/03	2.28	2.86	5.01						3	Coal	
WVKC-32	0	Horse Branch	1/29/03	2.9	4.59	5.04						75	Coal	
WVKC-32	0	Horse Branch	3/3/03	1.49	1.78	5.31					<	3	Coal	
WVKC-33	0	Haggle Branch	3/19/03	0.44	0.51	5.27						5.2	Coal	
WVKC-33	0	Haggle Branch	3/3/03	0.5	0.5	5.45					<	3	Coal	
WVKC-33	0	Haggle Branch	3/30/03	0.32	0.39	5.45					<	3	Coal	
WVKC-33	0	Haggle Branch	12/17/02	0.31	0.45	5.55						5	Coal	
WVKC-33	0	Haggle Branch	11/14/02	0.1	0.11	5.67					<	3	Coal	
WVKC-33	0	Haggle Branch	5/29/03	0.1	0.27	5.79					<	3	Coal	
WVKC-33	0	Haggle Branch	1/29/03	0.31	0.52	5.96						7	Coal	
WVKC-35	2.7	White Oak Creek	10/29/02	0.1	22	7.52						1320	Coal	
WVKC-35	2.7	White Oak Creek	11/13/02	0.09	0.14	7.63						4	Coal	
WVKC-35	2.7	White Oak Creek	3/3/03	0.09	0.8	7.69						30	Coal	
WVKC-35	0.1	White Oak Creek	10/29/02	0.09	3.88	7.74						275	Coal	
WVKC-35	2.7	White Oak Creek	12/20/02	0.09	0.21	7.76					<	3	Coal	
WVKC-35	2.7	White Oak Creek	10/9/02	0.1	0.1	7.79					<	3	Coal	
WVKC-35	2.7	White Oak Creek	7/24/02	0.11	0.14	7.81					<	3	Coal	
WVKC-35	2.7	White Oak Creek	8/26/02	0.1	0.12	7.82					<	5	Coal	
WVKC-35	0.1	White Oak Creek	5/29/03	0.1	0.81	7.87						30	Coal	
WVKC-35	0.1	White Oak Creek	3/19/03	0.11	0.18	7.89					<	3	Coal	
WVKC-35	2.7	White Oak Creek	5/29/03	0.12	0.79	7.89						23	Coal	
WVKC-35	2.7	White Oak Creek	1/29/03	0.11	0.28	7.95						3	Coal	
WVKC-35	2.7	White Oak Creek	3/19/03	0.16	0.27	7.98						3.6	Coal	
WVKC-35	2.7	White Oak Creek	3/30/03	0.11	0.24	8.05						4	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	3/19/03	12.1	12.2	3.98					<	3	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	7/23/02	6.79	6.79	4.03						10.4	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	5/29/03	8.42	8.53	4.15						6	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	3/3/03	7.36	7.4	4.17						8	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	11/14/02	4.98	4.98	4.19					<	3	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	3/30/03	12.8	12.8	4.30					<	3	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	12/17/02	4.25	4.25	4.47						30	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	10/30/02	6.6	6.61	4.49					<	3	Coal	
WVKC-35.8	0	UNT/Big Coal River RM 52.7	3/19/03	5.09	7.17	4.71						14.4	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	1/28/03	8.99	8.99	4.72					<	3	Coal	
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	10/9/02	1.12	1.12	4.85					<	3	Coal	

AllCode	Mile Point	Stream Name	Date	Dis. Al (mg/L)	Total Al (mg/L)	pH	Q	Tot. Fe (mg/L)	Q	Diss. Fe (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVKC-35.8	0.5	UNT/Big Coal River RM 52.7	8/26/02	1.35	1.48	4.87						7	Coal	
WVKC-35.8	0	UNT/Big Coal River RM 52.7	3/3/03	3.06	3.18	5.13						6	Coal	
WVKC-35.8	0	UNT/Big Coal River RM 52.7	1/28/03	3.63	7.47	5.26						18	Coal	
WVKC-35.8	0	UNT/Big Coal River RM 52.7	5/28/03	0.81	3.69	5.32						37	Coal	
WVKC-35.8	0	UNT/Big Coal River RM 52.7	3/30/03	5.55	7.94	5.35						16	Coal	
WVKC-35.8	0	UNT/Big Coal River RM 52.7	11/14/02	0.38	2.56	5.36						10	Coal	
WVKC-35.8	0	UNT/Big Coal River RM 52.7	12/17/02	0.81	1.83	5.51						6	Coal	
WVKC-35.8	0	UNT/Big Coal River RM 52.7	7/22/02	0.09	3.36	7.36						12	Coal	
WVKC-35-D	0	Threemile Branch	3/19/03	0.52	0.53	4.65					<	3	Coal	
WVKC-35-E	0	Left Fork/White Oak Creek	3/3/03	0.1	0.47	8.09						21	Coal	
WVKC-35-E	0	Left Fork/White Oak Creek	5/29/03	0.11	0.21	8.10					<	3	Coal	
WVKC-35-E	0	Left Fork/White Oak Creek	3/19/03	0.15	0.36	8.16						5.2	Coal	
WVKC-35-E	0	Left Fork/White Oak Creek	3/30/03	0.1	0.33	8.22						5	Coal	
WVKC-39	0	Little Elk Creek	5/14/03	0.1	0.25	8.07					<	3	Coal	
WVKC-39	0	Little Elk Creek	9/5/02	0.1	0.72	8.08					<	3	Coal	
WVKC-46	32	Marsh Fork	10/9/02	0.088	0.148	7.82						3	Coal	
WVKC-46-A	0.7	Little Marsh Fork	11/25/02	0.14	1.16	7.77						13	Coal	
WVKC-46-A	0.7	Little Marsh Fork	11/4/02	0.1	0.58	7.81						13	Coal	
WVKC-46-A	0.7	Little Marsh Fork	10/15/02	0.19	0.55	7.96						7	Coal	
WVKC-46-A	0.7	Little Marsh Fork	12/23/02	0.09	0.22	8.02						4	Coal	
WVKC-46-A	0.7	Little Marsh Fork	1/21/03	0.1	0.58	8.07						6	Coal	
WVKC-46-A	0.7	Little Marsh Fork	4/17/03	0.09	0.33	8.12						8	Coal	
WVKC-46-A	0.7	Little Marsh Fork	5/12/03	0.16	0.55	8.18						15	Coal	
WVKC-46-A	0.7	Little Marsh Fork	3/17/03	0.16	1.03	8.21						36.4	Coal	
WVKC-46-A	0.7	Little Marsh Fork	8/27/02	0.19	0.21	8.21					<	5	Coal	
WVKC-46-A	0.7	Little Marsh Fork	7/24/02	0.22	0.44	8.26						8	Coal	
WVKC-46-A-4	0	Brushy Fork	11/26/02	0.1	1.55	7.57						22	Coal	
WVKC-46-A-4	0	Brushy Fork	11/4/02	0.1	1.11	7.64						16	Coal	
WVKC-46-A-4	0	Brushy Fork	3/18/03	0.11	1.68	7.78						24	Coal	
WVKC-46-A-4	0	Brushy Fork	5/12/03	0.18	0.96	7.95						19	Coal	
WVKC-46-A-4	0	Brushy Fork	4/16/03	0.21	0.97	8.03						22	Coal	
WVKC-46-A-4	0	Brushy Fork	7/24/02	0.29	1.1	8.05						17.2	Coal	
WVKC-46-A-4	0	Brushy Fork	12/23/02	0.15	2.9	8.07					<	3	Coal	
WVKC-46-A-4	0	Brushy Fork	10/15/02	0.11	0.92	8.10						18	Coal	
WVKC-46-A-4	0	Brushy Fork	8/27/02	0.15	0.49	8.12						8.8	Coal	
WVKC-46-D	0	Shumate Creek	2/24/03	1.51	1.51	7.46						36	Coal	
WVKC-46-G-2	2.6	Martin Fork	4/16/03	2.15	3.1	4.92						3.6	Coal	
WVKC-46-G-2	2.6	Martin Fork	12/30/02	1.84	3.43	5.29						8	Coal	
WVKC-46-G-3	0	Millers Fork	3/20/03	0.76	0.76	7.07						34	Coal	
WVKC-46-J-2	0.7	Bee Branch	7/25/02	2.6	2.84	4.62					<	3	Coal	
WVKC-46-J-2	0.7	Bee Branch	9/3/02	1.2	1.2	4.64						4	Coal	
WVKC-46-J-2	0.7	Bee Branch	5/29/03	1.36	1.77	5.01						6	Coal	
WVKC-46-N	0.1	Maple Meadow Creek	10/9/02	0.089	0.09	7.33						4	Coal	

AnCode	Mile Point	Stream Name	Date	Diss Al (mg/L)	Total Al (mg/L)	pH	Q	Diss Fe (mg/L)	Q	Total Fe (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVKC-46-Q	5	Miller Camp Branch	10/10/02	0.757	2.2	5.91						10	Coal	
WVKC-46-Q	4.2	Miller Camp Branch	10/10/02	0.106	0.129	7.13						10	Coal	
WVKC-46-Q	4.2	Miller Camp Branch	1/15/03	0.1	0.1	7.34					<	3	Coal	
WVKC-46-Q	4.2	Miller Camp Branch	5/8/03	0.3	0.18	7.36						3	Coal	
WVKC-46-Q	1	Miller Camp Branch	8/13/02	0.153	0.313	7.76						4	Coal	
WVKC-46-Q	0	Miller Camp Branch	10/22/02	0.104	0.198	7.81						2	Coal	
WVKC-46-Q	0	Miller Camp Branch	9/5/02	0.1	0.21	7.84					<	5	Coal	
WVKC-46-Q	0	Miller Camp Branch	9/25/02	0.1	0.202	7.85						5	Coal	
WVKC-47	7.2	Clear Fork	10/17/02	0.09	0.55	7.21						24	Coal	
WVKC-47	7.2	Clear Fork	11/14/02	0.09	0.3	7.69						5	Coal	
WVKC-47	4.1	Clear Fork	7/15/02	0.12	0.48	7.74						13.2	Coal	
WVKC-47	7.2	Clear Fork	3/24/03	0.1	0.38	7.84					<	3	Coal	
WVKC-47	2.4	Clear Fork	7/15/02	0.1	0.52	7.90						18	Coal	
WVKC-47	7.2	Clear Fork	7/10/02	0.26	0.29	7.91					<	3	Coal	
WVKC-47	0	Clear Fork	7/15/02	0.09	0.74	7.95						19.2	Coal	
WVKC-47	7.2	Clear Fork	5/13/03	0.16	0.26	8.06					<	3	Coal	
WVKC-47	4.1	Clear Fork	5/13/03	0.1	0.17	8.08					<	3	Coal	
WVKC-47	7.2	Clear Fork	9/4/02	0.2	0.24	8.16					<	5	Coal	
WVKC-47-F	0	Stonecoal Branch	2/25/03	6.6	6.6	4.59						10	Coal	
WVKC-47-F	0	Stonecoal Branch	3/24/03	6.12	6.12	4.64					<	3	Coal	
WVKC-47-F	0	Stonecoal Branch	4/16/03	6.33	6.33	4.65						4	Coal	
WVKC-47-F	0	Stonecoal Branch	5/13/03	5.63	5.75	4.74						10	Coal	
WVKC-47-F	0	Stonecoal Branch	7/10/02	1.46	6.09	4.77						170	Coal	
WVKC-47-F	0	Stonecoal Branch	9/4/02	1.01	1.85	4.77						38	Coal	
WVKC-47-F	0	Stonecoal Branch	1/30/03	6.09	6.09	4.88						6	Coal	
WVKC-47-F	0	Stonecoal Branch	10/29/02	2.6	4.39	4.94						65	Coal	
WVKC-47-F	0	Stonecoal Branch	10/17/02	3.34	3.71	5.01						14	Coal	
WVKC-47-F	0	Stonecoal Branch	11/14/02	1.53	2.4	5.14						7	Coal	
WVKC-47-F	0	Stonecoal Branch	12/10/02	0.34	8.39	5.30						382	Coal	
WVKC-47-G	0.5	Long Branch	10/17/02	0.1	0.68	6.32						5	Coal	
WVKC-47-G	0.5	Long Branch	10/30/02	0.11	0.5	6.66						5	Coal	
WVKC-47-G	0.5	Long Branch	1/29/03	0.11	0.78	7.26						6	Coal	
WVKC-47-G	0.5	Long Branch	9/4/02	0.13	1.14	7.27						7.2	Coal	
WVKC-47-G	0.5	Long Branch	7/10/02	0.15	1.22	7.31						3.2	Coal	
WVKC-47-G	0.5	Long Branch	5/13/03	0.1	0.64	7.36						3	Coal	
WVKC-47-G	0.5	Long Branch	4/2/03	0.1	0.68	7.42						8	Coal	
WVKC-47-G	0.5	Long Branch	12/10/02	0.09	0.46	7.45					<	3	Coal	
WVKC-47-G-1	0	Dow Fork	2/25/03	13	13	3.55						14	Coal	
WVKC-47-G-1	0	Dow Fork	1/29/03	10.4	10.6	3.79					<	3	Coal	
WVKC-47-G-1	0	Dow Fork	4/15/03	8.92	9	3.84						3.6	Coal	
WVKC-47-G-1	0	Dow Fork	7/10/02	13	13	3.94					<	3	Coal	
WVKC-47-G-1	0	Dow Fork	9/4/02	9.68	9.68	4.00					<	5	Coal	
WVKC-47-G-1	0	Dow Fork	4/2/03	10.6	10.8	4.03					<	3	Coal	

AnCode	Mile Point	Stream Name	Date	Dis Al (mg/L)	Total Al (mg/L)	pH	Q	Total Ca (mg/L)	Q	Total Mg (mg/L)	Q	TSS (mg/L)	Watershed	AWSC
WVKC-47-G-1	0	Dow Fork	5/13/03	10	10.1	4.09					<	3	Coal	
WVKC-47-G-1	0	Dow Fork	12/10/02	7.55	7.55	4.17					<	3	Coal	
WVKC-47-G-1	0	Dow Fork	10/17/02	9.2	9.2	4.36					<	3	Coal	
WVKC-47-G-1	0	Dow Fork	11/13/02	5.19	5.19	4.41					<	3	Coal	
WVKC-47-G-1	0	Dow Fork	10/30/02	5.8	5.8	4.48					<	3	Coal	
WVKE	89.5	Elk River	12/3/02	0.21	0.28	6.40					<	3	Elk	
WVKE	107	Elk River	12/3/02	0.1	0.18	6.64					<	3	Elk	
WVKE	27.2	Elk River	5/12/03	0.15	0.85	6.94						100	Elk	
WVKE	56.3	Elk River	4/4/03	0.15	0.22	7.06						3	Elk	
WVKE	4.4	Elk River	5/12/03	0.16	1.25	7.11						225	Elk	
WVKE	27.2	Elk River	4/4/03	0.19	0.25	7.16					<	3	Elk	
WVKE	107	Elk River	1/6/03	0.12	0.32	7.22						3	Elk	
WVKE	27.2	Elk River	1/9/03	0.12	0.2	7.27					<	3	Elk	
WVKE	4.4	Elk River	1/6/03	0.12	0.16	7.27					<	3	Elk	
WVKE	4.4	Elk River	12/6/02	0.11	0.15	7.40					<	3	Elk	
WVKE	27.2	Elk River	2/11/03	0.11	0.23	7.42					<	3	Elk	
WVKE	27.2	Elk River	3/6/03	0.16	0.23	7.45					<	3	Elk	
WVKE	89.5	Elk River	1/6/03	0.14	0.29	7.45					<	3	Elk	
WVKE	56.3	Elk River	6/5/03	0.18	0.29	7.47						11	Elk	
WVKE	27.2	Elk River	6/5/03	0.21	0.48	7.49						16	Elk	
WVKE	56.3	Elk River	2/11/03	0.14	0.16	7.57					<	3	Elk	
WVKE	56.3	Elk River	3/6/03	0.16	0.19	7.60					<	3	Elk	
WVKE	89.5	Elk River	4/2/03	0.22	0.26	7.66					<	3	Elk	
WVKE	107	Elk River	6/4/03	0.12	0.22	7.70						11	Elk	
WVKE	4.4	Elk River	2/20/03	0.14	0.57	7.72						43	Elk	
WVKE	107	Elk River	4/2/03	0.25	0.29	7.73					<	3	Elk	
WVKE	107	Elk River	2/10/03	0.15	0.31	7.83					<	3	Elk	
WVKE-23	0.9	Big Sandy Creek	2/17/01	0.1	4.74	6.50						360	Elk	
WVKE-23	0.9	Big Sandy Creek	5/12/03	0.15	0.36	6.65						22	Elk	
WVKE-23	0.9	Big Sandy Creek	4/18/00	0.144	2.52	6.90						110	Elk	
WVKE-23	0.9	Big Sandy Creek	2/11/03	0.25	0.3	7.27					<	3	Elk	
WVKE-23	0.9	Big Sandy Creek	1/9/03	0.11	0.16	7.28					<	3	Elk	
WVKE-23	0.9	Big Sandy Creek	4/4/03	0.16	0.28	7.31					<	3	Elk	
WVKE-23	0.9	Big Sandy Creek	12/6/02	0.14	0.15	7.35						3	Elk	
WVKE-23	0.9	Big Sandy Creek	3/6/03	0.14	0.19	7.40					<	3	Elk	
WVKE-23	0.9	Big Sandy Creek	6/5/03	0.11	0.46	7.48						9	Elk	
WVKE-23	0.9	Big Sandy Creek	4/4/00	0.122	3.94	7.60						260	Elk	
WVKE-26	0.7	Morris Creek	4/4/00	0.117	0.662	6.70						17	Elk	
WVKE-26	0.7	Morris Creek	4/18/00	0.118	0.4	7.00						5	Elk	
WVKE-26-A	0	Left Fork/Morris Creek	4/10/01	1.42	1.72	4.86						4	Elk	
WVKE-50	15.2	Buffalo Creek	5/7/01	0.391	0.838	4.85						4	Elk	
WVKE-50	15.2	Buffalo Creek	4/11/01	0.368	1.23	5.33						16	Elk	
WVKE-50	0.7	Buffalo Creek	4/4/03	0.17	0.52	6.75						3	Elk	

[illegible]	Mile Point	Stream Name	Date	[illegible]	[illegible]	pH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	TSS mg/l	Watershed	WVSCI
WVKE-50	0.7	Buffalo Creek	1/9/03	0.16	0.44	6.87						5	Elk	
WVKE-50	0.7	Buffalo Creek	6/5/03	0.1	0.47	7.46					<	3	Elk	
WVKE-50	0.7	Buffalo Creek	2/11/03	0.26	0.31	7.73					<	3	Elk	
WVKE-50-P		Taylor Creek	5/7/01	1.9	1.89	4.14						2	Elk	
WVKE-50-P		Taylor Creek	4/11/01	1.28	1.46	4.46						5	Elk	
WVKE-50-R		Spanish Oak Branch	5/7/01	0.34	0.389	4.31						4	Elk	
WVKE-50-R		Spanish Oak Branch	4/11/01	0.407	0.417	4.59					<	1	Elk	
WVKE-50-S		Dille Run	5/7/01	2.95	2.99	3.88						2	Elk	
WVKE-50-S		Dille Run	4/11/01	1.24	1.28	4.44						2	Elk	
WVKE-50-T.3		2nd UNT/Buffalo Creek	4/11/01	0.878	0.918	5.04						4	Elk	
WVKE-50-T.3		2nd UNT/Buffalo Creek	5/7/01	0.293	0.618	5.50						4	Elk	
WVKE-50-T.5		3rd UNT/Buffalo Creek	5/7/01	0.897	0.93	4.89						2	Elk	
WVKE-50-T.5		3rd UNT/Buffalo Creek	4/11/01	1.06	1.08	4.91						1	Elk	
WVKE-50-U		Brushy Fence Run	5/7/01	1.67	1.84	4.84						1	Elk	
WVKE-50-U		Brushy Fence Run	4/11/01	1.26	1.86	4.89						4	Elk	
WVKE-76	11.9	Birch River	12/3/02	0.19	0.31	6.60					<	3	Elk	
WVKE-76	11.9	Birch River	2/10/03	0.18	0.18	7.22					<	3	Elk	
WVKE-76	11.9	Birch River	4/2/03	0.26	0.29	7.52					<	3	Elk	
WVKE-76	11.9	Birch River	5/6/03	0.3	0.31	7.60					<	3	Elk	
WVKE-9	0.7	Little Sandy Creek	4/18/00	0.128	3.28	7.20						140	Elk	
WVKE-9	0.7	Little Sandy Creek	4/4/00	0.118	3.89	8.20						230	Elk	
WVKE-9-B	0.1	Wills Creek	4/18/00	0.117	2.1	7.00						97	Elk	
WVKE-9-B	0.1	Wills Creek	4/4/00	0.102	1.99	7.50						100	Elk	
WVKG-13-G	0	Jones Branch	9/3/03	0.09	2.52	7.64						64	Gauley	
WVKG-13-O	0	Bryant Branch	3/31/04	0.09	15.9	7.63						528	Gauley	
WVKG-19-U-2-A	0	Briery Creek	9/3/03	1.22	1.28	4.84					<	3	Gauley	
WVKG-19-U-2-A	0	Briery Creek	1/13/04	0.41	0.79	5.02					<	3	Gauley	
WVKG-19-U-2-A	0	Briery Creek	11/4/03	0.34	0.8	5.19					<	3	Gauley	
WVKG-19-U-2-A	0	Briery Creek	10/21/03	0.22	0.64	5.41					<	3	Gauley	
WVKG-19-U-2-A	0	Briery Creek	7/16/03	0.18	0.82	5.55						9	Gauley	
WVKG-19-V-3.8	0	UNT/Little Clear Creek RM 7.5	9/3/03	0.12	0.81	7.42						5	Gauley	
WVKG-19-V-4	0	Cutlip Branch	9/24/03	0.09	2.59	7.64						23	Gauley	
WVKG-26-B	0.2	Glade Creek	11/12/03	0.1	7.94	6.40						265	Gauley	
WVKG-26-K-1	0.1	Lower Spruce Run	2/18/04	0.4	1.42	5.80						19	Gauley	
WVKG-26-K-1	0.1	Lower Spruce Run	1/21/04	0.15	0.23	6.05					<	3	Gauley	
WVKG-26-K-1	0.1	Lower Spruce Run	3/2/04	0.27	0.72	6.61						18	Gauley	
WVKG-26-K-1-A	0	Spruce Run	3/15/04	0.49	0.93	5.22						4	Gauley	
WVKG-26-K-1-A	0	Spruce Run	2/18/04	1.47	2.18	6.11						20	Gauley	
WVKG-26-K-1-A	0	Spruce Run	3/2/04	1.28	1.44	6.14					<	3	Gauley	
WVKG-26-K-1-A	0	Spruce Run	1/21/04	0.51	0.82	6.84						4	Gauley	
WVKG-30	14.1	Big Beaver Creek	10/24/03	0.18	0.19	6.98					<	2.39	Gauley	
WVKG-30	4.6	Big Beaver Creek	10/23/03	0.14	0.25	7.30					<	2.39	Gauley	
WVKG-30	6.3	Big Beaver Creek	10/14/03	0.23	0.23	7.41					<	2.39	Gauley	

AnCode	Mile Point	Stream Name	Date	Diss Al mg/L	Total Al mg/L	pH	Q	Total Ca mg/L	Q	Total Mg mg/L	Q	TSS mg/L	Watershed	WVSCI
WVKG-30-D	0.8	Wyatt Run	10/23/03	0.13	0.17	7.66					<	2.39	Gauley	
WVKG-30-E	2.9	Little Beaver Creek	10/14/03	0.22	0.27	6.88						3	Gauley	
WVKG-30-E	4	Little Beaver Creek	10/14/03	0.24	0.27	7.38						4	Gauley	
WVKG-30-E	0.4	Little Beaver Creek	10/14/03	0.13	0.25	7.48						6	Gauley	
WVKG-30-E-4	0	UNT/Little Beaver Creek RM 4.0	10/14/03	0.26	0.28	7.37						3	Gauley	
WVKG-30-L	0.3	Bearpen Fork	1/14/04	0.83	2.38	5.74						18	Gauley	
WVKG-30-L	0.3	Bearpen Fork	2/12/04	0.16	1.36	5.90						18	Gauley	
WVKG-30-L	0.3	Bearpen Fork	12/18/03	0.1	0.54	6.02						3	Gauley	
WVKG-30-L	0.3	Bearpen Fork	4/6/04	0.12	0.52	6.21						4	Gauley	
WVKG-30-L	0.3	Bearpen Fork	10/24/03	0.25	1.08	6.43						7	Gauley	
WVKG-30-L	1.1	Bearpen Fork	2/12/04	0.09	0.58	6.47						12	Gauley	
WVKG-30-N	0	Lower Laurel Run	10/24/03	0.2	0.22	6.76					<	2.39	Gauley	
WVKG-30-P	0.1	Upper Laurel Run	11/12/03	0.11	0.8	4.82						18	Gauley	
WVKG-30-P	0.1	Upper Laurel Run	12/15/03	0.18	0.23	5.03					<	3	Gauley	
WVKG-30-P	0.1	Upper Laurel Run	4/6/04	0.2	0.3	5.42					<	3	Gauley	
WVKG-30-P	0.1	Upper Laurel Run	3/8/04	0.15	0.36	5.73					<	3	Gauley	
WVKG-30-P	0.1	Upper Laurel Run	10/24/03	0.22	0.24	6.21						4	Gauley	
WVKG-30-P	0.1	Upper Laurel Run	2/12/04	0.18	0.2	6.28					<	3	Gauley	
WVKG-30-P	0.1	Upper Laurel Run	1/14/04	0.12	0.3	6.84						8	Gauley	
WVKG-30-Q	0.1	Board Fork	10/24/03	0.18	0.22	6.67					<	2.39	Gauley	
WVKG-31	0	Little Laurel Creek	7/22/03	0.13	0.36	7.44						3	Gauley	
WVKG-31	0	Little Laurel Creek	10/14/03	0.1	0.49	7.67					<	3	Gauley	
WVKG-31	0	Little Laurel Creek	10/1/03	0.09	0.3	7.67					<	3	Gauley	
WVKG-32	3.4	Panther Creek	9/5/03	0.2	0.29	6.17						8	Gauley	
WVKG-32	0	Panther Creek	7/22/03	0.09	0.43	7.16						3	Gauley	
WVKG-32	0	Panther Creek	10/1/03	0.1	0.4	7.64					<	3	Gauley	
WVKG-34-H-11.5	0	Carpenter Run	7/22/03	0.36	0.36	4.24						3	Gauley	
WVKG-34-H-11.5	0	Carpenter Run	4/7/04	0.49	0.52	4.59					<	3	Gauley	
WVKG-34-H-8	0	Windy Run	7/22/03	0.27	0.29	4.45					<	3	Gauley	
WVKG-34-H-8	0	Windy Run	9/9/03	0.28	0.29	4.47					<	3	Gauley	
WVKG-34-H-9	0	Armstrong Run	7/22/03	0.3	0.34	4.40						4	Gauley	
WVKG-5-B-1	0	Open Fork	12/29/03	0.5	1.32	5.01					<	3	Gauley	
WVKG-5-B-1	0	Open Fork	2/19/04	0.95	1.58	5.22						3	Gauley	
WVKG-5-B-1	0	Open Fork	1/28/04	1.04	1.68	5.42						4	Gauley	
WVKG-5-B-1	0	Open Fork	3/18/04	0.45	1.12	5.51						4	Gauley	
WVKG-5-B-1	0	Open Fork	3/30/04	0.18	0.93	5.76						3	Gauley	
WVKG-5-B-1	0	Open Fork	9/29/03	0.1	1.28	5.97						6	Gauley	
WVKG-5-B-1-C	0	Sangamore Fork	12/29/03	7	7	4.23					<	3	Gauley	
WVKG-5-B-1-C	0	Sangamore Fork	2/27/04	11	11	4.32						4	Gauley	
WVKG-5-B-1-C	0	Sangamore Fork	7/16/03	9.15	9.15	4.33					<	3	Gauley	
WVKG-5-B-1-C	0	Sangamore Fork	9/29/03	9.7	9.7	4.42					<	3	Gauley	
WVKG-5-B-1-C	0	Sangamore Fork	10/27/03	9.08	9.35	4.43						10	Gauley	
WVKG-5-B-1-C	0	Sangamore Fork	1/28/04	8	8	4.50					<	3	Gauley	

AN Code	Mile Point	Stream Name	Date	[illegible] Al (mg/L)	T Al (mg/L)	pH	Q	Fe (mg/L)	Q	Mn (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVKG-5-B-1-C	0	Sangamore Fork	3/19/04	5.8	6.17	4.58					<	3	Gauley	
WVKG-5-B-1-C	0	Sangamore Fork	11/11/03	6	6	4.64					<	3	Gauley	
WVKG-5-B-1-C	0	Sangamore Fork	9/2/03	3.42	4.69	4.72						32	Gauley	
WVKG-5-B-1-C	0	Sangamore Fork	4/2/04	2.28	3	5.15						16	Gauley	
WVKG-5-F	0	Rockcamp Fork	12/23/03	0.95	1.25	4.75						7	Gauley	
WVKG-5-F	0	Rockcamp Fork	2/26/04	1.92	2.08	4.81					<	3	Gauley	
WVKG-5-F	0	Rockcamp Fork	7/17/03	0.97	1.07	4.96					<	3	Gauley	
WVKG-5-F	0	Rockcamp Fork	10/28/03	1.04	1.19	4.97					<	3	Gauley	
WVKG-5-F	0	Rockcamp Fork	10/1/03	1.79	1.82	5.10					<	3	Gauley	
WVKG-5-F	0	Rockcamp Fork	11/11/03	0.22	0.6	5.19						3	Gauley	
WVKG-5-F	0	Rockcamp Fork	3/18/04	0.57	0.83	5.28						3	Gauley	
WVKG-5-F	0	Rockcamp Fork	2/2/04	0.9	1.19	5.29						4	Gauley	
WVKG-5-F	0	Rockcamp Fork	4/2/04	0.16	0.64	5.62						13	Gauley	
WVKG-5-F-1	0	Spring Branch	10/29/03	11.2	11.5	3.29					<	3	Gauley	
WVKG-5-F-1	0	Spring Branch	12/23/03	8	8	3.30					<	3	Gauley	
WVKG-5-F-1	0	Spring Branch	2/27/04	12.4	12.4	3.32					<	3	Gauley	
WVKG-5-F-1	0	Spring Branch	7/17/03	11.8	11.7	3.36						3	Gauley	
WVKG-5-F-1	0	Spring Branch	11/11/03	6	6	3.40					<	3	Gauley	
WVKG-5-F-1	0	Spring Branch	10/1/03	14.2	13.4	3.44					<	3	Gauley	
WVKG-5-F-1	0	Spring Branch	3/18/04	6.43	6.66	3.44					<	3	Gauley	
WVKG-5-F-1	0	Spring Branch	9/3/03	3.95	3.8	3.57					<	3	Gauley	
WVKG-5-F-1	0	Spring Branch	4/2/04	2.79	2.95	3.79						4	Gauley	
WVKN-22	14.9	Dunloup Creek	7/11/02	1.53	1.73	3.81						3.2	Lower New	
WVKN-22	14.1	Dunloup Creek	7/11/02	0.27	1.44	5.35						8.8	Lower New	
WVKN-22-{14.4}-Discharge		Dunloup Creek-Mine Discharge #2	7/11/02	12.6	12.6	3.53					<	3	Lower New	
WVKN-22-B	3.1	Meadow Fork	3/20/02	0.34	0.36	7.75						74	Lower New	
WVKN-22-B-1.3	0	UNT/Meadow Fork RM 0.7	1/17/02	5.44	7	3.40					<	5	Lower New	
WVKN-22-B-1.3	0	UNT/Meadow Fork RM 0.7	4/3/02	5.29	5.42	3.42					<	3	Lower New	
WVKN-22-B-1.3	0	UNT/Meadow Fork RM 0.7	3/21/02	0.74	0.98	3.67					<	3	Lower New	
WVKN-22-B-1.5	0.1	UNT/Meadow Fork RM 0.9	1/16/02	0.866	0.99	4.04					<	5	Lower New	
WVKN-22-B-1.5	0.1	UNT/Meadow Fork RM 0.9	4/3/02	1.29	1.42	4.58					<	3	Lower New	
WVKN-22-B-1.5	0.1	UNT/Meadow Fork RM 0.9	3/20/02	0.5	0.8	4.77						21.6	Lower New	
WVKN-22-B-3-{0.0}-Seep		Sleepy Hollow Mine Seep into UNT/Meadow Fork	4/3/02	0.27	0.34	5.29						9.2	Lower New	
WVKN-22-F	0	Smith Branch	4/3/02	0.63	0.77	5.37					<	3	Lower New	
WVKN-22-F	0	Smith Branch	3/13/02	0.11	0.96	6.43					<	3	Lower New	
WVKN-22-P	0	UNT/Dunloup Creek RM 14.1	7/11/02	1.67	1.67	3.59					<	3	Lower New	
WVKP-1	1.4	Heizer Creek	8/28/02	0.11	0.29	5.98					<	3	Lower Kanawha	
WVKP-1	1.8	Heizer Creek	8/28/02	0.12	0.28	6.22					<	3	Lower Kanawha	
WVKP-1-0.9A	0.1	UNT/Heizer Creek RM 0.6	2/27/03	5.94	6.08	4.08					<	3	Lower Kanawha	
WVKP-13	4	Tupper Creek	2/25/03	7.11	8.06	4.49						4	Lower Kanawha	
WVKP-13	5.8	Tupper Creek	2/25/03	5.3	6.11	4.75						28	Lower Kanawha	

AllCode	Mile Point	Stream Name	Date	[illegible]	[illegible]	pH		[illegible] (mg/L)		[illegible] (mg/L)		TSS (mg/L)	Watershed	WVSCI
WVKP-13	1.3	Tupper Creek	2/25/03	0.22	3.01	6.65						28	Lower Kanawha	
WVKP-13	1.3	Tupper Creek	4/21/03	0.1	7.3	7.35						221	Lower Kanawha	
WVKP-13-A	0	Legg Fork	4/21/03	0.09	4.5	7.41						109	Lower Kanawha	
WVKP-13-C.5	0.1	Union Fork	2/26/03	14.1	14.7	3.77						32	Lower Kanawha	
WVKP-13-C.5	0.1	Union Fork	3/25/03	8.97	11.6	4.49						32	Lower Kanawha	
WVKP-13-C.5	0.1	Union Fork	4/24/03	0.18	5.43	5.97						33	Lower Kanawha	
WVKP-13-C.5	0.1	Union Fork	5/14/03	0.1	5.92	6.16						25	Lower Kanawha	
WVKP-13-C.5-1	0.2	UNT/Union Fork RM 0.2	2/25/03	15.6	15.6	3.57						28	Lower Kanawha	
WVKP-13-C.5-1	0.2	UNT/Union Fork RM 0.2	3/25/03	15.3	16.1	3.90						24	Lower Kanawha	
WVKP-13-C.5-1	0.2	UNT/Union Fork RM 0.2	5/14/03	4.98	9.35	4.86						27	Lower Kanawha	
WVKP-13-C.5-1	0.2	UNT/Union Fork RM 0.2	4/24/03	3.96	7.55	4.99						34	Lower Kanawha	
WVKP-1-A	1.1	Manila Creek	8/27/02	3.74	3.91	4.36					<	5	Lower Kanawha	
WVKP-1-A	0.8	Manila Creek	8/27/02	2.37	2.69	4.82					<	5	Lower Kanawha	
WVKP-1-A	1.1	Manila Creek	7/17/02	0.16	0.44	5.82					<	3	Lower Kanawha	
WVKP-1-A	0.8	Manila Creek	1/27/03	0.14	1.44	6.58						6	Lower Kanawha	
WVKP-1-A	1.1	Manila Creek	10/16/02	0.12	2.34	6.80						96	Lower Kanawha	
WVKP-1-A	0.8	Manila Creek	10/16/02	0.1	1.66	6.96						31	Lower Kanawha	
WVKP-1-A.3	0.1	Coal Hollow	3/24/03	7.56	7.56	3.76						13	Lower Kanawha	
WVKP-1-A.3	0.1	Coal Hollow	8/28/02	9.08	9.08	3.81					<	3	Lower Kanawha	
WVKP-1-A.3	0.1	Coal Hollow	7/18/02	7.32	7.32	3.90					<	3	Lower Kanawha	
WVKP-1-A.3	0.1	Coal Hollow	11/4/02	8.25	8.67	3.98					<	3	Lower Kanawha	
WVKP-1-A.3	0.1	Coal Hollow	10/15/02	10.5	10.5	4.12					<	3	Lower Kanawha	
WVKP-1-A.3	0.1	Coal Hollow	5/12/03	5.96	5.96	4.13					<	3	Lower Kanawha	
WVKP-1-A.3	0.1	Coal Hollow	4/24/03	5.95	5.95	4.20					<	3	Lower Kanawha	
WVKP-1-A.3	0.1	Coal Hollow	12/19/02	5.66	5.66	4.30					<	3	Lower Kanawha	
WVKP-1-A.3	0.1	Coal Hollow	11/18/02	4.21	4.21	4.52						13	Lower Kanawha	
WVKP-1-A.6	0	UNT/Heizer Creek RM 2.3	1/31/03	5.93	5.93	3.32						13	Lower Kanawha	
WVKP-1-A.6	0	UNT/Heizer Creek RM 2.3	12/19/02	4.06	4.06	3.34					<	3	Lower Kanawha	
WVKP-1-A.6	0	UNT/Heizer Creek RM 2.3	3/24/03	5.06	5.06	3.44					<	3	Lower Kanawha	
WVKP-1-A.6	0	UNT/Heizer Creek RM 2.3	5/12/03	5.93	5.93	3.62						10	Lower Kanawha	
WVKP-1-A.6	0	UNT/Heizer Creek RM 2.3	4/23/03	4.88	4.88	3.69						8	Lower Kanawha	
WVKP-1-A.6	0	UNT/Heizer Creek RM 2.3	6/12/03	5.5	5.82	3.83						15	Lower Kanawha	
WVKP-1-A.6	0	UNT/Heizer Creek RM 2.3	2/28/03	0.83	2.32	5.59						29	Lower Kanawha	
WVKP-1-A-{2.0}-Mine		Mine Drainage into Manila Creek	7/17/02	41.8	42.7	2.87						21.6	Lower Kanawha	
WVKP-1-A-{3.12}-Mine		Mine Discharge into Manila Creek	3/3/03	1.94	2.64	4.10						12	Lower Kanawha	
WVKP-1-A-0.2	0	UNT/Manila Creek RM 1.0	10/16/02	0.14	1.25	7.12						26	Lower Kanawha	
WVKP-1-A-0.3	0	Martins Branch	10/16/02	0.13	1.37	6.39						16	Lower Kanawha	
WVKP-1-A-0.4	0	Sulphur Hollow	7/17/02	23.2	23.5	3.16					<	3	Lower Kanawha	
WVKP-1-A-0.4	0	Sulphur Hollow	10/15/02	20.9	22.1	3.27						12	Lower Kanawha	
WVKP-1-A-0.4	0	Sulphur Hollow	11/4/02	13.6	13.7	3.39					<	3	Lower Kanawha	
WVKP-1-A-0.4	0	Sulphur Hollow	5/13/03	14.7	15.1	3.42						6	Lower Kanawha	
WVKP-1-A-0.4	0	Sulphur Hollow	2/27/03	11.8	11.8	3.47						32	Lower Kanawha	
WVKP-1-A-0.4	0	Sulphur Hollow	3/24/03	13	13	3.52						12	Lower Kanawha	

ANCode	Mile Point	Stream Name	Date	[illegible] (mg/L)	[illegible] (mg/L)	pH	Q	Total Ca (mg/L)	Q	Total Mg (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVKP-1-A-0.4	0	Sulphur Hollow	4/22/03	3.52	6.62	4.63						19	Lower Kanawha	
WVKP-1-A-0.4	0	Sulphur Hollow	11/20/02	0.31	3.58	5.51						17	Lower Kanawha	
WVKP-1-A-0.48	0	UNT/Manila Creek RM 2.3 (#4 Hollow)	1/27/03	2.97	3.95	3.74						16	Lower Kanawha	
WVKP-1-A-0.48	0	UNT/Manila Creek RM 2.3 (#4 Hollow)	5/12/03	3.32	4.34	4.08						51	Lower Kanawha	
WVKP-1-A-0.48	0	UNT/Manila Creek RM 2.3 (#4 Hollow)	3/24/03	0.52	3.15	5.53						26	Lower Kanawha	
WVKP-1-A-0.48	0	UNT/Manila Creek RM 2.3 (#4 Hollow)	11/20/02	0.13	1.14	6.03						12	Lower Kanawha	
WVKP-1-A-0.6	0	Alcocks Hollow	11/5/02	6.19	6.19	3.99					<	3	Lower Kanawha	
WVKP-1-A-0.6	0	Alcocks Hollow	10/15/02	8.75	8.75	4.05						3	Lower Kanawha	
WVKP-1-A-0.6	0	Alcocks Hollow	5/12/03	4.89	4.93	4.58						5	Lower Kanawha	
WVKP-1-A-0.6	0	Alcocks Hollow	4/24/03	3.72	5.16	4.86						14	Lower Kanawha	
WVKP-1-A-0.6	0	Alcocks Hollow	2/27/03	1.83	4.97	5.23						24	Lower Kanawha	
WVKP-1-A-0.6	0	Alcocks Hollow	3/24/03	0.53	4.2	5.40						16	Lower Kanawha	
WVKP-1-A-0.6	0	Alcocks Hollow	12/20/02	0.1	0.34	7.14					<	3	Lower Kanawha	
WVKP-1-A-0.6	0	Alcocks Hollow	11/19/02	0.09	0.37	7.20					<	3	Lower Kanawha	
WVKP-1-A-0.7	0	UNT/Manila Creek RM 2.9	10/16/02	0.13	0.92	7.10						8	Lower Kanawha	
WVLK-31	20	Spring Creek	12/14/99	0.51	1.68	7.80						144	Little Kanawha	
WVLK-31	0	Spring Creek	12/14/99	0.41	4.02	8.10						375	Little Kanawha	
WVLK-31	7	Spring Creek	12/14/99	0.28	4.23	8.10						650	Little Kanawha	
WVLK-31-A		Bear Run	12/14/99	0.24	1.49	8.40						144	Little Kanawha	
WVLK-31-AA	4	Right Fork/Spring Creek	12/14/99	0.34	1.44	7.10						96	Little Kanawha	
WVLK-31-AA	0	Right Fork/Spring Creek	12/14/99	0.41	1.68	7.50						144	Little Kanawha	
WVLK-31-AA-1	2.6	Lick Fork	12/14/99	0.49	1.13	7.40						70	Little Kanawha	
WVLK-31-AA-1	0	Lick Fork	12/14/99	0.45	0.84	7.50						52	Little Kanawha	
WVLK-31-AA-3		Missouri Fork	12/14/99	0.11	1.81	7.50						206	Little Kanawha	
WVLK-31-H	0.2	Beaverdam Run	12/14/99	0.31	0.8	7.70						15	Little Kanawha	
WVLK-31-N		Toms Run	12/14/99	0.47	0.94	7.80						18	Little Kanawha	
WVLK-31-O	4.8	Little Spring Creek	12/14/99	0.54	1.95	7.70						180	Little Kanawha	
WVLK-31-O	0	Little Spring Creek	12/14/99	0.46	2.07	8.00						114	Little Kanawha	
WVLK-31-O-2		Left Fork/Little Spring Creek	12/14/99	0.94	1.52	7.60						68	Little Kanawha	
WVLK-31-O-6		Right Fork/Little Spring Creek	12/14/99	0.38	2	7.00						156	Little Kanawha	
WVLK-31-R		Island Run	12/14/99	0.46	1.19	7.90						72	Little Kanawha	
WVLK-31-W		Nancy Run	12/14/99	0.46	3.34	7.90						285	Little Kanawha	
WVLK-31-X		Tanner Run	12/14/99	0.58	1.33	7.40						74	Little Kanawha	
WVLK-31-X-1		Miletree Run	12/14/99	0.47	1.4	7.20						190	Little Kanawha	
WVLK-31-X-2		Scaffold Run	12/14/99	0.88	2.92	7.20						34	Little Kanawha	
WVLK-31-Y		Goff Run	12/14/99	0.38	0.86	7.20						48	Little Kanawha	
WVLK-31-Y-1		Laurel Run/Goff Run	12/14/99	0.53	0.56	7.00						20	Little Kanawha	
WVLK-31-Z	2.8	Left Fork/Spring Creek	12/14/99	0.36	1.31	6.40						140	Little Kanawha	
WVLK-31-Z	0	Left Fork/Spring Creek	12/14/99	0.46	2.11	6.70						190	Little Kanawha	

AN Code	Mile Point	Stream Name	Date	[illegible]	[illegible]	pH	Q	[illegible]	Q	[illegible]	Q	TSS (mg/L)	Watershed	WVSCI
WVLK-31-Z-1	0	Charles Fork	12/14/99	0.29	0.8	6.50						78	Little Kanawha	
WVLK-31-Z-1	2.9	Charles Fork	12/14/99	0.49	2.36	7.30						266	Little Kanawha	
WVLK-31-Z-2		Daniels Run	12/14/99	0.33	0.84	6.40						36	Little Kanawha	
WVLK-31-Z-3		Vandale Fork	12/14/99	0.4	0.96	6.50						78	Little Kanawha	
WVMC-11	1	Bull Run	6/25/01	13.4	14.9	3.24						1	Cheat	13.54
WVMC-16-A	0.8	South Fork/Greens Run	6/18/01	25.9	28	2.69						1	Cheat	20.6
WVMC-16-A	0.5	South Fork/Greens Run	6/20/01	28.8	31.1	2.69						4	Cheat	15.25
WVMC-16-A-1	0	UNT/South Fork RM 0.6/Greens Run	6/20/01	32.1	34.4	2.72						15	Cheat	9.78
WVMC-17	0	Muddy Creek	6/20/01	11	11.1	3.13						13	Cheat	15.37
WVMC-17	3.37	Muddy Creek	6/18/01	0.66	2.23	4.83						16	Cheat	
WVMC-17-A	0	Martin Creek	6/19/01	36.5	39.1	2.90						2	Cheat	13.68
WVMC-17-A-0.5	0	Fickey Run	6/25/01	69.3	75.1	2.70						4	Cheat	9.78
WVMC-24		Heather Run	6/19/01	13.6	15.3	2.97						1	Cheat	18.99
WVMC-25		Lick Run/Cheat River	6/19/01	42.5	48	2.65						3	Cheat	17.3
WVMC-27		Pringle Run	6/19/01	6.83	7.86	3.84						2	Cheat	31.39
WVMT-12	11.2	Three Fork Creek	9/25/02	7.46	7.46	4.46					<	3	Tygart Valley	49.8
WVMT-12	0.3	Three Fork Creek	9/26/02	1.53	1.87	4.88						6	Tygart Valley	53.55
WVMT-12	11.2	Three Fork Creek	9/25/02	7.92	7.92							4	Tygart Valley	33.04
WVMT-12-C	0.1	Raccoon Creek	9/25/02	8.33	8.33	4.43					<	3	Tygart Valley	51.2
WVMT-12-G	0	Fields Creek	9/25/02	0.23	0.27	5.11						4	Tygart Valley	
WVMT-12-H	0.1	Birds Creek	9/25/02	16	16.6	4.04						3	Tygart Valley	23.54
WVMT-18	3.5	Sandy Creek	10/1/02	0.91	0.92	6.62						6	Tygart Valley	48.29
WVMT-18-E	0.7	Little Sandy Creek	10/1/02	2.81	2.81	5.62					<	3	Tygart Valley	
WVMT-18-E-3	0	Left Fork/Little Sandy Creek	10/1/02	24.4	24.9	5.46					<	3	Tygart Valley	9.78
WVMT-37	0	Beaver Creek	10/2/02	8.88	8.89	3.38					<	3	Tygart Valley	21.21
WVMT-42	0.2	Roaring Creek	9/25/02	15.7	15.7	3.11						12	Tygart Valley	11.84
WVMT-42	9.3	Roaring Creek	10/3/02	0.38	0.42	4.89					<	3	Tygart Valley	
WVMT-42	6.3	Roaring Creek	10/3/02	0.3	0.34	5.55					<	3	Tygart Valley	
WVMT-42-B	0	Flatbush Fork	10/3/02	0.88	0.88	4.33					<	3	Tygart Valley	
WVMTB-11-B	0.5	Mud Lick	10/3/02	0.54	0.54	4.18					<	3	Tygart Valley	
WVMTB-11-B.7	0.1	Bridge Run	10/3/02	2.72	2.72	3.38						10	Tygart Valley	
WVMTM-16	1.5	Cassity Fork	9/24/02	56.9	56.9	3.06					<	3	Tygart Valley	46.17
WVO-100-{0.3}-Discharge		Clay Mine Discharge into Hardin Run	12/4/01	24	30	3.29						93	Upper Ohio North	
WVO-100-{0.3}-Discharge		Clay Mine Discharge into Hardin Run	1/8/02	11.4	12.3	3.47						57	Upper Ohio North	
WVO-100-{0.3}-Discharge		Clay Mine Discharge into Hardin Run	2/5/02	6.59	7.44	3.85						36.8	Upper Ohio North	
WVO-100-{0.3}-Discharge		Clay Mine Discharge into Hardin Run	3/19/02	1.73	4.24	5.56						27.6	Upper Ohio North	
WVO-101	0.2	Deep Gut Run	9/10/01	4.16	4.17	3.23					<	5	Upper Ohio	
WVO-101	0.2	Deep Gut Run	8/20/01	3.8	4	3.42						9	Upper Ohio	

ANCode	Mile Point	Stream Name	Date	Diss Al (mg/l)	Total Al (mg/l)	pH	Total Se (ug/l)	Diss Se (ug/l)	Q	TSS (mg/l)	Watershed	WVSCI
WVO-101	0.2	Deep Gut Run	10/23/01	3.8	3.8	3.42			<	5	Upper Ohio	
WVO-101	0.2	Deep Gut Run	11/5/01	1.65	2.08	4.00				5	Upper Ohio	
WVO-101	0.2	Deep Gut Run	7/23/01	1.83	2.02	5.54				12	Upper Ohio	
WVO-101	2	Deep Gut Run	9/10/01	0.12	0.31	7.63				18	Upper Ohio	
WVO-101-E	0	UNT/Deep Gut Run RM 1.8	9/10/01	0.17	0.17	7.59				20	Upper Ohio	
WVO-21-B-2	0	UNT/Robinson Run	4/17/00	0.48	6.6	6.50				140	Middle Ohio	
WVO-21-B-2	0.8	UNT/Robinson Run	4/17/00	0.71	5.1	6.90				110	Middle Ohio	
WVO-23	3.4	Tenmile Creek	8/19/03	4.02	7.05	6.39				10	Middle Ohio	50.7
WVO-3	7.7	Fourpole Creek	1/24/02	0.097	10.4	7.32				532	Lower Ohio	
WVO-3	4.8	Fourpole Creek	1/24/02	0.0898	16.8	7.51				896	Lower Ohio	
WVO-3	7	Fourpole Creek	1/24/02	0.097	6.26	7.60				254	Lower Ohio	
WVO-3	7.5	Fourpole Creek	10/9/01	0.21	0.23						Lower Ohio	
WVO-3	1.6	Fourpole Creek	10/9/01	0.24	0.25						Lower Ohio	
WVO-3	1.6	Fourpole Creek	11/7/01	0.13	0.26						Lower Ohio	
WVO-3-B	0.1	Grapevine Branch	1/24/02	0.101	14.3	7.27				876	Lower Ohio	
WVO-3-B	0	Grapevine Branch	10/9/01	0.15	0.18						Lower Ohio	
WVO-95	3.5	Cross Creek	9/12/01	0.23	0.24	8.16				5	Upper Ohio	
WVO-95	7.8	Cross Creek	5/21/02	0.13	0.52	8.21				8.4	Upper Ohio	
WVO-95	7.8	Cross Creek	4/16/02	0.12	0.58	8.26				15.6	Upper Ohio	
WVO-95	7.8	Cross Creek	9/11/01	0.14	0.22	8.36				5	Upper Ohio	
WVO-95	7.8	Cross Creek	6/18/02	0.13	0.28	8.38				5.6	Upper Ohio	
WVO-95	5	Cross Creek	4/16/02	0.11	0.5	8.39				11.2	Upper Ohio	
WVO-95	5.05	Cross Creek	9/11/01	0.1	0.18	8.42				5	Upper Ohio	
WVO-95	1.1	Cross Creek	4/15/02	0.09	0.48	8.42				13.2	Upper Ohio	
WVO-95-B	0	Ebenezer Run	9/11/01	0.19	0.29	8.45			<	5	Upper Ohio	
WVO-95-C	0	North Potrock Run	9/11/01	0.1	0.26	8.32			<	5	Upper Ohio	
WVO-95-F	0	UNT/Cross Creek RM 6.9	9/11/01	0.12	0.36	8.39				5	Upper Ohio	
WVO-97	7.2	Harmon Creek	9/11/01	0.14	0.15	7.34				11	Upper Ohio	
WVO-97	1.2	Harmon Creek	9/11/01	0.16	0.22	7.85				16	Upper Ohio	
WVO-97-0.7A	0	UNT/Harmon Creek RM 2.9	9/11/01	0.14	0.14	7.92			<	5	Upper Ohio	
WVO-97-0.9A	0	UNT/Harmon Creek RM 3.2	9/12/01	0.12	0.22	7.95			<	5	Upper Ohio	
WVO-97-B	0	Alexanders Run	9/10/01	0.12	0.19	7.41				12	Upper Ohio	
WVO-97-B	2.8	Alexanders Run	9/12/01	0.1	0.18	7.87			<	5	Upper Ohio	
WVO-97-B.5	0	UNT/Harmon Creek RM 5.4	9/11/01	0.13	0.48	7.79				14	Upper Ohio	
WVO-97-D	0	Brown Hollow	9/11/01	0.12	0.34	7.70				11	Upper Ohio	
WVO-98	0.1	Kings Creek	9/12/01	0.23	0.26	7.77				11	Upper Ohio	
WVO-98-0.5A	0	Turkeyfoot Run	9/11/01	0.1	0.22	7.69				5	Upper Ohio	
WVO-98-A.5	0	Marrow Run	9/11/01	0.14	0.17	7.99				7	Upper Ohio	
WVOG	79.5	Guyandotte River	9/4/03	0.18	4.92	7.23				1870		
WVOG	2.8	Guyandotte River	9/4/03	0.16	0.29	7.34				3		
WVOG	79.5	Guyandotte River	6/16/03	0.28	2	7.65				190	Lower	
WVOG-110	0.2	Indian Creek	9/6/00	0.11	0.45	8.47					Upper	71.21
WVOG-124	0.7	Pinnacle Creek	9/5/00	0.15	0.18	8.21					Upper	60.47

AnCode	Mile Point	Stream Name	Date	Diss Al (mg/L)	Total Al (mg/L)	pH	Q	Total Fe (mg/L)	Q	Total Mn (mg/L)	Q	TSS (mg/L)	Watershed	WVSCI
WVOG-124-D		Smith Branch/Pinnacle Creek	9/6/00	0.22	0.35	8.25							Upper	52.69
WVOG-134-D		Measle Fork	9/5/00	5.79	5.79	3.70							Upper	68.04
WVOG-139	0	Stonecoal Creek	9/6/00	0.089	0.164	7.99						8	Upper	52.01
WVOG-65-B-1-A		Lower Dempsey Branch	8/23/00	0.19	3.7	5.62						37	Upper	53.19
WVOG-65-B-1-E		Upper Dempsey Branch	8/23/00	6.7	6.7	4.72					<	5	Upper	29.26
WVOG-65-B-4-C	0.1	UNT/Trace Fork RM 0.6	4/1/04	21.8	21.8	3.01						14	Upper	
WVOG-65-B-4-C	0.1	UNT/Trace Fork RM 0.6	3/16/04	10.4	10.4	3.08						6	Upper	
WVOG-75	18	Buffalo Creek	8/30/00	2.26	9.96	5.00							Upper	
WVOG-77-A.5		Oldhouse Branch/Rockhouse	8/31/00	7.4	8	4.37						30	Upper	31.2
WVOG-96	1.6	Big Cub Creek	9/5/00	0.2	0.2	8.00						2	Upper	63.14
WVOG-96-B	0.4	Road Branch	9/5/00	0.3	0.4	7.58						6	Upper	67.32
WVOG-96-F		Toler Hollow	9/6/00	0.18	0.38	8.12						8	Upper	58.5
WVOG-96-H		McDonald Fork	9/6/00	0.11	0.22	7.96						4	Upper	63.03
WVOG-99		Reedy Branch	9/6/00	0.13	0.22	7.63						6	Upper	65.91
WVOGC-16-U		Franks Fork	8/29/00	0.11	0.18	7.33							Upper	50.46
WVOGC-26		Crane Fork	8/30/00	0.13	1.04	7.25							Upper	49.3
WVPNB-11	0.5	Montgomery Run	1/13/03	7.04	7.04	3.48						9	North Branch	
WVPNB-11	0.5	Montgomery Run	3/11/03	6.03	6.09	3.52						20	North Branch	
WVPNB-11	0.1	Montgomery Run	3/11/03	5.21	5.21	3.60						20	North Branch	
WVPNB-11	0.1	Montgomery Run	1/13/03	6.29	6.29	3.88						9	North Branch	
WVPNB-11	0.5	Montgomery Run	4/15/03	3.86	4.67	4.09						7.6	North Branch	
WVPNB-11	0.1	Montgomery Run	4/15/03	3.15	4.21	4.76						10	North Branch	
WVPNB-11	1.4	Montgomery Run	4/15/03	0.28	0.52	4.81						3.6	North Branch	
WVPNB-11	1.4	Montgomery Run	1/13/03	3.13	3.46	4.91						3	North Branch	
WVPNB-11	1.4	Montgomery Run	5/6/03	1.69	2.19	5.10					<	3	North Branch	
WVPNB-11	0.1	Montgomery Run	7/9/02	0.14	2.02	7.88						9.6	North Branch	
WVPNB-11	0.1	Montgomery Run	8/6/02	0.13	1.49	7.97						9.2	North Branch	
WVPNB-11	0.1	Montgomery Run	8/6/02	0.13	1.53							9.2	North Branch	
WVPNB-11-A	0	UNT/Montgomery Run RM 1.4	11/19/02	4.08	4.11	4.64					<	3	North Branch	
WVPNB-11-A	0	UNT/Montgomery Run RM 1.4	8/6/02	1.93	5.74	4.98						19.8	North Branch	
WVPNB-11-A	0	UNT/Montgomery Run RM 1.4	12/9/02	11.1	11.1	5.01					<	3	North Branch	
WVPNB-11-A	0	UNT/Montgomery Run RM 1.4	11/13/02	3.79	3.79	5.14					<	3	North Branch	
WVPNB-11-A	0	UNT/Montgomery Run RM 1.4	5/6/03	0.53	1.51	5.49						4	North Branch	
WVPNB-11-A	0	UNT/Montgomery Run RM 1.4	1/13/03	1.26	1.26	5.58					<	3	North Branch	
WVPNB-11-A	0	UNT/Montgomery Run RM 1.4	4/15/03	0.34	0.52	5.79						3.2	North Branch	
WVPNB-12	0	Piney Swamp Run	10/8/02	17.4	17.8	3.11					<	3	North Branch	
WVPNB-12	0	Piney Swamp Run	6/26/02	16.1	16.1	3.26						5.6	North Branch	
WVPNB-12	0	Piney Swamp Run	2/10/03	8.01	8.01	3.30					<	3	North Branch	
WVPNB-12	0	Piney Swamp Run	1/13/03	4.89	4.89	3.43						7	North Branch	
WVPNB-12	0	Piney Swamp Run	4/15/03	6.45	6.47	3.62						8.8	North Branch	
WVPNB-12	0	Piney Swamp Run	12/9/02	9.07	9.09	3.63						9	North Branch	
WVPNB-12	0	Piney Swamp Run	8/6/02	11.3	11.3	3.63						7.6	North Branch	
WVPNB-12	0	Piney Swamp Run	3/12/03	4.02	4.61	3.96						13.6	North Branch	

AN Code	Mile Point	Stream Name	Date	Dis Al (mg/L)	Total Al (mg/L)	pH	Q	Total Fe (mg/L)	Q	Total Mn (mg/L)	Q	TSS mg/L	Watershed	WVSCI
WVPNB-12	0	Piney Swamp Run	5/6/03	4.52	4.78	3.96						12	North Branch	
WVPNB-12	0	Piney Swamp Run	11/12/02	4.19	4.47	4.03						26	North Branch	
WVPNB-12	0	Piney Swamp Run	11/19/02	3.68	3.82	4.15						6	North Branch	
WVPNB-12	2.2	Piney Swamp Run	2/10/03	1.47	1.47	4.75					<	3	North Branch	
WVPNB-12	2.2	Piney Swamp Run	12/9/02	1.52	1.61	4.77						4	North Branch	
WVPNB-12	2.2	Piney Swamp Run	11/12/02	1.2	1.47	4.86						10	North Branch	
WVPNB-12	3.2	Piney Swamp Run	10/8/02	0.55	0.56	4.98					<	3	North Branch	
WVPNB-12	3.2	Piney Swamp Run	8/6/02	0.65	0.7	5.02						4.8	North Branch	
WVPNB-12	3.2	Piney Swamp Run	6/26/02	0.4	0.46	5.19						4.8	North Branch	
WVPNB-12	1.6	Piney Swamp Run	3/11/03	0.77	1.92	5.19						10	North Branch	
WVPNB-12	1.6	Piney Swamp Run	1/13/03	0.98	2.02	5.22						8	North Branch	
WVPNB-12	2.2	Piney Swamp Run	1/13/03	0.47	0.99	5.23						9	North Branch	
WVPNB-12	1.6	Piney Swamp Run	2/10/03	0.71	1.61	5.41						4	North Branch	
WVPNB-12	1.6	Piney Swamp Run	11/19/02	1.95	1.95	5.47						11	North Branch	
WVPNB-12	3.2	Piney Swamp Run	12/9/02	0.19	0.55	5.51						4	North Branch	
WVPNB-12	1.6	Piney Swamp Run	4/15/03	0.59	1.93	5.57						18.4	North Branch	
WVPNB-12	3.2	Piney Swamp Run	3/11/03	0.19	0.56	5.62						4	North Branch	
WVPNB-12	2.2	Piney Swamp Run	11/19/02	0.26	0.81	5.66						6	North Branch	
WVPNB-12	3.2	Piney Swamp Run	2/10/03	0.3	0.52	5.73					<	3	North Branch	
WVPNB-12	1.6	Piney Swamp Run	12/9/02	0.15	1.51	5.79						8	North Branch	
WVPNB-12	1.6	Piney Swamp Run	5/6/03	0.18	1.62	5.79						19	North Branch	
WVPNB-12	3.2	Piney Swamp Run	4/15/03	0.09	0.69	5.84						12.8	North Branch	
WVPNB-12	2.2	Piney Swamp Run	3/11/03	0.11	0.72	5.86						6.8	North Branch	
WVPNB-12	3.2	Piney Swamp Run	1/13/03	0.13	0.38	5.92						3	North Branch	
WVPNB-12	3.2	Piney Swamp Run	11/19/02	0.1	0.43	6.09						4	North Branch	
WVPNB-12	3.2	Piney Swamp Run	11/12/02	0.1	1.26	6.25						37	North Branch	
WVPNB-12	3.2	Piney Swamp Run	10/8/02	0.55	0.56						<	3	North Branch	
WVPNB-12-{2.4}-Mine		Mine Seep into Piney Swamp Run	10/8/02	8.81	9.68	4.59						9	North Branch	
WVPNB-12-{2.4}-Mine		Mine Seep into Piney Swamp Run	2/10/03	1.03	3.13	5.22						16	North Branch	
WVPNB-12-{2.4}-Mine		Mine Seep into Piney Swamp Run	12/9/02	1.5	3.21	5.80						14	North Branch	
WVPNB-12-B	0	UNT/Piney Swamp Run RM 0.7	3/11/03	2.34	5.4	3.87						3.2	North Branch	
WVPNB-12-B	0	UNT/Piney Swamp Run RM 0.7	8/6/02	9.79	9.79	4.25						3.2	North Branch	
WVPNB-12-B	0	UNT/Piney Swamp Run RM 0.7	5/6/03	5.81	6.7	4.51						4	North Branch	
WVPNB-12-B	0	UNT/Piney Swamp Run RM 0.7	4/15/03	8.18	8.2	4.63					<	3	North Branch	
WVPNB-12-B	0	UNT/Piney Swamp Run RM 0.7	12/9/02	8.37	9.12	4.69					<	3	North Branch	
WVPNB-12-B	0	UNT/Piney Swamp Run RM 0.7	1/13/03	6.63	6.63	4.89					<	3	North Branch	
WVPNB-12-B	0	UNT/Piney Swamp Run RM 0.7	2/10/03	7.99	7.99	4.91					<	3	North Branch	
WVPNB-12-B	0	UNT/Piney Swamp Run RM 0.7	11/19/02	2.87	5.18	5.41						15	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	10/8/02	16.1	16.2	3.49						8	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	11/12/02	7.55	7.55	4.29						13	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	7/9/02	11.3	11.4	4.43						7.2	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	8/6/02	10.2	11.1	4.47						12.4	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	12/9/02	8.76		4.85						16	North Branch	

AWCode	Mile Point	Stream Name	Date	[illegible]	[illegible] mg/L	pH	Q	[illegible] mg/L	Q	[illegible] mg/L	Q	TSS mg/L	Watershed	WVSCI
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	4/15/03	4.84	6.62	4.85						8.4	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	5/6/03	4.61	8.09	4.91						16	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	3/11/03	4.36	4.41	4.94						6.4	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	1/13/03	4.33	6.84	4.94						13	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	2/10/03	7.61	10.3	4.97						24	North Branch	
WVPNB-12-E	0	UNT/Piney Swamp Run RM 1.8	11/19/02	4.34	6.11	5.14						11	North Branch	
WVPNB-12-F	0	UNT/Piney Swamp Run RM 2.2	5/6/03	8.16	8.29	4.41						6	North Branch	
WVPNB-12-F	0	UNT/Piney Swamp Run RM 2.2	4/15/03	8.22	8.53	4.58						5.2	North Branch	
WVPNB-12-F	0	UNT/Piney Swamp Run RM 2.2	1/13/03	8.62	8.87	4.61						10	North Branch	
WVPNB-12-F	0	UNT/Piney Swamp Run RM 2.2	3/11/03	7.65	10.8	4.64						3.6	North Branch	
WVPNB-12-F	0	UNT/Piney Swamp Run RM 2.2	11/19/02	11.3	11.3	4.72						15	North Branch	
WVPNB-12-F	0	UNT/Piney Swamp Run RM 2.2	11/12/02	5.87	14.2	4.78						82	North Branch	
WVPNB-12-F	0	UNT/Piney Swamp Run RM 2.2	2/10/03	4.35	7.05	5.15						20	North Branch	
WVPNB-12-F	0	UNT/Piney Swamp Run RM 2.2	12/9/02	1.26	6.24	5.36						27	North Branch	
WVPNB-16	15.8	Abrams Creek	6/25/02	3.99	3.99	4.27						6	North Branch	
WVPNB-16	15.8	Abrams Creek	8/12/02	3.84	4.02	4.30						4	North Branch	
WVPNB-16	15.8	Abrams Creek	4/17/03	3.76	3.85	4.58						5	North Branch	
WVPNB-16	15.8	Abrams Creek	3/13/03	1.76	2.05	4.61						6.4	North Branch	
WVPNB-16	17.7	Abrams Creek	5/8/03	5.31	5.51	4.70						8	North Branch	
WVPNB-16	3.1	Abrams Creek	7/17/02	1.16	1.16	4.74					<	3	North Branch	
WVPNB-16	9	Abrams Creek	10/9/02	2.4	2.63	4.78						3	North Branch	
WVPNB-16	3.1	Abrams Creek	10/8/02	1.15	1.67	4.79					<	3	North Branch	
WVPNB-16	17.7	Abrams Creek	10/10/02	1.81	3.05	4.84						8	North Branch	
WVPNB-16	9	Abrams Creek	8/7/02	2.01	2.18	4.87					<	3	North Branch	
WVPNB-16	9	Abrams Creek	7/11/02	2.35	2.57	4.88					<	3	North Branch	
WVPNB-16	17.7	Abrams Creek	4/14/03	1.59	1.98	4.89						4	North Branch	
WVPNB-16	15.8	Abrams Creek	10/10/02	1.86	2.68	4.91						22	North Branch	
WVPNB-16	9	Abrams Creek	4/17/03	1.47	2.44	4.92						9	North Branch	
WVPNB-16	17.7	Abrams Creek	2/12/03	2.23	2.46	4.98						3	North Branch	
WVPNB-16	17.7	Abrams Creek	8/12/02	1.24	2.3	4.98						8.4	North Branch	
WVPNB-16	15.8	Abrams Creek	11/11/02	1.17	1.34	5.04						6	North Branch	
WVPNB-16	15.8	Abrams Creek	12/10/02	1.67	2.11	5.12						10	North Branch	
WVPNB-16	3.1	Abrams Creek	8/6/02	0.64	0.72	5.12						4.4	North Branch	
WVPNB-16	9	Abrams Creek	11/11/02	0.46	0.94	5.21						5	North Branch	
WVPNB-16	15.8	Abrams Creek	5/8/03	0.68	1.89	5.21						20	North Branch	
WVPNB-16	15.8	Abrams Creek	2/12/03	1.87	1.87	5.22						6	North Branch	
WVPNB-16	15.8	Abrams Creek	11/21/02	1.34	1.44	5.26						4	North Branch	
WVPNB-16	17.7	Abrams Creek	3/10/03	1.24	1.77	5.29						18.4	North Branch	
WVPNB-16	17.7	Abrams Creek	11/21/02	1.36	1.4	5.29					<	3	North Branch	
WVPNB-16	9	Abrams Creek	12/11/02	0.73	2.5	5.31						14	North Branch	
WVPNB-16	17.7	Abrams Creek	12/10/02	1.06	1.55	5.33					<	3	North Branch	
WVPNB-16	17.7	Abrams Creek	1/15/03	0.9	1.66	5.39						6	North Branch	
WVPNB-16	9	Abrams Creek	3/13/03	0.27	1.91	5.52						11.6	North Branch	

AMCode	Mile Point	Stream Name	Date	Sol Al	Total Al	pH	Q	Total	Q	Total	Q	TSS	Watershed	WVSCI
				(mg/l)	(mg/l)			Ca (mg/l)		Mg (mg/l)		(mg/l)		
WVPNB-16	17.7	Abrams Creek	11/11/02	2.35	2.35	5.65					<	3	North Branch	
WVPNB-16	3.1	Abrams Creek	4/16/03	0.22	1.37	5.66						9.6	North Branch	
WVPNB-16	0	Abrams Creek	10/8/02	0.2	0.58	5.68					<	3	North Branch	
WVPNB-16	9	Abrams Creek	2/11/03	0.21	2.17	5.77						14	North Branch	
WVPNB-16	9	Abrams Creek	11/20/02	0.16	1.08	5.82						8	North Branch	
WVPNB-16	9	Abrams Creek	5/8/03	0.16	2.02	5.93						12	North Branch	
WVPNB-16	3.1	Abrams Creek	1/14/03	0.1	0.58	6.07					<	3	North Branch	
WVPNB-16	3.1	Abrams Creek	12/11/02	0.1	1.43	6.16						8	North Branch	
WVPNB-16	9	Abrams Creek	1/15/03	0.47	1.45	6.55						7	North Branch	
WVPNB-16-0.5A	0	UNT/Abrams Creek RM 1.9	5/6/03	0.09	0.39	7.67						10	North Branch	
WVPNB-16-A	1.7	Emory Run	3/11/03	4.38	4.56	4.33						6.4	North Branch	
WVPNB-16-A	1.7	Emory Run	1/14/03	4.13	4.13	4.36						4	North Branch	
WVPNB-16-A	0	Emory Run	10/8/02	3.19	3.46	4.52					<	3	North Branch	
WVPNB-16-A	1.7	Emory Run	12/11/02	4.38	4.82	4.61						12	North Branch	
WVPNB-16-A	0	Emory Run	1/14/03	1.72	2.78	4.62						7	North Branch	
WVPNB-16-A	1.7	Emory Run	2/11/03	3.78	4.06	4.71						5	North Branch	
WVPNB-16-A	1.7	Emory Run	8/12/02	2.13	5.05	4.83						12	North Branch	
WVPNB-16-A	1.7	Emory Run	11/20/02	2.54	3	4.85						6	North Branch	
WVPNB-16-A	1.7	Emory Run	10/9/02	2.5	3.79	4.92						8	North Branch	
WVPNB-16-A	0	Emory Run	8/6/02	1.34	2.43	4.94						10	North Branch	
WVPNB-16-A	1.7	Emory Run	11/13/02	1.04	1.77	5.02						9	North Branch	
WVPNB-16-A	1.7	Emory Run	4/6/03	1.68	2.49	5.06						9.2	North Branch	
WVPNB-16-A	0	Emory Run	3/11/03	1.06	2.68	5.06						16	North Branch	
WVPNB-16-A	0	Emory Run	7/17/02	0.61	1.74	5.15						4.4	North Branch	
WVPNB-16-A	0	Emory Run	11/20/02	0.54	2.74	5.23						14	North Branch	
WVPNB-16-A	0	Emory Run	4/16/03	0.41	2.72	5.24						22	North Branch	
WVPNB-16-A	0	Emory Run	2/11/03	0.62	3.26	5.25						14	North Branch	
WVPNB-16-A	0	Emory Run	12/11/02	0.56	6.46	5.28						40	North Branch	
WVPNB-16-A	1.7	Emory Run	5/8/03	0.14	1.52	5.46						12	North Branch	
WVPNB-16-A	0	Emory Run	11/13/02	0.2	1.64	5.56						14	North Branch	
WVPNB-16-A-1	0	UNT/Emory Run RM 0.8	10/8/02	4.08	4.86	3.36					<	3	North Branch	
WVPNB-16-A-1	0	UNT/Emory Run RM 0.8	7/9/02	5.84	5.84	3.59						3.6	North Branch	
WVPNB-16-A-1	0	UNT/Emory Run RM 0.8	8/6/02	3.95	3.95	3.77					<	3	North Branch	
WVPNB-16-A-1	0	UNT/Emory Run RM 0.8	1/14/03	1.98	2.2	4.58						4	North Branch	
WVPNB-16-A-1	0	UNT/Emory Run RM 0.8	11/20/02	1.61	2.43	4.79						14	North Branch	
WVPNB-16-A-1	0	UNT/Emory Run RM 0.8	11/13/02	1.01	1.37	4.87						9	North Branch	
WVPNB-16-A-1	0	UNT/Emory Run RM 0.8	2/11/03	0.3	2.6	5.69						14	North Branch	
WVPNB-16-A-1	0	UNT/Emory Run RM 0.8	3/11/03	0.31	1.88	5.70						31.6	North Branch	
WVPNB-16-A-1	0	UNT/Emory Run RM 0.8	12/11/02	0.14	16.4	5.95						162	North Branch	
WVPNB-16-B.5	0	Glade Run	6/27/02	2.15	2.15	3.94						14	North Branch	
WVPNB-16-B.5	0	Glade Run	10/9/02	2.17	2.21	4.44						10	North Branch	
WVPNB-16-B.5	0	Glade Run	8/7/02	1.84	1.91	4.73						11.6	North Branch	
WVPNB-16-B.5	0	Glade Run	2/12/03	0.15	0.78	5.81						6	North Branch	

ANCode	Mile Point	Stream Name	Date	Diss Al (mg/L)	Total Al (mg/L)	pH		Total Fe (mg/L)		Total Mn (mg/L)		TSS (mg/L)	Watershed	WVSCI
WVPNB-16-B.5-1	0	UNT/Glade Run RM 0.3	10/9/02	2.85	2.94	4.53						5	North Branch	
WVPNB-16-B.5-1	0	UNT/Glade Run RM 0.3	8/7/02	1.75	2.08	4.96						7.2	North Branch	
WVPNB-16-C	0.2	Laurel Run	10/9/02	8.94	8.94	4.57					<	3	North Branch	
WVPNB-16-C	0.2	Laurel Run	6/27/02	8.23	9	4.59						5.6	North Branch	
WVPNB-16-C	0.2	Laurel Run	8/7/02	6.11	6.52	4.73						6	North Branch	
WVPNB-16-C	0.2	Laurel Run	2/13/03	3.26	5.84	4.81						13	North Branch	
WVPNB-16-C	0.2	Laurel Run	12/12/02	3.62	4.97	4.84						8	North Branch	
WVPNB-16-C	0.2	Laurel Run	4/16/03	2.72	4.51	4.85						14	North Branch	
WVPNB-16-C	0.2	Laurel Run	11/20/02	2.14	2.32	4.98						4	North Branch	
WVPNB-16-C	0.2	Laurel Run	3/12/03	3.6	5.01	4.98						12.8	North Branch	
WVPNB-16-C	0.2	Laurel Run	1/14/03	2.8	3.81	5.03						8	North Branch	
WVPNB-16-C	0.2	Laurel Run	5/8/03	1.69	4.3	5.03						18	North Branch	
WVPNB-16-C	0.2	Laurel Run	11/13/02	1.1	2.18	5.07						16	North Branch	
WVPNB-16-C	0.2	Laurel Run	11/20/02	2.21	2.41						<	3	North Branch	
WVPNB-16-C.4	0	UNT/Abrams Creek RM 13.6	4/16/03	6.26	8.01	4.84						5.6	North Branch	
WVPNB-16-C.4	0	UNT/Abrams Creek RM 13.6	1/14/03	2.13	4.85	5.04						18	North Branch	
WVPNB-16-C.4	0	UNT/Abrams Creek RM 13.6	7/10/02	3.21	6.63	5.28						21.6	North Branch	
WVPNB-16-C.4	0	UNT/Abrams Creek RM 13.6	8/7/02	0.5	3.38	5.85						14.8	North Branch	
WVPNB-16-C.4	0	UNT/Abrams Creek RM 13.6	11/20/02	0.1	2.2	6.31						8	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	10/10/02	23.7	24.3	2.99						4	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	8/12/02	34.3	34.3	3.23					<	3	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	7/11/02	19.8	19.8	3.41						3.6	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	1/15/03	17.2	17.2	3.52						10	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	4/17/03	25.4	25.4	3.54						5	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	3/13/03	10.9	10.9	3.89						9.2	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	12/10/02	14.1	14.1	3.89						6	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	2/12/03	12.2	12.6	4.02						6	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	11/11/02	6.94	6.94	4.13						4	North Branch	
WVPNB-16-C.8	0	UNT/Abrams Creek RM 15.9	5/8/03	5.18	5.45	4.41						9	North Branch	
WVPNB-16-D	0	Little Creek	4/14/03	1.91	2.19	4.68						6	North Branch	
WVPNB-16-D	0	Little Creek	11/21/02	1.99	1.99	4.85						4	North Branch	
WVPNB-16-D	0	Little Creek	11/11/02	1.54	1.54	4.85					<	3	North Branch	
WVPNB-16-D	0	Little Creek	1/15/03	1.7	1.75	5.05						6	North Branch	
WVPNB-16-D	0	Little Creek	3/10/03	1.6	1.87	5.08						6	North Branch	
WVPNB-16-D	0	Little Creek	12/10/02	1.33	1.53	5.17						3	North Branch	
WVPNB-16-D	0	Little Creek	2/12/03	1.02	1.22	5.17						4	North Branch	
WVPNB-17	6.9	Stony River	8/13/97	0.147	0.05	7.90							North Branch	77.5
WVPNB-19	0.5	Buffalo Creek	8/12/02	0.11	0.33	7.32						10	North Branch	
WVPNB-19-0.5A	0	UNT/Buffalo Creek RM 0.6	11/18/02	0.18	0.63	7.72						4	North Branch	
WVPNB-19-0.5A	0	UNT/Buffalo Creek RM 0.6	12/10/02	0.21	0.34	8.16						3	North Branch	
WVPNB-19-0.5A	0	UNT/Buffalo Creek RM 0.6	2/10/03	0.41	0.66	8.22						4	North Branch	
WVPNB-19-0.5A	0	UNT/Buffalo Creek RM 0.6	10/10/02	0.14	0.21	8.44						6	North Branch	
WVPNB-19-0.5A	0	UNT/Buffalo Creek RM 0.6	3/10/03	1.52	1.97	8.61						5.6	North Branch	

AN Code	Mile Point	Stream Name	Date	D. Al mg/L	Total Al mg/L	pH		Total Ca mg/L		Total Mg mg/L		TSS mg/L	Watershed	WVSCI
WVPNB-19-0.5A	0	UNT/Buffalo Creek RM 0.6	8/7/02	0.23	0.38	8.62						3.6	North Branch	
WVPNB-19-0.5A	0	UNT/Buffalo Creek RM 0.6	5/7/03	0.33	0.49	8.63					<	3	North Branch	
WVPNB-19-0.5A	0	UNT/Buffalo Creek RM 0.6	4/14/03	0.96	1.18	8.76					<	3	North Branch	
WVPNB-19-0.5A	0	UNT/Buffalo Creek RM 0.6	1/13/03	0.3	0.36	8.95					<	3	North Branch	
WVPNB-19-A	0	Little Buffalo Creek	10/10/02	4.64	6.61	4.54						14	North Branch	
WVPNB-19-A	0	Little Buffalo Creek	12/10/02	0.14	1.12	5.52						6	North Branch	
WVPNB-19-A	0	Little Buffalo Creek	11/11/02	0.62	0.86	6.13						7	North Branch	
WVPNB-19-A	0.6	Little Buffalo Creek	4/14/03	0.33	0.49	7.16						10	North Branch	
WVPNB-19-A-1	0	UNT/Little Buffalo Creek RM 0.6	7/8/02	416	422	2.55						7.6	North Branch	
WVPNB-22-A	0	Elk Run	11/12/02	0.09	0.82	6.78						28	North Branch	