West Virginia GROUND WATER MANAGEMENT STRATEGY

1987

Department of Natural Resources
Division of Water Resources
Charleston, West Virginia 25311

West Virginia
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Arch A. Moore, Jr.
Governor

Ronald R. Potesta
Director
Department of Natural Resources

David W. Robinson
Chief
Division of Water Resources

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INTRODUCTION

The importance of West Virginia's ground water resource is emphasized by the state's reliance upon ground water as the major source of drinking water for its population. Fifty-three percent of the state's total population, including 95% of the rural population, rely upon ground water for their source of drinking water. The remaining 47% of the state's population obtain their drinking water from surface water sources. For a substantial period of time each year, however, ground water is the source of this surface water. In addition to supplying domestic water needs, ground water supplies 18% of industry's self-supplied water needs, excluding thermoelectric power withdrawals. This usage by industry represents 68% of the total ground water withdrawal.

Ground water is truly a valuable state resource. It can also be a very vulnerable resource, subject to depletion and/or contamination, if not properly managed.

West Virginia's ground water management strategy sets forth a long-range, dynamic plan which, when fully implemented, will manage the ground water resources to achieve beneficial uses for the people of the state, consistent with the protection of public health and the environment. The strategy stresses a comprehensive approach for managing water withdrawals and potential sources of contamination in order to protect the ground water resources for present and future West Virginians.

This strategy is by necessity long-range, primarily because there are not enough financial resources available to address all ground water management needs simultaneously. The strategy is also long-range and dynamic due to the present limited knowledge regarding the nature and condition of the state's ground water resources.

Existing ground water resource, statutory and programmatic information developed in preparing the three appendices to this document provides the foundation upon which the state ground water management strategy is based. Input and council from the Department of Natural Resources' Ground Water Advisory Committee and its subcommittees were utilized in developing the strategy. The ground water management strategy, as presented in this document, represents a consensus view of many of the ground water interests in West Virginia.

ASSESSMENTS

Ground Water Resources

In December 1985, the Division of Water Resources, based upon existing information, completed an assessment of the state's ground water resource. This assessment indicated that there does not appear to be massive widespread pollution of ground water in West Virginia. In general, the state's ground water is clean and plentiful, with geological conditions producing natural variations in quality and quantity. This is not to say that there are no ground water problems in West Virginia. Public and private ground water contamination complaints received by the Departments of Energy, Health and Natural Resources indicate that there are localized areas of pollution and dewatering. These complaints often occur as a result of relatively current land-use practices. In addition, there is a potential for significant ground water contamination as a result of past land-use activities in the state.

It can be concluded from the assessment of ground water resources that West Virginia is fortunate. The state apparently does not have to react to a major ground water contamination crisis while developing and implementing its ground water management program.

An updated and more complete assessment of the state's ground water resource is underway and is expected to be available by mid-1987. This work is being done by the Ground

Water Advisory Committee's resource subcommittee and the U.S. Geological Survey.

Ground Water Statutes

In August 1986, the West Virginia Attorney General's Office completed a review of existing state statutes pertaining to ground water. Existing statutory authorities were found to be adequate for managing the state's ground water. Some revision of existing statutes, in addition to the development of new or umbrella legislation, may be desirable to eliminate conflicts and ensure a comprehensive approach to ground water management. The conclusions of this assessment were further supported by the Ground Water Advisory Committee's statutes and programs subcommittee report of November 1986 which stated, "...that West Virginia need not necessarily adopt new legislation with respect to ground water protection in order to accomplish much of the objective of protecting ground water quality; however, the adoption of new ground water legislation would have the benefit of simplifying the ground water regulatory process and clarifying responsibilities among various agencies...". New legislation could also provide the framework for the management of ground water use.

Ground Water Programs and Activities

In September 1986, the Departments of Agriculture, Energy, Health, Highways, Natural Resources, along with the State Water Resources Board and other state and federal agencies, completed

the identification and assessment of current programs and activities directly or indirectly related to ground water management. In general, the present approach to ground water management was found to be large, complex and incomplete. This assessment was, for the most part, supported by the statutes and programs subcommittee's findings which stated that new legislation would simplify the ground water regulatory process and clarify responsibilities among agencies. The primary cause for such a complex approach is that state programs and activities were developed piecemeal in response to specific problems, rather than with the goal of overall ground water management objectives. As a result, some aspects of ground water management are either not being addressed or are not adequately financed, implemented or enforced. Moreover, some authorities are overlapping and unclear, allowing for potential conflict.

ASSESSMENT RESULTS AND ACTION

Review of the assessments found in Appendix I, II and III indicates that several functions fundamental to achieving a comprehensive approach to ground water management need to be addressed. A discussion of identified needs follows, with the order of discussion indicating their relative priority.

Regulatory Framework

The highest priority is assigned to development and implementation of a regulatory framework.

As indicated in both the statutory, and programs and activities assessments, existing statutory authority is adequate for managing ground water quality. For surface water this authority is implemented through policies, classifications, standards and regulations. However, for ground water there is no corresponding regulatory framework implementing the authority.

Action - The regulatory subcommittee, of the Ground Water Advisory Committee will implement the ground water resource management policy by developing an appropriate regulatory framework. This subcommittee has already begun work compiling and reviewing different ground water classification and standard options. Concurrent with this last objective, the Ground Water Advisory Committee, through its statutes and programs subcommittee and in conjunction with the Legislature,

will pursue the concept of new ground water legislation to simplify the regulatory process, clarify responsibilities and address ground water use/quality issues.

Institutionalize Coordination

With the development of the ground water resource management policy, classification, standards and supporting regulations, each regulatory agency may have to establish regulations to implement the basic ground water regulatory framework. To ensure that each agency's approach to ground water management contributes to a comprehensive state program, a mechanism for continued coordination and cooperation between state agencies needs to be institutionalized.

Action - The Ground Water Advisory Committee, through its interagency coordination subcommittee, will consider alternatives to achieve continued coordination and cooperation between agencies.

Data Management

A cooperative ground water data management project between the U.S. Geological Survey and West Virginia's Underground Injection Control (UIC) program was initiated in 1983. With the establishment of West Virginia's ground water strategy, this cooperative project has been continued. The data management system in this period has progressed from a conceptual to a nearly mature stage. Continued expansion of

the data base is needed to provide the information necessary for management of the state's ground water resource.

Action - The Division of Water Resources, in cooperation with the U.S. Geological Survey, will continue compiling and entering information into the ground water data base.

Pollution Complaint Response

At present, public and private ground water complaints are received by the Departments of Health, Energy, and Natural Resources. Each agency tends to respond individually to the complaints they receive. As a result, no one agency has an overall picture of the contamination incidents, what their cumulative effects are on ground water or whether programs for protecting ground water are adequate. A mechanism needs to be established for coordinating among the various agencies, the compilation, review and response for ground water pollution complaints.

Action - Develop agreements and procedures to facilitate cooperation between agencies in resolving and analyzing ground water contamination complaints. A prototype of the information collection and response systsem is ready for trial within the Division of Water Resources, and will be made available to other agencies as appropriate.

Characterize Ground Water Resources

Not enough is known about the use, nature and condition of West Virginia's ground water. The information that is available is the result of specialized research projects that were not intended to provide information useful in an overall characterization of the state's ground water. Currently, there are 37 ground water monitoring stations. Until recently, only water level data was collected from this monitoring network. Even with the collection of water quality data, it is estimated that the existing network will be grossly inadequate for characterizing the ground water resource. Additional knowledge is needed to describe the nature and condition of the state's ground water resource and its use, so that management programs can be developed to adequately protect the resource.

Action - The resource subcommittee of the Ground Water Advisory Committee will develop for consideration of the full committee a proposal for a state ambient ground water monitoring network.

Ground Water Training

State program emphasis has been on surface water. Therefore, personnel selection and training activities have been oriented to surface water objectives. Recent interest and new ground water protection concerns make it imperative to recruit personnel with ground water expertise, and to continue training the existing staff in order to develop ground water expertise within agencies.

Action - Agencies will evaluate staffing/training needs relative to ground water management, and will develop appropriate training and job description criteria to meet needs. Training and technical information resources will be made available to other state agencies as developed.

Public Information

Over the past two years, West Virginia's ground water program actively engaged in informing the public of the state's effort to develop a ground water management strategy. Now, with the strategy completed, public participation during the implementation of the strategy will ensure that issues and concerns are identified and addressed.

Action - It is planned that a combination of advisory committees, public speaking engagements, ground water newsletter articles, etc., will be used to maintain public contact. These activities will assist ground water program development and provide opportunity for public participation.

Strategy Update

Traditionally, as new programs are developed, adjustments in program direction/objectives are needed to take into consideration new information and concerns. The state's ground water program is not expected to be an exception.

Action - In cooperation with EPA and through the EPA grant application process, ground water management strategy, priorities and program budget should continue to be updated.

The state's ground water management effort currently receives all of its funding from the federal government. In order for the state ground water management program to be effective, West Virginia must make a commitment to provide the resources necessary to fully implement and enforce the program. In addition, the various agencies responsible for the program must make a commitment towards its implementation and enforcement.

GROUND WATER MANAGEMENT POLICY

The West Virginia State Code sets forth in Chapter 20, Article 5A, Part I the general provisions and public policy of the Water Pollution Control Act. This policy provides adequate authority for protecting the waters of the state, which by definition include both surface and ground water.

The authority for managing surface water is implemented through Series I of the West Virginia Administrative Regulations. Section 4 of the Series describes an anti-degradation policy which is based on water use criteria. This policy contains provisions for limited degradation, non-degradation and improvement when necessary or appropriate.

The state's ground water resource management policy is consistent with the surface water anti-degradation policy, in that it closely parallels and supports that policy. The ground water management policy provides that the state shall maintain and protect the ground water resources as necessary to support the present and prospective future beneficial uses (20-5A-3a) and further, to protect ground water at existing quality where the existing quality is better than the criteria established for the designated use, unless otherwise provided for by regulations set forth by the Water Resources Board.

ORGANIZATIONAL STRUCTURE

The West Virginia Department of Natural Resources was designated by the Governor as the lead agency to develop the state ground water management program. To coordinate program development, a Ground Water/Underground Injection Control Office was established within the Division of Water Resources.

A Memorandum of Agreement, signed in April 1986 by the Departments of Agriculture, Energy, Health, Highways and Natural Resources, recognized the importance of protecting the state's ground water resources. More importantly, it stated the agencies' willingness to participate in the development of the ground water management program. As a result of this Memorandum of Agreement, an interagency ground water group was established. This group presently has representatives from the Department of Agriculture; Department of Energy's Divisions of Mining and Minerals, and Oil and Gas; Department of Health; Department of Highways; Department of Natural Resources' Divisions of Water Resources and Waste Management; and the State Water Resources Board. The function of this group is the coordination of ground water management program development among agencies.

In July 1986, the Director of the Department of Natural Resources established a Ground Water Advisory Committee. This committee has representatives from the West Virginia Manufacturers Association, the State Water Resources Board, League of Women Voters, U.S. Geological Survey, West Virginia

Chamber of Commerce, State Soil Conservation Committee, U.S. Environmental Protection Agency, Sierra Club, West Virginia Mining and Reclamation Association, West Virginia Water Well Drillers Association, and West Virginia Association of County Officials. The committee is chaired by the Director of the Department of Natural Resources. The purpose of this committee is to represent public and private interests by advising the Department of Natural Resources of issues and concerns throughout development and implementation of the state ground water management program. Relatively unlimited participation in the development of the ground water program is accomplished through five subcommittees formed to address major issues.

In addition, consideration is being given to a recommendation that the WV Legislature establish a Select Committee on Ground Water. The purpose of this proposed committee would be to work with the various state agencies in addressing ground water program statutory and regulatory needs. Cooperation and coordination are the processes through which objectives are to be achieved.

Appendix I

GROUND WATER RESOURCE ASSESSMENT

Excerpted from West Virginia Water Quality Status Assessment

1983-1985

D. Ground Water Quality

1. Overview

Ground water in West Virginia is, on the average, adequate and clean. Across the state, however, quantity and quality vary widely. The best sources are found in the east, although agricultural pollution is a problem in the karst areas of the eastern panhandle. In parts of the western and southwestern two-thirds of the state, however, well yields are marginal and water quality is affected locally by factors such as salt-water intrusion and acid drainage. Although insufficient data were found on which to base a general assessment of the presence of pathogenic agents in West Virginia ground water, high levels of fecal coliform bacteria have been reported in a few areas (Bissonnette, 1985). In most parts of the state, ground water is hard and contains moderate to high levels of iron and manganese. Presently, there is no indication that contamination by synthetic organic compounds is a serious threat to water guality, although there is a potential for damage from accidental spills and nonpoint sources.

"West Virginia is divided into three physiographic provinces, each with distinctive principal rock types and ground water characteristics. The western and central parts of the state are in the Appalachian Plateaus physiographic province. The nearly flat-lying, consolidated sedimentary rocks that underlie this area

have been eroded by streams and rivers to form steep hills and deeply incised valleys. The Allegheny Mountains section of the Appalachian Plateaus province is underlain by gently to moderately folded strata. The eastern part of the state is in the Valley and Ridge physiographic province. The consolidated sedimentary rocks underlying this area are faulted extensively and folded sharply; the folded strata form a series of northeast-trending valleys and ridges. The Blue Ridge province includes only a very small area along the easternmost part of the State." (Puente, 1985)

Precipitation is the primary source of recharge to the ground water systems of West Virginia. Average annual precipitation across the state ranges from about 30 to 60 inches. Of this amount, about two to 12 inches becomes ground water, however very little moves into deeper aquifers. Most of this new ground water quickly becomes surface water as it re-emerges at springs and seeps and contributes to the flow of surface streams (Puente, 1985). An exception is noted in the karst areas of the state, where there are few streams on the surface and where ground water can flow quickly for miles underground through solution channels, caves, and fissures in the limestone.

Ground water and surface water are therefore intimately related. Since one readily becomes the other, what affects one also causes changes in the other.

For example, the effects of the floods of November 1985 will become apparent in future ground water studies.

While this report is a summary of the best information available to date, some gaps were found, such as the lack of data on organic and pathogenic contamination. It is hoped this situation will be remedied as the West Virginia Ground Water Protection Program is implemented. This program will coordinate ground water programs presently in place in a number of state agencies, and will seek to fill gaps and to eliminate overlaps and conflicting responsibility. It will also establish a ground water data base in which information now maintained in separate files in the West Virginia Departments of Natural Resources, Health, Energy, Agriculture, and Highways, the U.S. Environmental Protection Agency and the U.S. Geological Survey will be stored in a uniform system accessible by all.

The following discussions of ground water conditions in West Virginia are based on U.S. Geological Survey (U.S.G.S.) divisions of the state into 11 basins drained by major rivers or their minor tributaries. The correspondence between the U.S.G.S. basins and their equivalents as designated in the stream classification system of the West Virginia Department of Natural Resources (DNR) is shown in Table D-1. Figure D-1 shows

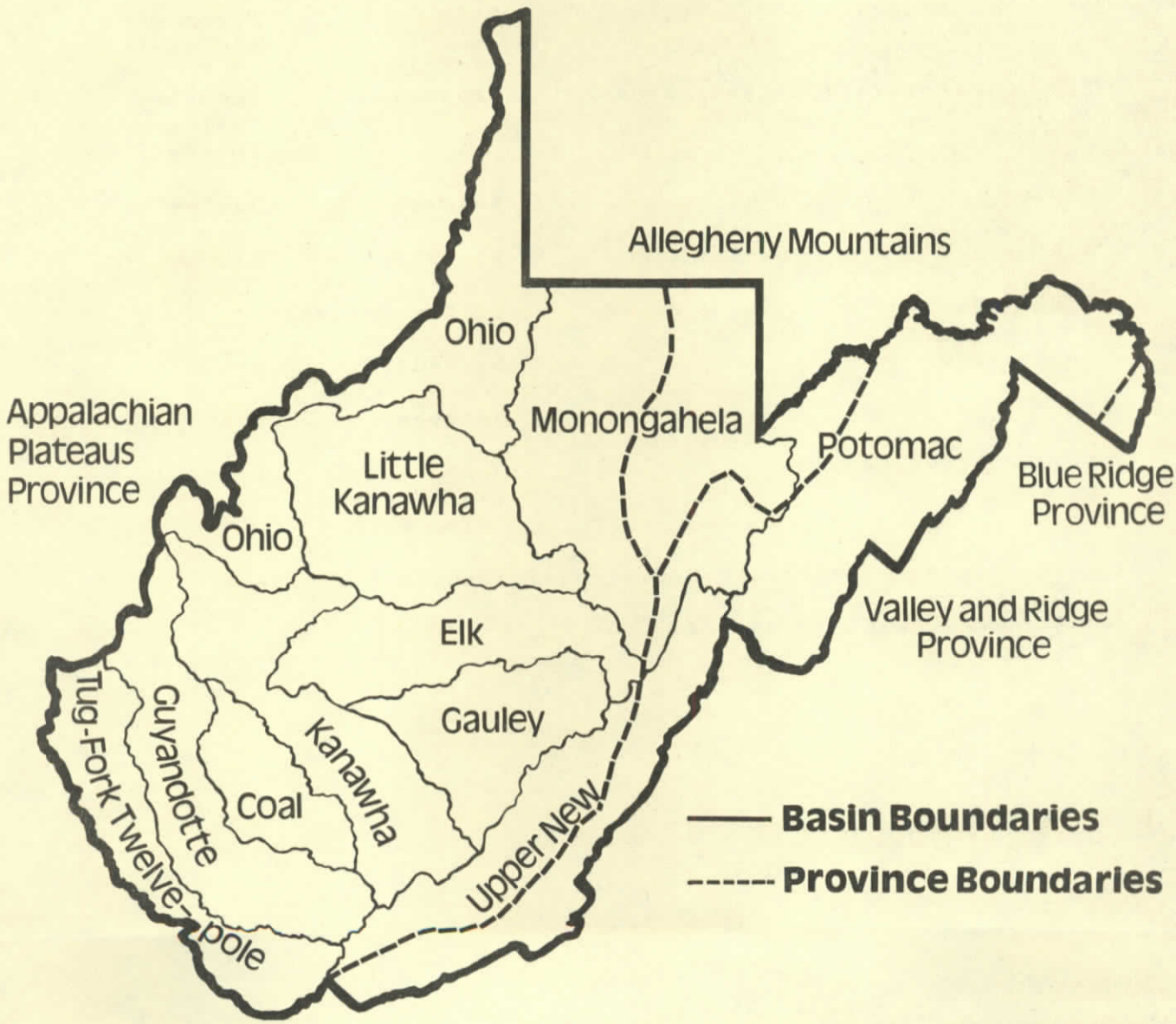
the approximate boundaries of the basins and the physiographic provinces of the state.

TABLE D-1

U.S.G.S. Drainage Basins	DNR Drainage Basins major	DNR Drainage Basins minor
Monongahela	Monongahela	
Potomac	Potomac	
Upper New	Kanawha	New Bluestone Greenbrier
Minor tributaries of the Ohio	Ohio	Upper Ohio Middle Ohio
Minor tributaries of the Kanawha	Kanawha	Kanawha mainstem Pocatalico
Gauley	Kanawha	Gauley
Elk	Kanawha	Elk
Little Kanawha	Little Kanawha	
Guyandotte	Guyandotte	
Coal	Kanawha	Coal
Tug Fork-Twelvepole	Ohio Big Sandy-Tug Fork	Lower Ohio

Correspondence between U.S.G.S.-designated and WV DNR-designated drainage basins.

Figure D-I Physiographic provinces of West Virginia and USGS-designated drainage basins. (Adapted from Puente, 1985 and USGS, 1973-1985)



2. Quality

Threats to the quality of ground water vary widely across the state, due in part to different geologic and topographic conditions. In the karst areas of the east, nonpoint sources such as drainage from farms, septic tanks, municipal wastewater facilities, highways, and construction constitute the greatest threat.

In the Appalachian Plateaus province most ground water pollution, actual and potential, results from coal mining activities and from oil and gas well operations. Mine drainage and runoff can cause high levels of iron, manganese, sulfate, total dissolved solids, and hardness. In the northern (high-sulfur) coal fields north of the Kanawha River, mine drainage is typically acidic. In the south, however, acid drainage is less of a problem and abandoned mines have become valuable sources of drinking water for about 70 communities. Oil and gas wells can allow salt water (from deep aquifers), drilling fluids, and natural gas to enter freshwater aquifers and contaminate nearby wells. This condition is especially prevalent in the Little Kanawha and Pocatalico basins.

Few data were found to indicate contamination of ground water, since 1983, from the following sources: chemical manufacturing in the Kanawha Valley, transportation of hazardous materials by rail or highway, underground storage tanks and pipelines,

underground injection wells, and (except in the eastern panhandle and other small isolated areas) domestic sewage.

Background information is provided in Table D-2 and Figures D-2 through D-16. The table is a summary of major contaminants and their sources, as well as precipitation and ground water demand. Figures D-2 through D-14 show the means and ranges of the levels of iron, manganese, chloride, fluoride, sodium, sulfate, calcium, magnesium, potassium, dissolved solids, hardness, specific conductance, and temperature of water from wells in West Virginia. Figure D-15 gives the range (only) of pH values of ground water in the 11 basins. (Means or medians are not given since for a logarithmic parameter they are apt to be misleading.) Figure D-16, which shows depth to water, is an indication of the water table level across the state.

Many things can be learned from Table D-2 and Figures D-2 through D-16. For instance, federal drinking water standards are exceeded for several parameters. Almost all the ground water in the state exceeds the standard for iron, especially in the Guyandotte Basin. Sodium and dissolved solids levels are also very high. Most of the ground water in the state is moderately hard to very hard (Figure D-12), except in the Gauley Basin, where the mean hardness is about 57 milligrams per liter.

Table D-2
Groundwater Supply, Demand and Contamination

Basin	Annual Precipitation (inches) mean	range	Area sq. mi.	Groundwater Demand (mgd_1)	Sources of Contamination	Major Contaminants
Monongahela	50	40-70	4225	8	coal mines	acid drainage
Potomac	38	32-55	3464	15	farms, septic systems	agricultural chemicals and waste, sewage, petroleum products
Upper New	40	36-44	2570	3	farms	agricultural chemicals and waste
Ohio	40	37-48	2500	~20	coal mines, oil and gas wells	acid drainage, brine
Kanawha		39-50	2135	16	chemical industry, coal mines, oil and gas wells	brine, chemical wastes
Gauley		48-70	1420	<1	coal mines	acid drainage
Elk		42-66	1532	4	coal mines, oil and gas wells	acid drainage, brine
Little Kanawha	~45		2310	1	oil and gas wells	brine, gas
Guyandotte	45		1680	~1	coal mines, oil and gas wells, septic systems	mine drainage and runoff, brine, gas, decaying material
Coal	45		890	~1	coal mines	mine drainage
Tug Fork - Twelvepole	45		1440	~1	coal mines	mine drainage

1. mgd= million gallons per day

Figure D-2 Levels of Iron (Fe) in West Virginia ground water.

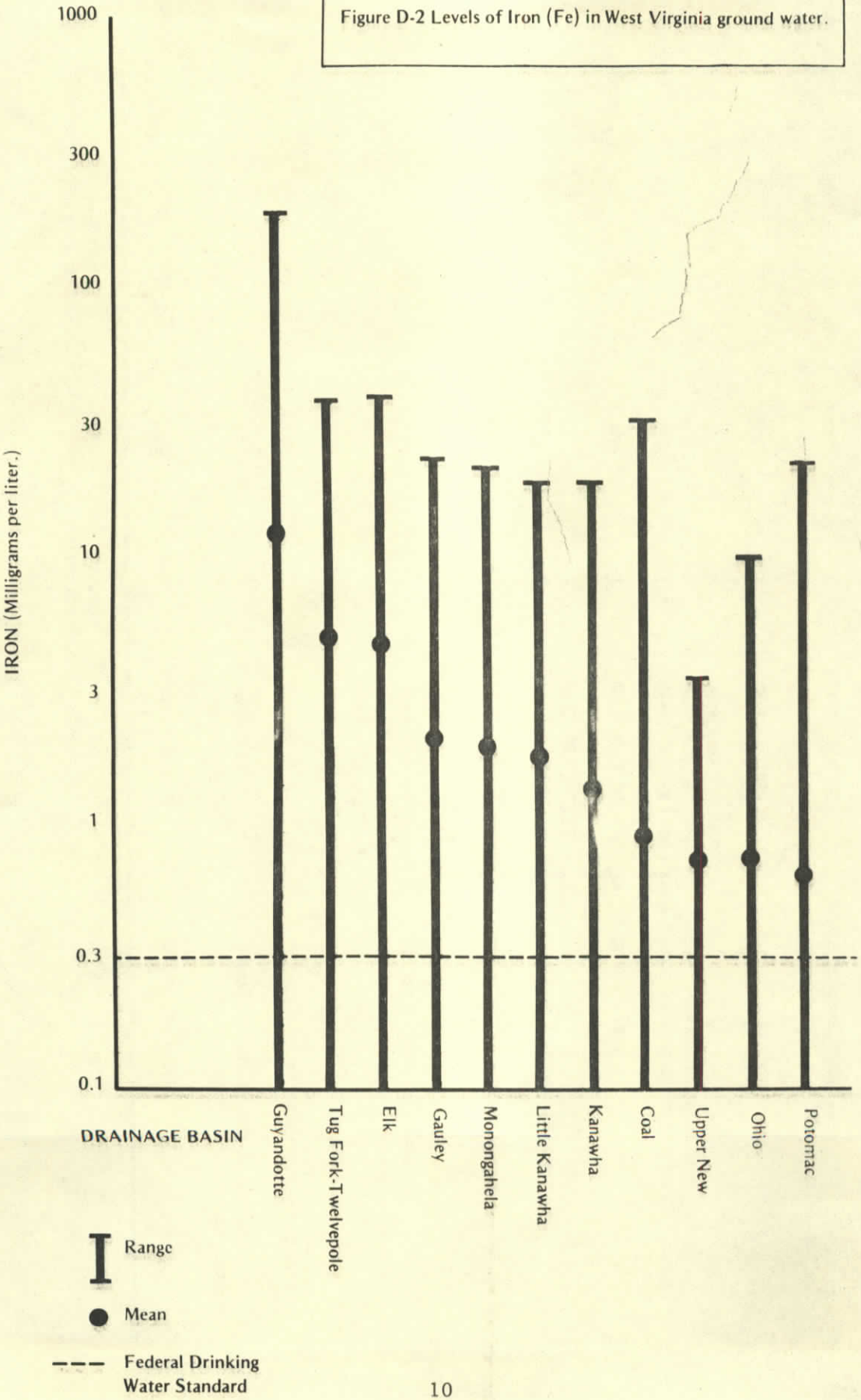


Figure D-3 Level of Manganese (Mn) in West Virginia ground water.

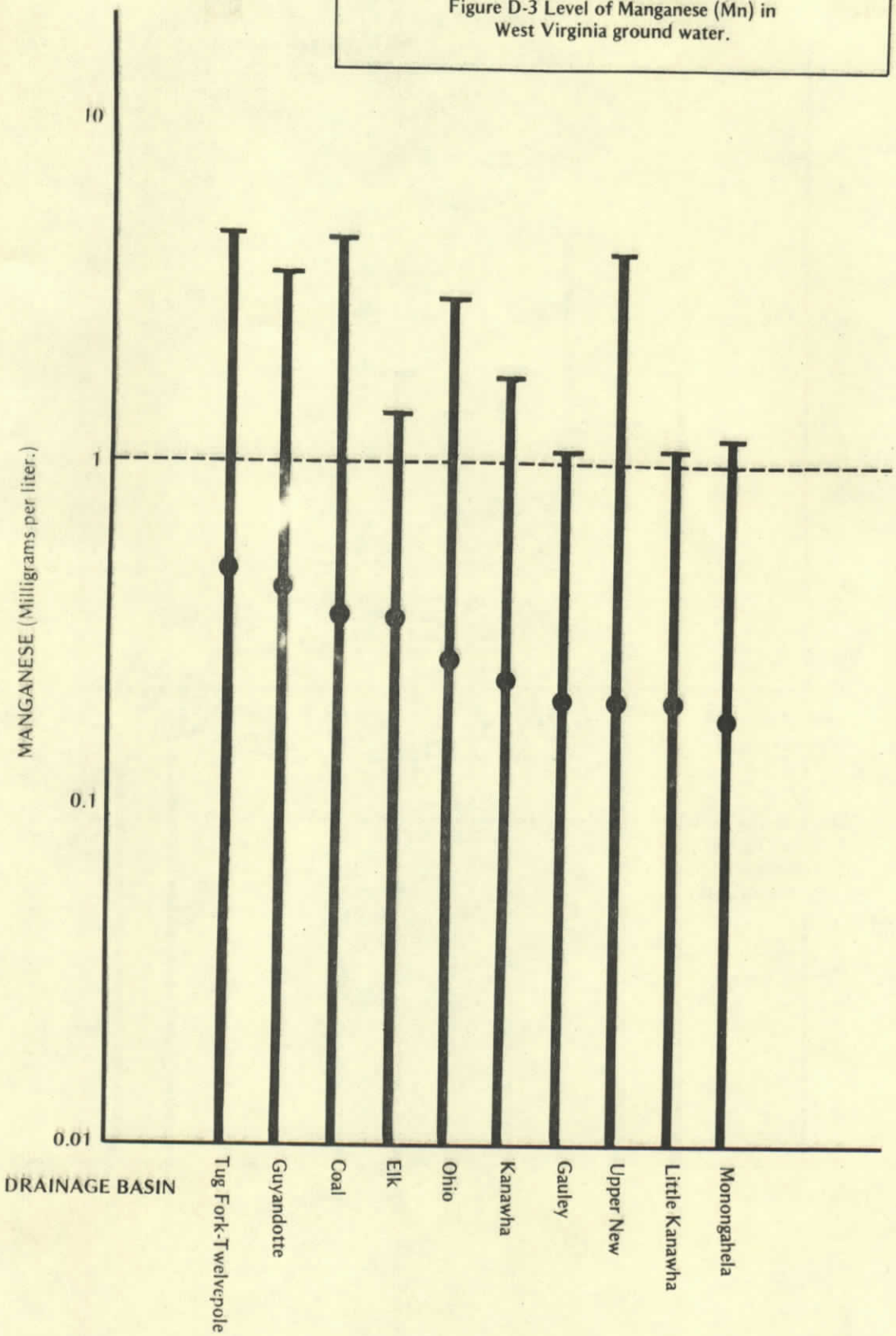


Figure D-4 Levels of Chloride (Cl) in West Virginia ground water.

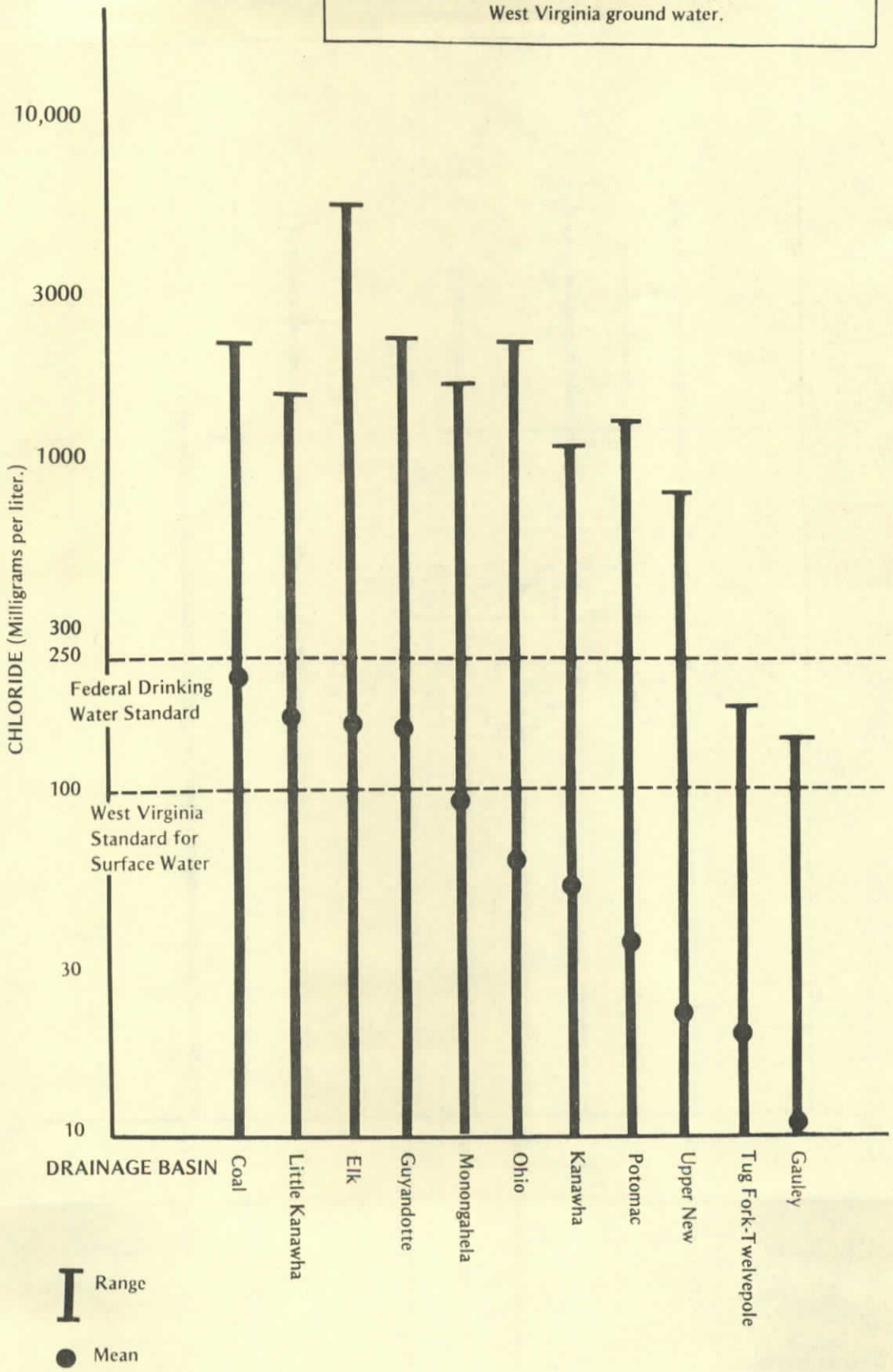


Figure D-5 Levels of Fluoride (F) in West Virginia ground water.

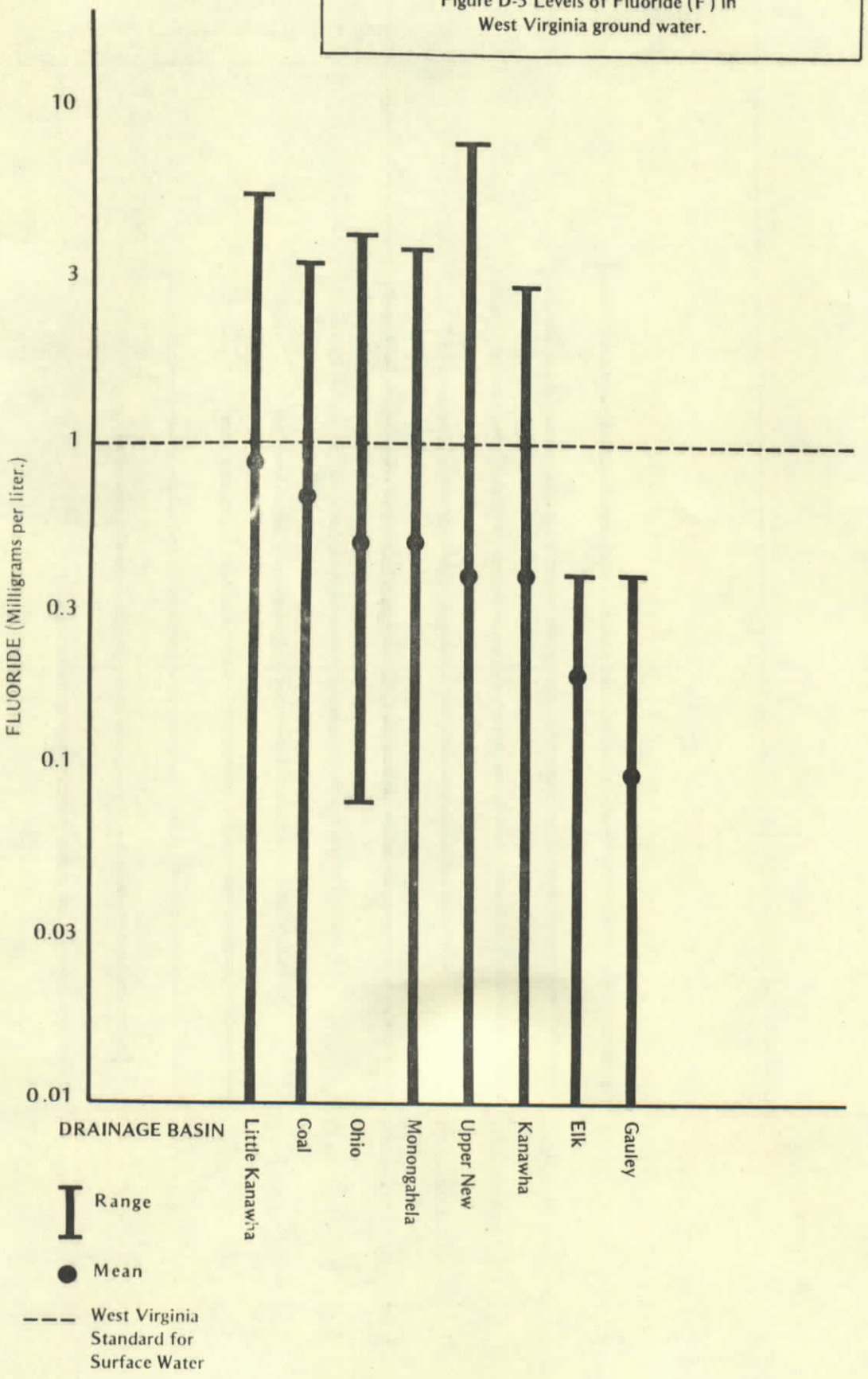


Figure D-6 Levels of Sodium (Na) in West Virginia ground water.

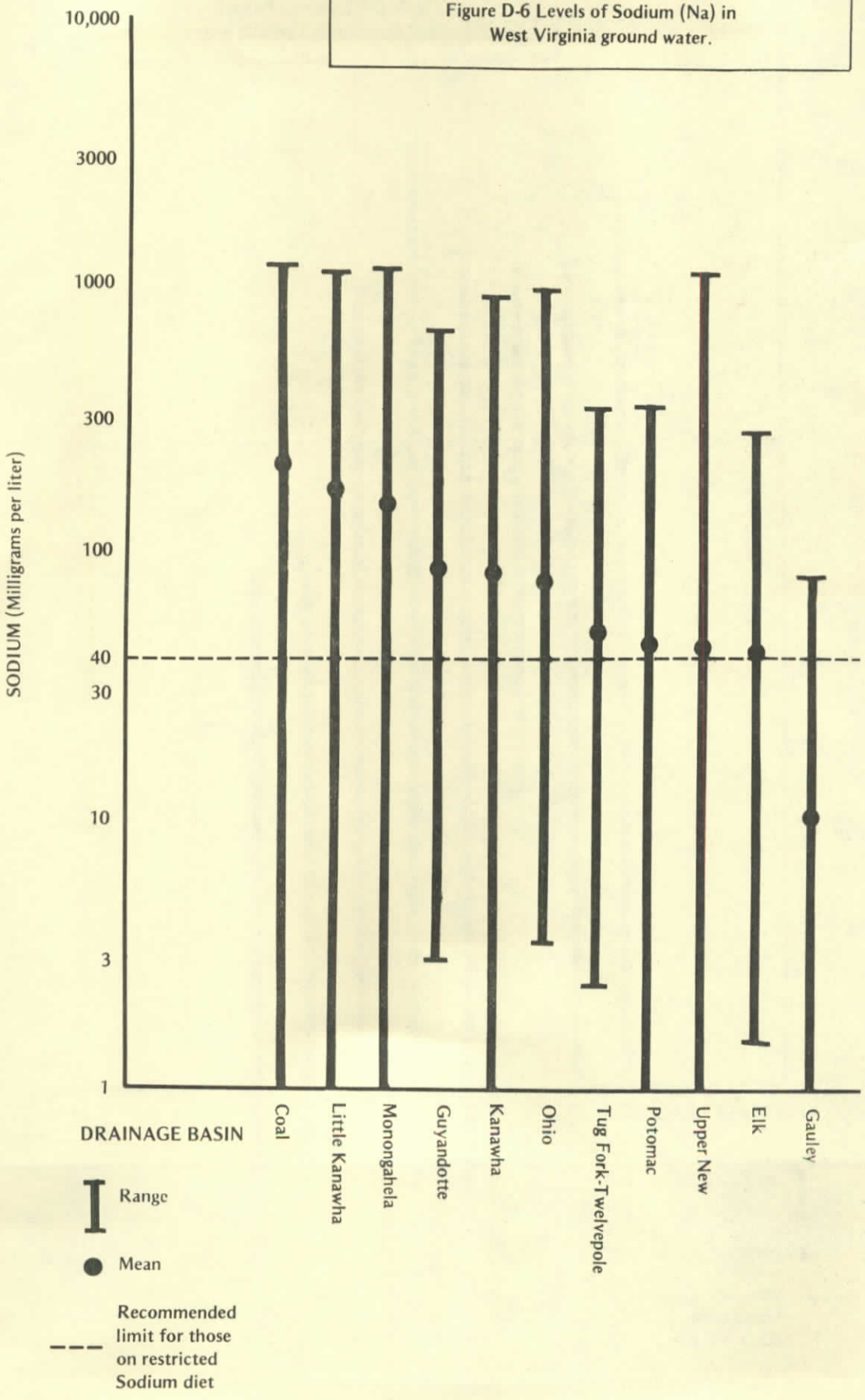


Figure D-7 Levels of Sulfate ($SO_4^=$) in West Virginia ground water.

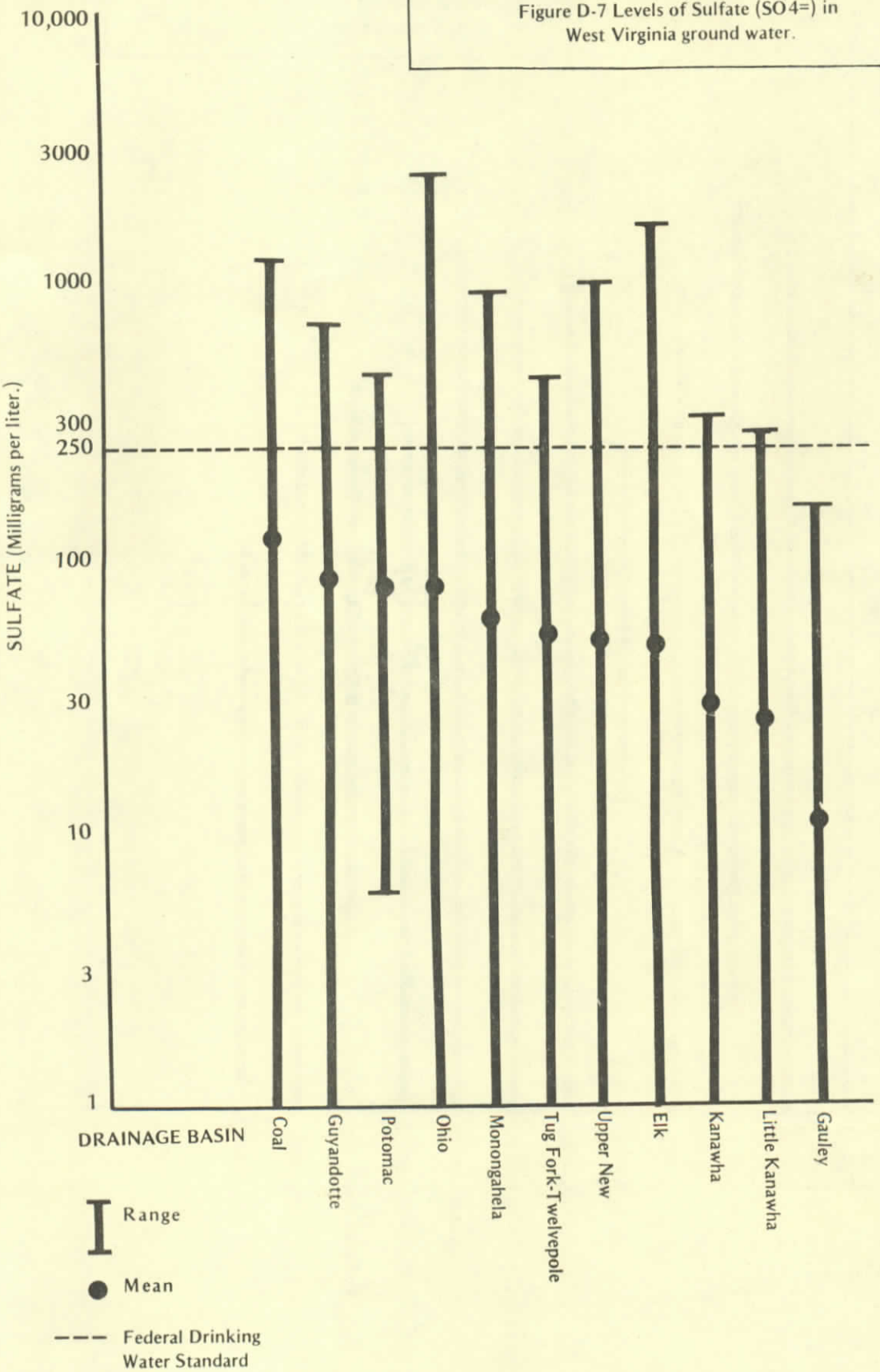


Figure D-8 Levels of Calcium (Ca) in West Virginia ground water.

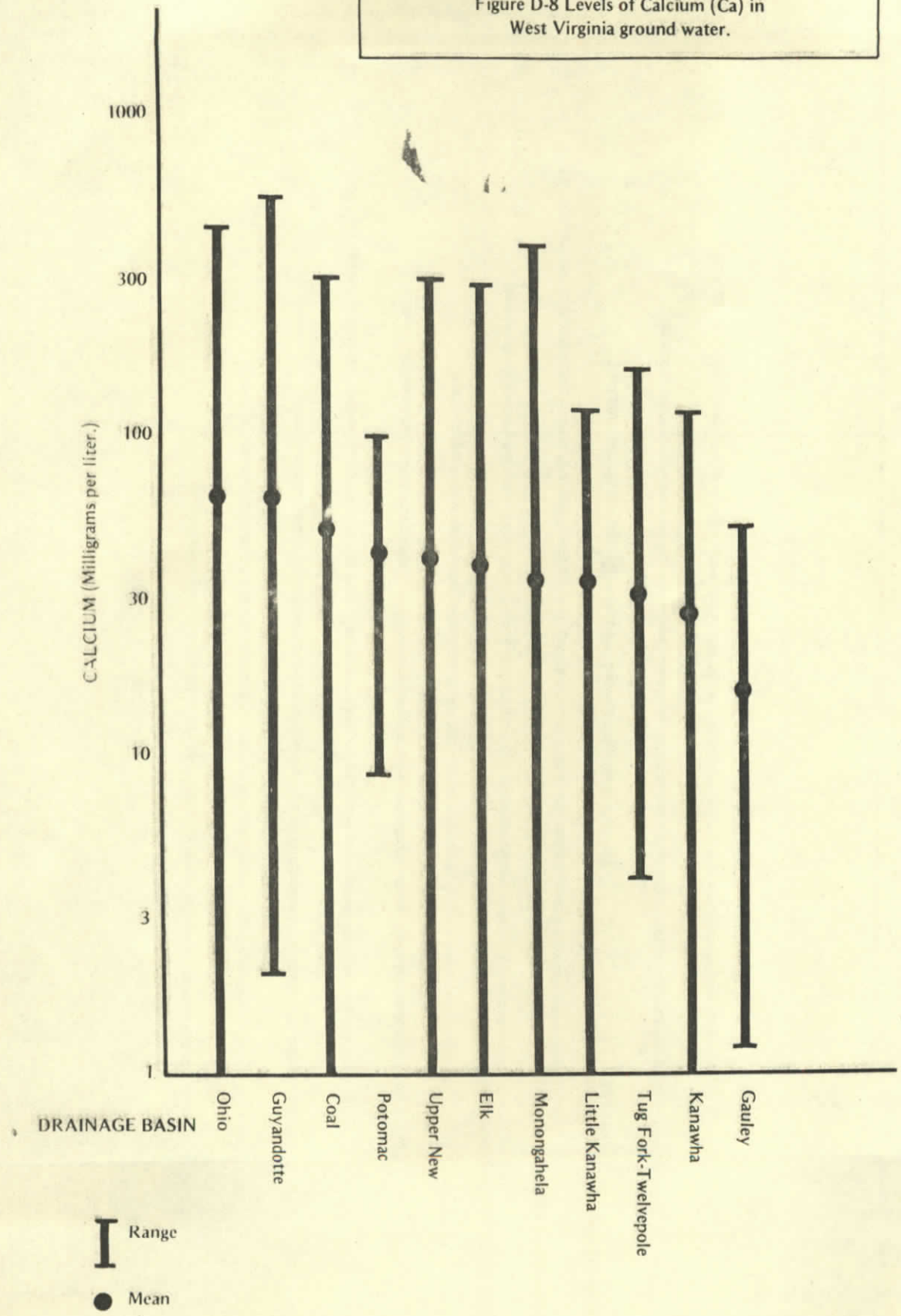


Figure D-9 Levels of Magnesium (Mg) in West Virginia ground water.

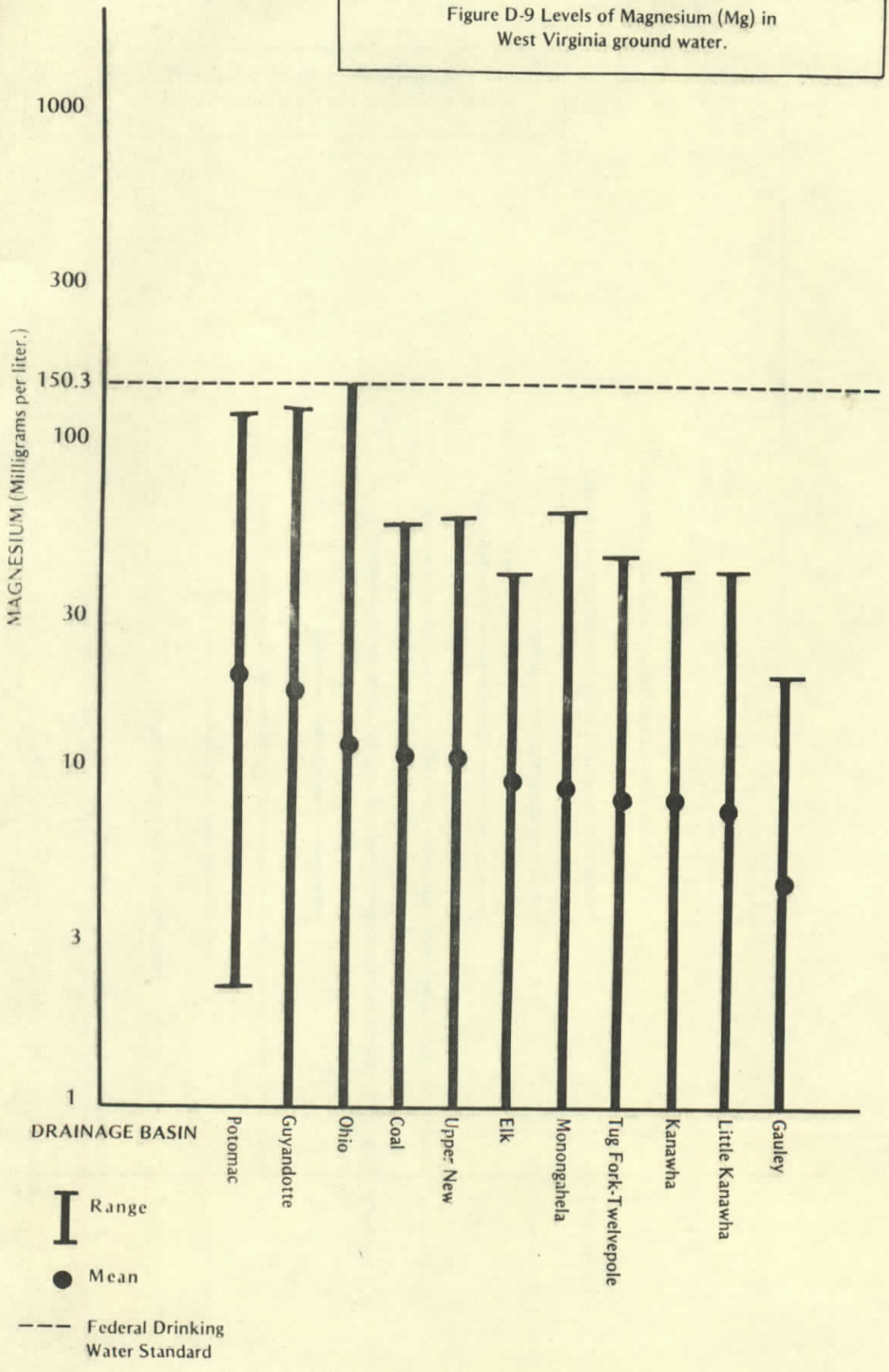


Figure D-10 Levels of Potassium (K) in West Virginia ground water.

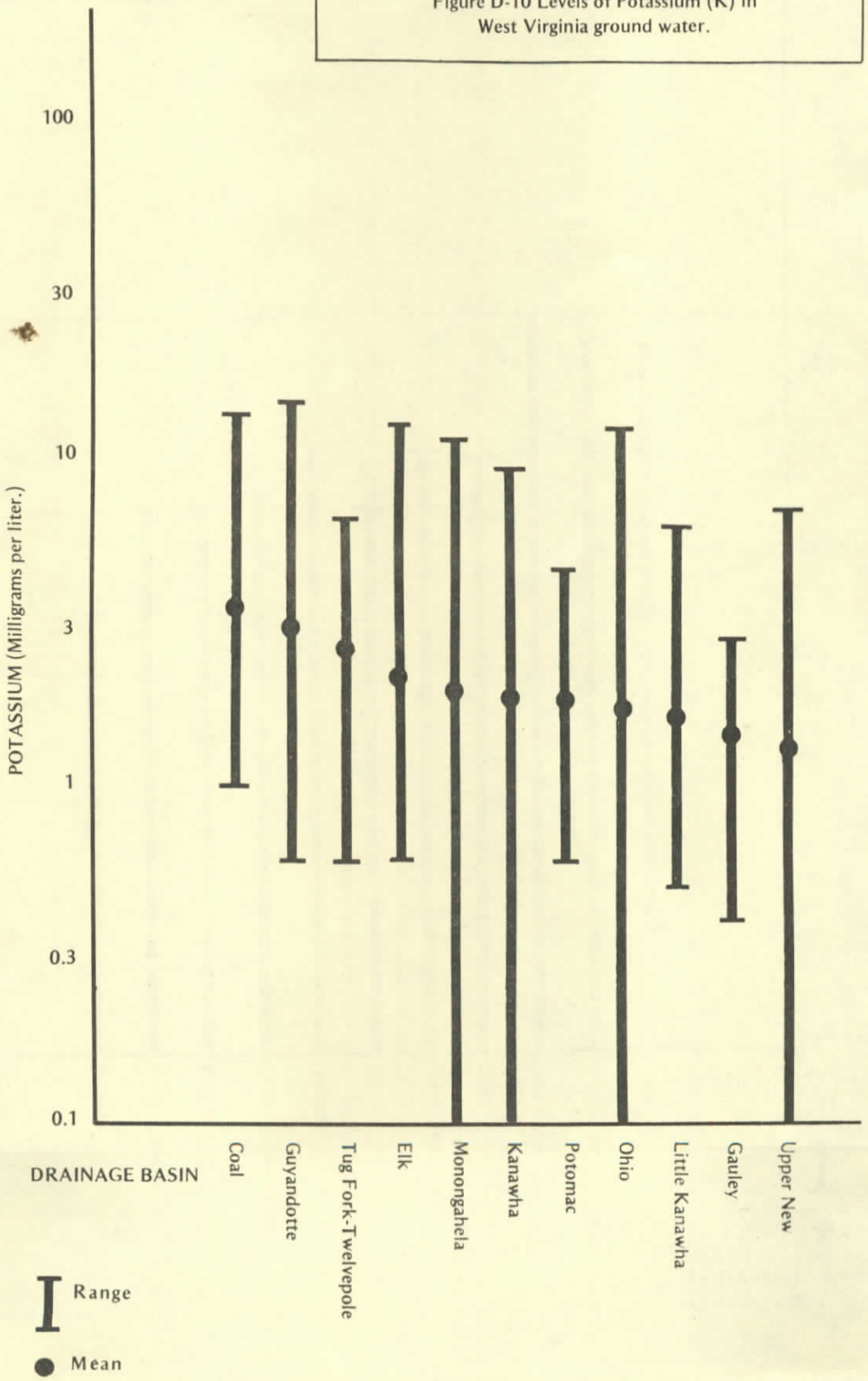


Figure D-11 Levels of dissolved solids in West Virginia ground water.

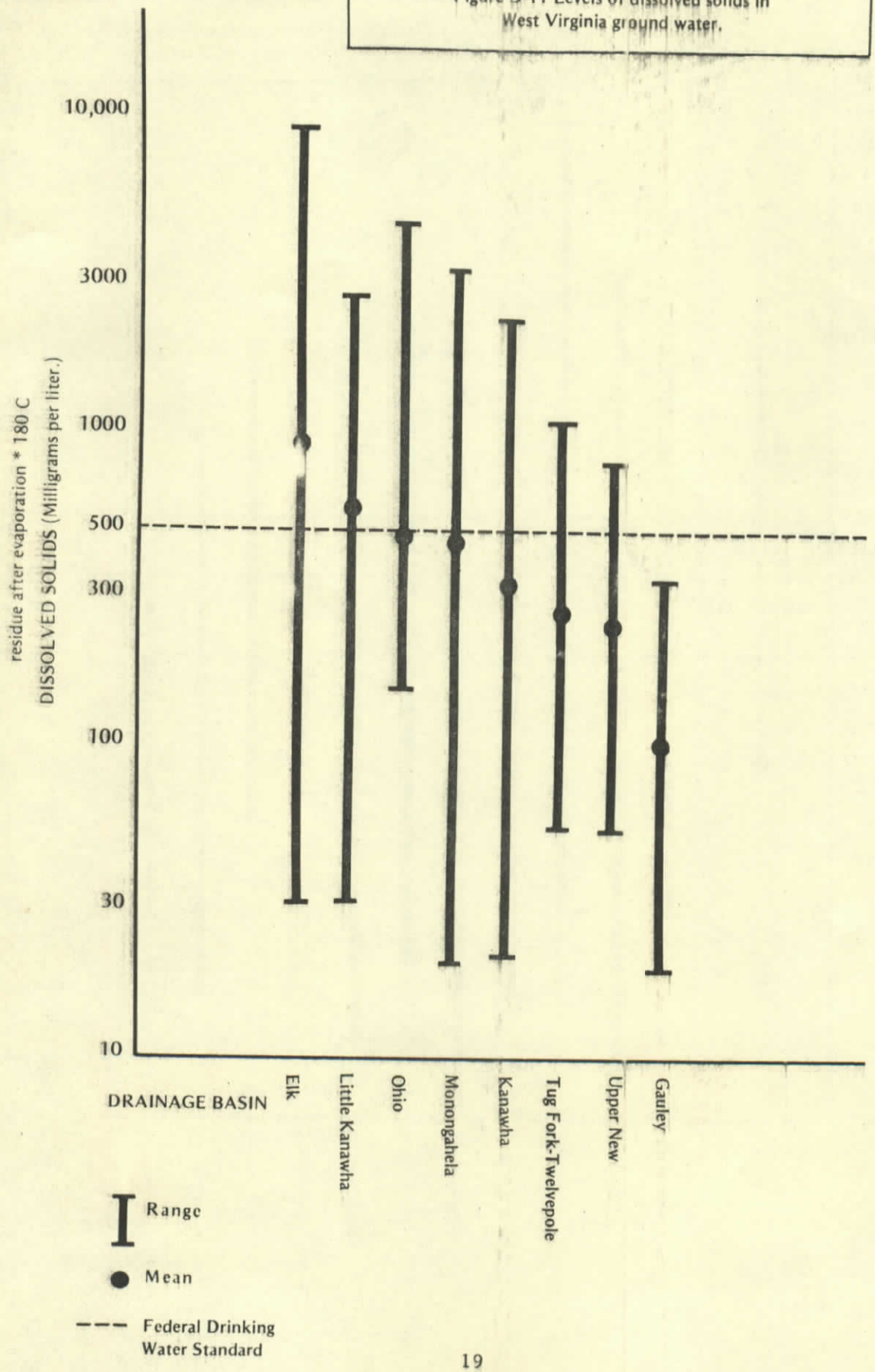


Figure D-12 Hardness as CaCO 3 (Ca,Mg) in West Virginia ground water.

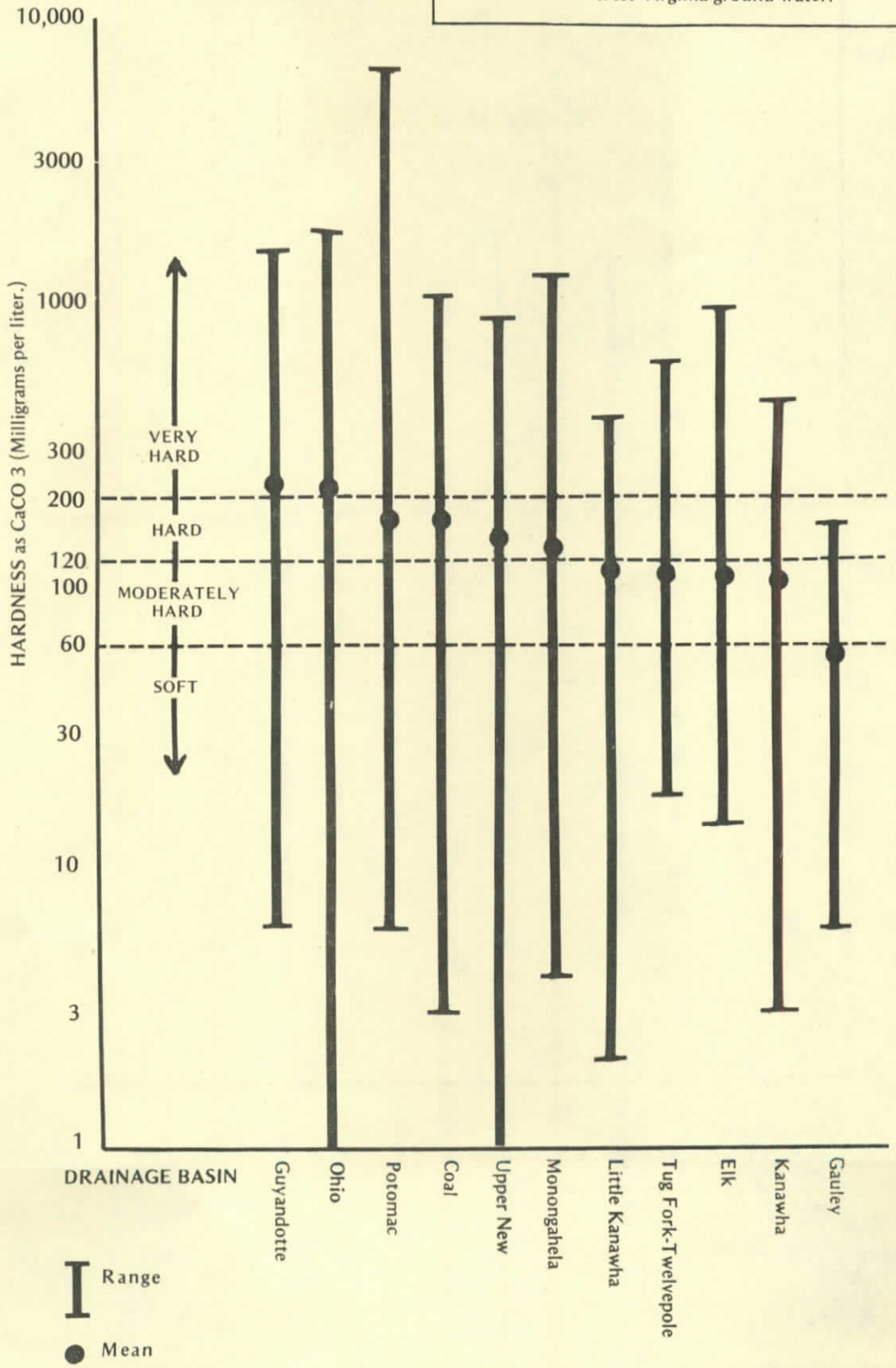


Figure D-13 Specific conductance of West Virginia ground water.

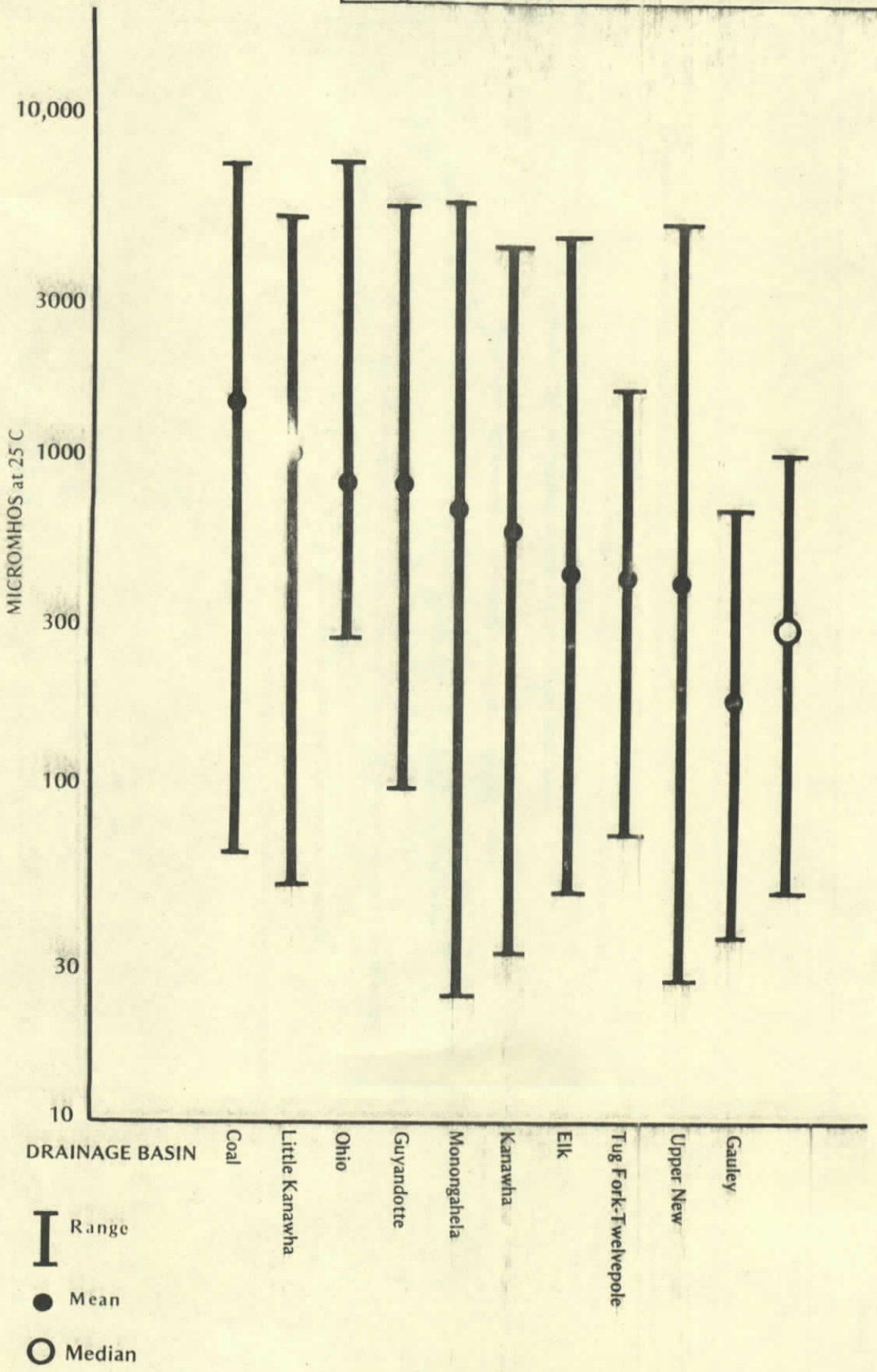


Figure D-14 Temperature of West Virginia ground water at the wells.

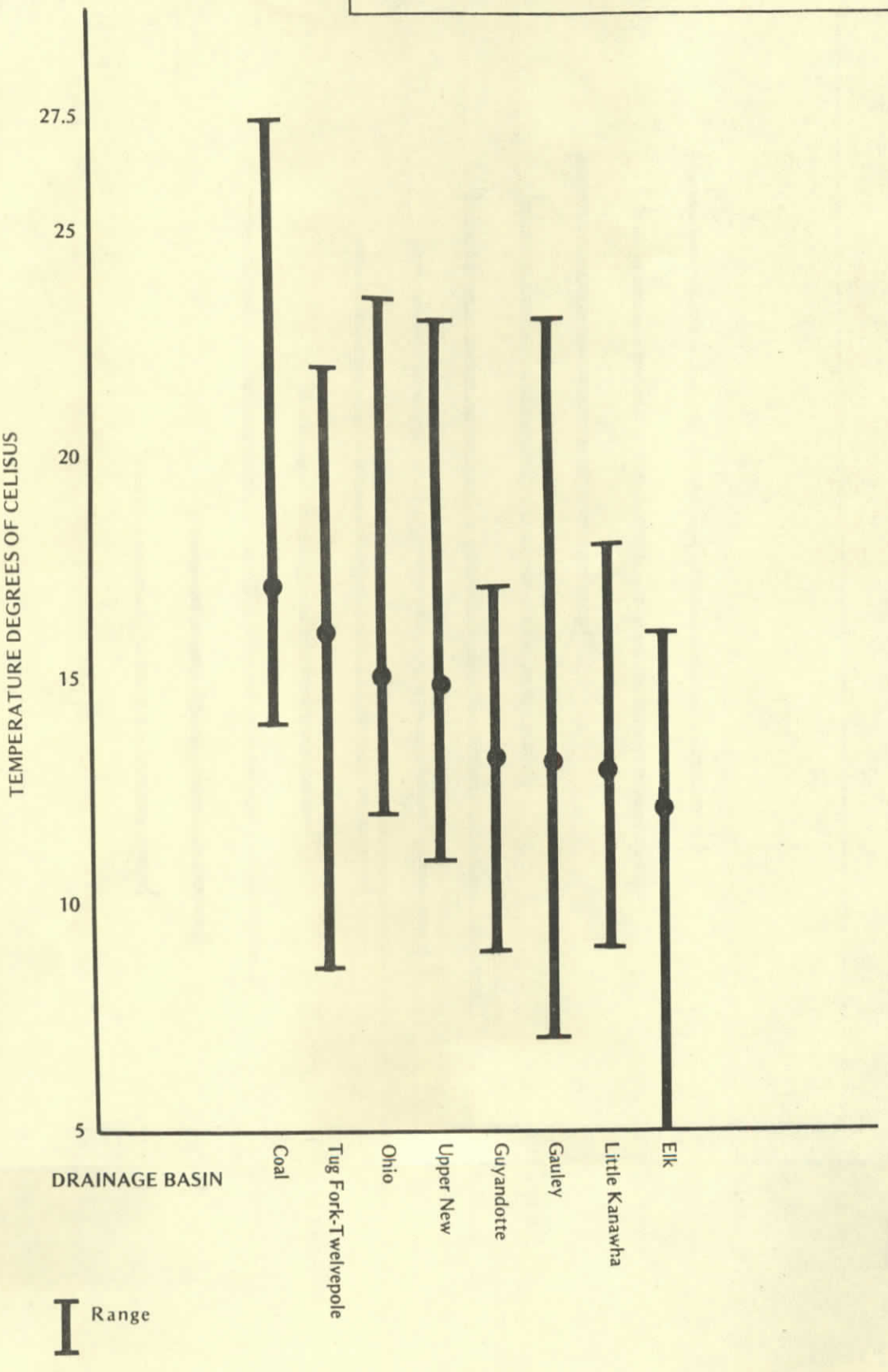


Figure D-15 Levels of pH in West Virginia ground water.

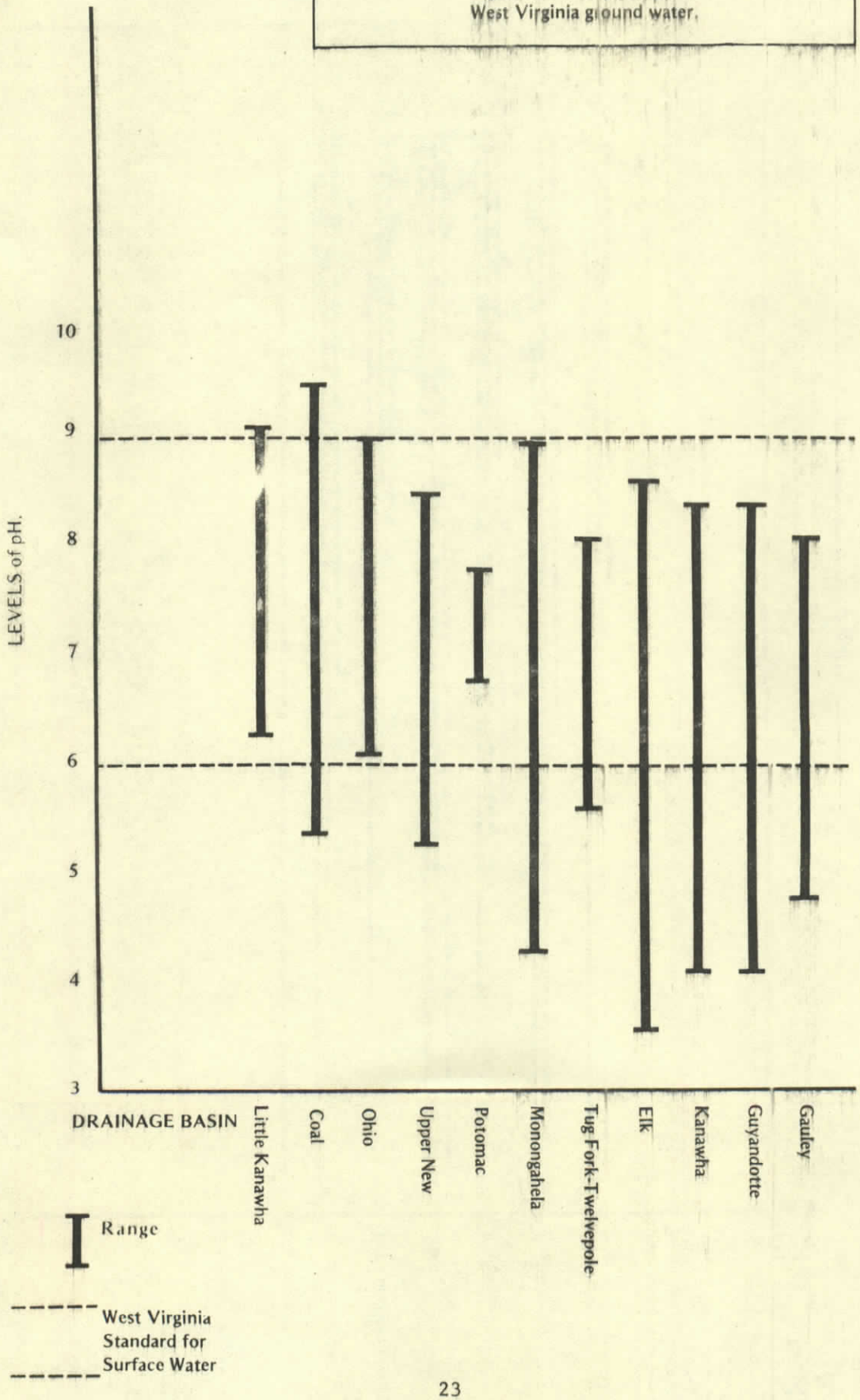
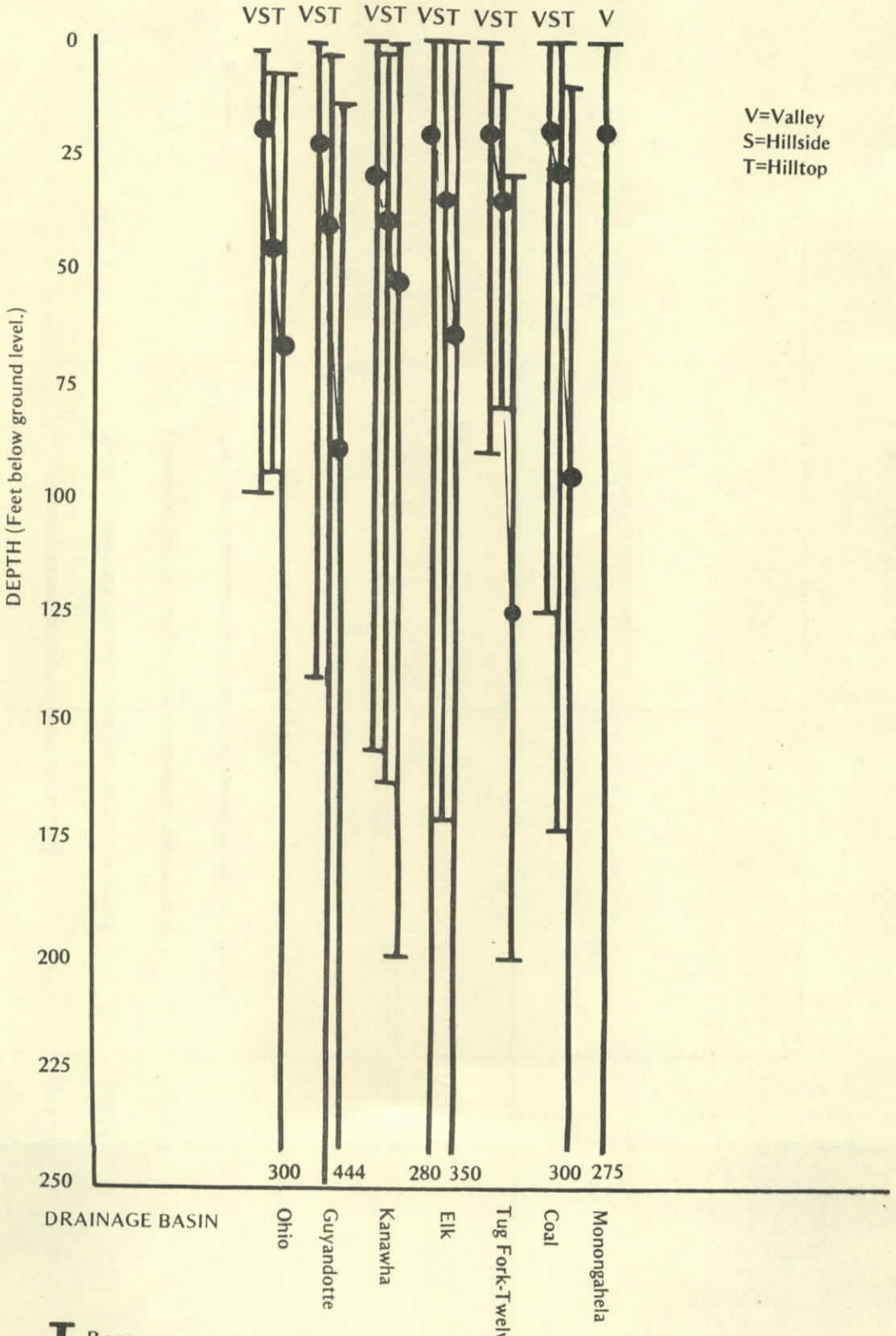


Figure D-16 Depth to Water by topographic site of wells.



In each figure (expect for Figure D-15, pH of ground water) the basins are arranged by mean value in descending order from left to right. This enabled a ranking of the basins by water quality. Based on the statistics for iron, chloride, sodium, sulfate, calcium, magnesium, potassium, hardness, and specific conductance (the figures with means in which all 11 basins are represented), the basins were given scores according to their positions on each figure and were ranked accordingly. The ranking is shown in Table D-3.

TABLE D-3

1. Gauley	7. Potomac
2. Upper New	8. Monongahela
3. Kanawha	9. Ohio
4. Tug Fork-Twelvepole	10. Coal
5. Little Kanawha	11. Guyandotte
6. Elk	

Rankings of the 11 drainage basins of West Virginia by ground water quality, based on 9 parameters. (No. 1 is highest quality. See Text.)

In Figures D-2, D-3, D-4, D-5, D-6, D-7, D-11, D-12, and D-15, applicable federal drinking water standards, West Virginia Stream quality standards, and other levels are indicated. Most of the figures were generated on a logarithmic scale.

Sources of the preceding tables and figures are 11 U.S. Geological Survey Ground Water Hydrology Atlases, one for each drainage basin in West Virginia (U.S.G.S. 1973-1985).

3. Recent Concerns

Since the data on which these atlases were based are all from years prior to 1983, attempts were made to obtain more recent data. The major source chosen was the West Virginia Department of Health, which between September 1984 and October 1985 conducted approximately 1,144 chemical analyses on water samples taken from privately owned wells from all areas of the state. Analyses such as these are not performed on a regular basis but only in response to complaints and requests by citizens. (See Table D-4). Because of this, the information given in Table D-5 is not an update of information previously presented but only an indication of recently-discovered trouble spots across the state.

Another source of recent information is the Division of Water Resources, which also maintains files of private water well complaints. Sources of data for these files are usually rural home owners who notify county sanitarians or DNR district water resources inspectors of sudden changes in their well water. Many of the complaints concern damage which has been relatively easy to trace to nearby oil and gas drilling operations. For other types of contamination, however,

it has been very difficult or impossible to determine the cause. These include the appearance of gasoline and fuel hydrocarbons (from leaking underground tanks?), salt (from highway maintenance road salt piles?), and chlordane (vandalism?), as well as imagined or suspected problems ("it must have been something in the water").

Table D-5 shows unusually high levels detected above a threshold (arbitrarily chosen for iron, manganese, sodium, alkalinity, hardness and pH) for 17 parameters, and the presence of several others, some of which cannot be quantified, for the 11 drainage basins. In eight basins, a total of 17 wells were declared unfit for household use, mostly because of sodium levels greater than 1,000 milligrams per liter and correspondingly high chloride levels.

Table D-4
Citizen Concerns for Groundwater Quality:
Approximate number of complaints and requests for chemical analysis of domestic well water
(WVDOH 1986)

Citizen Concerns	Monongahela	Potomac	Upper New	Ohio	Kanawha	Gauley	Elk	Little Kanawha	Guyandotte	Coal	Tug-Fork Twelvepole
Odor	3	6	7	12	10	1	2	18	4	4	1
Taste	2	2		5	4		1	11			1
Appearance	2	1		2	3		1	6	2	2	1
Oil and gas Drilling	2			7	4		4	21	8	3	1
Mining	1	1			1			1			
Petroleum product		5	2					1	1		
Oily film			1	1	3	1		2		1	
Synthetic organic compounds	2	3	1	2	2			1	1		
Salt	2			1	2	1	1		4		
Other inorganics	8[1]	2	2			1	1				
Sediment		1		5	2			2	1		
Stains/residue			3	2				4		1	1
Corrosivity			1	1							1
Physician's request			3		4			3	2		3
Health related	1	1	2	1	2		1	5			2
Sewage		1					1	1		3	
Other[2]	2			2	2		1	4	6		3
Total Analyses (9/84-10/85)	175	78	64	106	181	23	66	273	73	64	41

1. Mostly selenium and arsenic.
2. Includes mechanical well problems, vandalism, and presence of jellylike material, rodent hairs, etc.

Table D-5
Groundwater Contamination, Sep. 1984-Oct. 1985 (WVDOH, 1986)

Quantified Contaminants	Threshold, mg/l[1]	Drainage Basins[2]										
		Monongahela	Potomac	Upper New	Ohio	Kanawha	Gauley	Elk	Little Kanawha	Guyandotte	Coal	Tug Fork-Twelvepole
Iron	1.0	8	4	6	5	14	1	19	11	14	19	5
Manganese	0.3	9	4	3	3	9	1	11	15	9	11	2
Chloride	250	9		1	4	13		2	19	3	2	2
Sodium	100	12	1	4	21	22		15	36	5	12	5
TDS	500	16	1	6	19	28		2	33	5	11	3
H_2S	0	5	4	3	6	5	1		10		2	2
Sulfate	250	2		4		1			3	1	1	2
Alkalinity	300	6	3	2	15	19			25	2	3	1
Hardness	200	13	9	7	6	16		2	21	6	3	2
Fluoride	1.0	5		1	13	10			16		1	1
Copper	1.0								1			1
Petroleum	0	3	4			1			1			
Selenium	0.01	8										
Arsenic	0.05	1										
Synthetic Organics	0	3	2		2	2	1					1
Phenols	0.001			1								
Other Parameters												
Hydrocarbon Odor		5	3	1	4	5			12	4	3	1
Musty Odor		1	1	2	2	1			2			
Putrid Odor				1	1	1				1		
Other Odor			1						2			
pH[3]	5	7	1	1				3		1		1
Turbidity			1	1		1				2		
Sewage						1						
MBAS (foaming agent)									1	1		1
Gelatinous material					2				3			
Iron or sulfur bacteria						1			3			
Particulate material					2	1		1		1	1	
Other material			1		1					1		1
Corrosivity						1			1	1		1
Unusable		3	2			3		2	4	1	1	2
Total Analyses, (9/84-10/85)		175	78	64	106	181	23	66	273	73	64	41

1. mg/l = milligrams per liter
2. Reports of wells exceeding threshold (exc. pH)
3. Reports of wells with pH below threshold

Appendix II

GROUND WATER STATUTE ASSESSMENT

August 1986

UPDATED GROUND WATER STATUTORY REVIEW

AUGUST, 1986

SUMMARY OF AGENCIES AND STATUTES INCLUDED IN GROUND WATER REVIEW

Department of Natural Resources, Water Resources Division

20-5	Water Resources
20-5A	Water Pollution Control Act
20-5C	West Virginia Water Development Authority
20-5E	Hazardous Waste Management Act
20-5F	Solid Waste Management Act
20-5G	Hazardous Waste Emergency Response Fund

Department of Energy

20-5E	Hazardous Waste Management Act
22-3	Abandoned Mine Lands and Reclamation Act
22A-3	West Virginia Surface Coal Mining and Reclamation Act
22A-4	Surface Mining and Reclamation of Minerals other than coal
22B-1	Oil and Gas Wells
22B-2	Oil and Gas Production Damage Compensation

Department of Health

16-1	State Department of Health
16-9	Offenses Generally
20-5E	Hazardous Waste Management Act

Department of Agriculture

19-16B	West Virginia Pesticide Use and Application Act

Department of Highways

17-2A	West Virginia Commissioner of Highways
17-23	Salvage Yards
17-24	Disposal of junk and abandoned vehicles

Public Service Commission

20-5E Hazardous Waste Management Act

Air Pollution Control Commission

20-5E Hazardous Waste Management Act

Common Law Rule in West Virginia on Ground Water

Safe Drinking Water Act Amendments of 1986

General Zoning and Land Use Planning Authorities

GROUND WATER REVIEW

I. Department of Natural Resources

Division of Water Resources

Code Section	Comment
20-5-1	Gives the Division of Water Resources jurisdiction to enforce and administer all laws relative to the "conservation, development, protection, enjoyment and use" of the state water resources.
20-5-1a	Public policy that water resources of the state shall be available for reasonable use by all citizens.
20-5-2(e)	Defines "water resources", "water", and "waters" to include water on or beneath the surface, including wells. This section, when read with § 20-5-1 gives the Division jurisdiction over all ground water found in the state.
20-5-4	Chief shall make surveys of the state's water resources; investigate and study problems of water pollution; and formulate comprehensive plans and recommendations for protection and uses of water resources.

Code Section	Comment
20-5A-1	Establishes as the public policy of the state the maintaining of the purity and quality of state waters so as to be consistent with public health and enjoyment, propagation of plant and animal life, and commercial opportunities.
20-5A-2	Defines water resources and water to include ground water, thus establishing that it is the policy of the state to keep the ground water of sufficient quality to promote enumerated purposes.
20-5A-3(a)(1)-(14) and (d)	Powers and authority of Chief in controlling water pollution, e.g., studies, collecting information, sampling ground water, developing control programs, enforcing rules and regulations, requiring data from persons who discharge wastes into or near ground waters or underground strata, requiring monitoring by owner or operator of point sources.
20-5A-3(b)	Authority of the Water Resources Board to adopt regulations that, among other things, prevent, control and abate pollution, and that establish standards of quality for state waters to prevent, abate and control pollution.
20-5A-3a(a)	Gives the Water Resources Board, in order to carry out the purposes of Article 5, the authority to promulgate regulations setting water quality standards and effluent limitations to protect public health and welfare...and present and future uses of waters.
20-5A-3a(c)	Chief has the authority to revoke or modify any permit for noncompliance.
20-5A-4	Designates Water Resources as the water pollution control agency for the state and authorizes the Chief to cooperate with other state and federal agencies on any water pollution problem.
20-5A-5(a)	Gives the Chief the authority to issue a permit to discharge pollutants into state waters.

Code Section	Comment
20-5A-5(b)(1)	Prohibits discharge from a point source into waters of the state without a permit.
20-5A-5(b)(2)	Prohibits making or enlarging an outlet, without a permit, that would discharge into state waters.
20-5A-5(b)(3)	Prohibits, without a permit, construction, etc., of a waste disposal system that directly or indirectly discharges into state waters.
20-5A-5(b)(4)	Prohibits the increasing in volume or concentration of any discharge permitted under an existing permit.
20-5A-5(b)(5)	Prohibits, without a permit, the extension or modification of any permit source so as to increase the volume or concentration of the discharge from the point source.
20-5A-5(b)(6)	Applies to coal operations and when a permit is required. Coal operations that pollute or may pollute ground water will require a permit, and all coal preparation plants require a permit.
20-5A-5(b)(7)	Prohibits, without a permit, the operation of any disposal well for the injection or reinjection of any industrial wastes. Also prohibits, without a permit, converting a well to a disposal well, or plugging or abandoning any disposal well.
20-5A-8	Power of Chief to compel compliance; may revoke, suspend, or modify permits for cause.
20-5A-9	Requires any person who directly or indirectly discharges into or near any waters of the state, to file with the Division whatever information the Chief may require relative to that discharge. Further, if the Chief has reason to believe that the discharge is causing pollution, he may require further information and run tests as necessary to determine if such pollution does in fact exist.

Code Section	Comment
20-5A-10	Under this section, when the Chief determines that a person who does not have a permit is causing pollution of any waters of the state, the Chief can order that person to cease the pollution or he can enter an Order requiring that corrective or remedial action be taken. The Chief shall also direct that the person apply for a permit. The section does give the person the option to close down a facility, if doing so will abate the pollution.
20-5A-11	This section directs a person issued an Order under § 10 to comply with that Order. Section 11 also states that a person who is ordered to take remedial action cannot begin such action until a permit has been issued. This limits the ability of the Chief to order immediate action be taken. However, a permit is not required when a cease pollution Order is issued.
20-5A-11a	Gives a person the ability to exercise the power of eminent domain, when necessary, to comply with an Order of the Chief under § 10.
20-5A-12a	Whenever the Chief finds that any discharge, etc., into any waters of this state constitutes a "clear, present and immediate danger to the health of the public, or to the fitness of a private or public water supply for drinking purposes," he may, under § 12a issue an Order, with the concurrence of the Directors of the Depa tment of Natural Resources and Health Department, requiring the person discharging into the state waters to immediately cease or abate the discharge. Such an Order is effective immediately.
20-5A-14	Under this section, no one can claim a right or easement to pollute state waters on the basis of past pollution. This section gives the state the right to control state water quality. This section also makes it clear that even though a person complies with state law and Orders of the Chief or Board, he may still be required to take additional action with the passage of time and as conditions change.
20-5A-17	Civil penalties and injunctive relief for violations.

Code Section	Comment
20-5A-19	Criminal penalties.
20-5C	The West Virginia Water Development Authority has responsibility and authority for water development projects, improving the purity and quality of the state's waters, and preventing and abating water pollution.
20-5E-2	This section sets out the purpose of Article 5E, the "Hazardous Waste Management Act." Part of that purpose is to protect the public health and safety, as well as the environment, from the dangers inherent in hazardous waste materials and handling.
20-5E-3(3)	Disposal into <u>any</u> waters, including ground waters.
20-5E-3(6)	Defines hazardous waste as waste that poses a "substantial present or potential hazard" to human health or the environment. Water is part of the environment.
20-5E-4	DNR is lead agency for state hazardous waste management.
20-5E-6	Promulgation of rules and regulations by the Director.
20-5E-7	Other state agencies' authorities under the Act to promulgate rules and regulations for their areas of responsibility: Department of Highways, Public Service Commission, Department of Health, Air Pollution Control Commission, Department of Energy, and Water Resources Board.
20-5E-7(i)	In consultation with the Director of the DNR, the Water Resources Board shall promulgate rules and regulations governing discharges into the waters of this state of hazardous waste resulting from the treatment, storage, or disposal of hazardous waste.
20-5E-8(a)	Prohibits, without a permit from the Chief of Water Resources, the construction, modification, operation or closing of any facility or site for the treatment, disposal or storage of hazardous waste. Prohibits, without a permit, the storage, treatment or disposal of any hazardous waste. "Disposal

Code Section	Comment
	is defined to include any waters, including ground waters. However, these rules and regulations are not applicable to treatment, storage, or disposal of coal mining wastes and overburden.
20-5E-12	Chief's inspection and sampling authority.
20-5E-13(a)	Under § 13(a), if the Chief determines that the presence of hazardous waste at a facility or site at which such waste has been or is being stored, treated or disposed of, or, that the release of any waste from such facility or site may present a substantial hazard to human health or the environment, the Chief may order the owner or operator of such a facility or site to monitor, test, analyze and report to the Chief as necessary to determine the nature and extent of the hazard.
20-5E-13(b)	It is possible that an owner or operator of a facility or site as referred to in § 13(a) might not reasonably be expected to have actual knowledge of the presence of hazardous waste at his site. In that case, § 13(b) gives the Chief the authority to require the work referred to in § 13(a) and to require the owner or operator to reimburse the Chief for the costs of such work.
20-5E-13(d)	Section 13(d) gives the Chief the authority, under certain conditions, to do the work set out in § 13(a), and to equire the owner or operator to reimburse the Chief for the costs of such work.
20-5E-13(f)	Gives the Chief the authority to institute civil actions against persons failing to comply with Orders issued under § 13.
20-5E-14(a)	Grants the Chief the authority to issue various types of Orders, including cease and desist Orders, when the Chief discovers or learns of violations of Article 5E, a permit or an Order.
20-5E-15	Criminal penalties
20-5E-16	Civil penalties and injunctive relief for violations.

Code Section	Comment
20-5E-17	Gives the Chief the authority to request legal assistance to restrain any person from handling, storing, transporting, treating or disposing of a hazardous waste in such a manner as to present an imminent and substantial danger to the public health, safety or the environment.
20-5E-21	Use of hazardous waste management fund to administer the costs of this article.
20-5F-2(b)	"Waters" and "water resources" have same meaning as defined in 20-5A-2.
20-5F-4(a)	The Director of the DNR has the authority to adopt rules and regulations governing solid waste disposal; the Director may consider environmental impact, soil and geological conditions, and other considerations.
20-5F-4(b)	The Chief may deny a permit if the facility may cause adverse impacts on environmental concerns.
20-5F-6	Enforcement Orders, civil and criminal penalties.
20-5G-5	The Director has authority to collect fees to administer the Hazardous Waste Emergency Response Fund, and expend the money in responding to hazardous waste emergencies when there is a significant risk of harm to human health, safety, or the environment from hazardous wastes, when no federal funds are immediately available for clean up or containment.

II. Department of Energy

A. Division of Mines and Minerals

20-5E-7(g) and (h)	The Department of Energy has responsibility for hazardous waste management and regulations in coal mining, reclamation, oil and gas wells, liquid injection wells, and waste disposal wells, provided such authority does not diminish or alter the authority and responsibility of the Chief of Water Resources or the Water Resources Board under § 20-5 and § 20-5A.

Code Section	Comment
22-3-4	The Abandoned Mine Land Reclamation Fund may be used to reclaim and restore land and water resources adversely affected by past coal mining, and for prevention, abatement, treatment, and control of water pollution caused by coal mining. "Water" and "water resources" are not defined in this article or 22A, but it can be reasonably presumed that the terms pertain to all waters, surface and ground.
22-3-9	The Commissioner has the authority to construct and operate facilities to control and treat water pollution resulting from mine drainage - the extent dependent on the ultimate use of the water.
22A-3-2(b)	One of the purposes of the West Virginia Surface Coal Mining and Reclamation Act is to protect the public and the environment from the adverse effects of surface mining.
22A-3-2(c)	The Commissioner has the authority to promulgate and enforce regulations.
22A-3-3(b)	"Affected area" means all land and water resources.
22A-3-3(y)	"Significant, imminent environmental harm to land, air, or water resources, means any condition or violations which could reasonably be expected to cause appreciable and not immediately repairable adverse impact on land, air, or water resources." "Water resources" is not further defined, but can be reasonably presumed to include ground water.
22A-3-9(a)(11)	Requires that all surface mining permit applications include a determination of the probable hydrologic consequences of the proposed surface mining and reclamation activities, on and off the mine site with respect to the hydrologic regime and the quantity and quality of surface and ground water, and collection of sufficient data so that the Commissioner can determine the cumulative impacts of all anticipated mining in the area on the hydrology and water availability.

Code Section	Comment
22A-3-9(a)(13)	Requires that all permit applications contain maps showing the location of subsurface water and its quality, the location of significant aquifers, and the estimated elevation of the water table.
22A-3-9a	When surface-mining of two acres or less, a permittee shall conduct operations so as to minimize disturbances to the prevailing hydrologic balance and to the quality and quantity of water in surface and ground water systems, during and after mining and during reclamation by: avoiding acid and toxic mine drainage, preventing suspended solids runoff, etc.
22A-3-10(a)(11)	Requires that each surface mine reclamation plan contain a detailed description of the measures to be taken during the mining and reclamation process, to assure the protection of the quality and quantity of surface and ground water systems, on and off the mine site, from the adverse effects of the mining. If adequate protection cannot be assured, then the plan must contain means as to how alternative sources of water will be provided to those persons whose water supply will be affected.
22A-3-10(a)(12)	Reclamation plan shall include information which details the location of subsurface water, and a chemical analysis of the mineral and overburden, including acid forming properties.
22A-3-12(b)	General environmental protection performance standards for surface mining:
22A-3-12(b)(2)	restore so as not to pose any actual or probable threat of water diminution or pollution.
22A-3-12(b)(3)	cover acid forming and toxic materials in a way to prevent water pollution.
22A-3-12(b)(4)	stabilize spoil piles to control water pollution.
22A-3-12(b)(9)	prevent adverse water quality impacts due to augering.

Code Section	Comment
22A-3-12(b)(10)	minimize disturbances to the prevailing hydrologic balance, on and off-site, and to the quantity and quality of surface and ground water, during and after mining and during reclamation by: avoiding acid and toxic mine drainage, preventing suspended solids runoff, and other means.
22A-3-12(b)(14)	bury and compact or dispose of debris, acid forming materials, and toxics, to prevent contamination of ground and surface water.
22A-3-12(b)(17)	ensure that access and haul roads are constructed and maintained so as to control or prevent pollution of water.
22A-3-14(b)	General environmental protection performance standards for surface effects of underground mining:
22A-3-14(b)(4)	disposal of wastes so as not to degrade surface or ground waters below water quality standards.
22A-3-14(b)(9)	minimize disturbances to the prevailing hydrologic balance, on and off-site, and to quality and quantity of water in surface and ground systems, during and after mining and during reclamation by: avoiding acid or other toxic mine drainage, preventing suspended solids runoff. Monitoring of water from underground workings is done in accordance with provisions of Clean Water Act of 1977.
22A-3-14(b)(10)	ensure that access and haul roads are constructed and maintained so as to control or prevent pollution of water.
22A-3-15(b)(2)	When a surface mining operation removes or disturbs strata that serve as aquifers which significantly ensure the hydrologic balance of water either on or off the mine site, the Director, under this section, shall require that monitoring sites be established so as to record information (i.e., level, amount and quality) concerning the ground water that could potentially be affected.

Code Section	Comment
22A-3-16(a)	Under this section, a reclamation inspector can require the immediate cessation of any part of, or the entire surface mine operation when the operation "is causing or can reasonably be expected to cause significant, imminent, environmental harm to land, air or water resources." (Defined in 22A-3-3(y) above)
22A-3-17	Enforcement proceedings - notice of violation, cessation orders, civil and criminal penalties, permit revocation, bond forfeiture.
22A-3-22	Areas may be designated unsuitable for all or certain types of surface mining if:
22A-3-22(a)(1)	reclamation is not technologically or economically feasible.
22A-3-22(a)(2)	operations affect renewable resource lands, including significant aquifers and aquifer recharge areas, in which operations could result in a substantial loss or reduction of long-range productivity of water supply.
22A-3-23(b)	Before performance bond is released, the Commissioner shall inspect and evaluate the reclamation to determine whether pollution of surface or subsurface water is occurring, the probability of continuance or future occurrence of such pollution, and the estimated cost of abatement.
22A-3-24	This section requires an operator to replace the water supply of an owner of real property whose water supply has been contaminated, diminished or interrupted by such surface mining.
22A-3-40	NPDES permit required, presently still administered by Division of Water Resources.
22A-4-7	In surface mining and reclamation of minerals other than coal, a reclamation and mining plan is required and must include measures to eliminate water pollution, and maps showing:
22A-4-7(h)	drainage plan
22A-4-7(i)	presence of acid-producing material in the overburden.

Code Section	Comment
22A-4-10	The Commissioner may delete areas in the permit application where acid water pollution cannot feasibly be prevented.
22A-4-13	Operator is required to:
22A-4-13(2)	bury acid-producing and toxic materials.
22A-4-13(3)	seal acid breakthroughs.
22A-4-13(4)	treat runoff waters to reduce pollution of streams and other waters.
22A-4-14	Inspectors may order immediate cessation for non-compliance or when public welfare or safety calls for it.
22A-4-16	Bonds shall not be released until all acid-producing spoil has been treated adequately.
22A-4-21	Non-compliance actions - cessation Orders, permit suspension, permit revocation, and bond forfeiture.

B. Division of Oil and Gas

22B-1-1	For oil and gas purposes, "waters" are defined the same as under 20-5A-2(e), to include all waters.
22B-1-3	Upon inspection, if an oil and gas inspector determines that there is an "imminent danger that a fresh water source or supply will be contaminated or lost," he shall order the facility to cease operations until the danger is abated.
22B-1-6(a)	A permit is required for any well work.
22B-1-6(d)	The Director of the Oil and Gas Division shall consult with the Director of the DNR to ascertain whether the well work will cause or contribute to a pollution problem. Also, an erosion and sediment plan is required with each permit application.
22B-1-7(a)	NPDES Water Pollution Control Permit also required; presently still administered by the Division of Water Resources.

Code Section	Comment
22B-1-11	The well permit shall not be issued, or it shall be conditioned if:
22B-1-11(4)	the proposed well work fails to protect fresh water sources or supplies.
22B-1-14	In applying for a permit to introduce liquids, wastes, or pollutants into wells:
22B-1-14(a)(7)	the operator shall show the location of all water-bearing horizons above and below the formation.
22B-1-14(c)	The Director of the Water Resources Division shall comment on
22B-1-16(b)	If the Chief of Water Resources determines that the proposed well will affect detrimentally the reasonable standards of purity and quality of waters of the state, the Chief shall object and/or suggest protective conditions.
22B-1-16(e)(2)	After a hearing on the subject, if the Director of the Oil and Gas Division determines that reasonable standards of purity and quality of such waters will be endangered, the permit will not be issued. ("Reasonable standards of purity and quality" not defined)
22B-1-19	All water-protecting strings of casing shall remain in place until the well is plugged or abandoned.
22B-1-21	Well operators shall permanently cement a string of casing through fresh-water strata; no oil or gas well shall be drilled nearer than 200 feet from an existing water well or dwelling without written consent of the owner.
22B-1-22	Well operators shall report fresh water encountered.
22B-1-25	Liquid injection shall be controlled so that no water-bearing strata shall be affected thereby.
22B-1-26	Performance bond required.

Code Section	Comment
22B-1-29	Special reclamation fund for reclaiming and plugging abandoned wells.
22B-1-30	Reclamation requirements - oil, saltwater, and debris pits shall be removed.
22B-1-35	Civil action for contamination or deprivation of freshwater source or supply; within 1,000 feet of a drilling site, there is a rebuttable presumption that such drilling or well was the proximate cause of deprivation or contamination.
22B-2-3(a)	Compensation to surface owners - the oil and gas developer shall pay the surface owner compensation for:
22B-2-3(a)(3)	any damage to a water supply.

III. Department of Health

16-1-7	This section discusses the ability of the State Board of Health to promulgate regulations. The section also discusses limitations on that ability. However, § 7 makes it clear that there are not limits as to the ability of the Health Department to restrict any development or subdivision whose construction might endanger sources of water. There is no definition of sources of water in § 16-1. It can be assumed though, that water includes both surface and ground.
16-1-9	Prohibits <u>any</u> person, etc., from installing or establishing <u>any</u> system or method of water supply, drainage, sewage disposal or solid waste disposal without first obtaining a written permit from the Director of the Department. Not only is a permit required, but the plans for such a system or method must be approved by the Director prior to construction. These requirements apply to everything from single home wells to the largest public water systems.

Code Section	Comment
	Performance bonds are now required for the construction and operation of sewage facilities serving three or more single-family residences, any privately owned multi-unit residence with more than two units, or any commercial enterprise. If a bond is forfeited to the state, the Department of Health is required to use the proceeds to remedy the problem. If the Director or his representative becomes aware of a situation where the above stated requirements have not been met, the Director can issue an Order requiring the owner or operator to do whatever is necessary to correct the condition. Also, failure to comply with this section makes the owner or operator subject to civil and criminal liability. The presence of sewage, excreta, or solid waste being disposed of in an unapproved manner is prima facie evidence of a condition endangering public health.
16-1-9(a)	Defines a public water system. Also requires the State Board of Health to promulgate maximum contaminant levels for public water systems. A source for a public water system may be surface or ground water. Violation of this section subjects the owner or operator to various civil and criminal penalties.
16-1-10(2)	Gives the Director the authority to enforce all the laws in the state concerning public health, and health generally.
16-1-10(15)	Authorizes the Director to enforce rules and regulations and make inspections with regard to sources of water supply.
16-9-2	Pursuant to this section, any person who knowingly or willfully throws, causes to be thrown, or releases dead animals or offensive substances into any well or other body of water is guilty of a misdemeanor.

Code Section	Comment
20-5E-7(d)	In consultation with the Director of the DNR, the State Board of Health and Department of Health shall promulgate rules and regulations establishing standards applicable to permitting, licensing, and operation of facilities that treat, store, or dispose of hazardous waste with infectious characteristics.

IV. Department of Agriculture

19-16B-2	Pesticides may cause injury to man or may cause unreasonable adverse effects on the environment if not properly used. "Environment" includes water, air, land, all plants, and man and other animals.
19-16B-4(a)	The Commissioner of Agriculture shall promulgate and enforce regulations on the application of pesticides.
19-16B-4(c)	The Commissioner may restrict the use or application of any pesticide if he determines it may cause "unreasonable adverse effects on the environment."
19-16B-20	No person shall transport, store, or dispose of any pesticide or pesticide containers in such a manner as to cause injury to humans. This could include contaminating a ground water supply.

V. Department of Highways

17-2A-8	Although specific reference to road salts and de-icing could not be located, the Commissioner does have broad powers of supervision over the state road program, including maintenance, and the authority to set standards.
17-23-1	The legislative policy behind regulating salvage yards does not mention protecting waters or ground water, but only "the safety and recreational value of public travel" and preserving "natural beauty."
17-23-2	The term "salvage yard" includes garbage dumps and sanitary fills.

Code Section	Comment
17-24-2	The legislative policy behind regulating junked and abandoned vehicles does include considerations of public health, safety, and general welfare, public nuisances, and hazards.
17-24-6	The Department of Highways administers funds for abating the problems of junked and abandoned property and promulgates rules and regulations on the subject.
17-24-7 and 9	The enforcement agency has authority to take possession and dispose of abandoned and junked property.
17-24-10	Proceeds from the sale of any such property are to be used for other abatement efforts.
20-5E-7(a) and (c)	In consultation with the Director of the DNR, the Department of Highways shall promulgate rules and regulations governing the transportation of hazardous wastes by vehicle upon roads and highways, interstate and intrastate in scope, consistent with applicable rules and regulations of the Federal Department of Transportation, as necessary to protect public health, safety, and the environment.

VI. Public Service Commission

20-5E-7(b) and (c)	In consultation with the Director of the DNR, the PSC shall promulgate rules and regulations governing the transportation of hazardous wastes by railroad, interstate and intrastate, and consistent with federal rules and regulations, as necessary to protect public health, safety, and the environment.

VII. Air Pollution Control Commission

20-5E-7(f)	In consultation with the Director of the DNR, APPC shall promulgate rules and regulations establishing air pollution performance standards, and permit requirements and procedures. (Airborne pollutants can impact ground water quality.)

VIII. Common Law Rules in West Virginia on Ground Water

In West Virginia, subsurface waters which merely percolate, ooze, or filter through the soil and which do not flow in any permanent, district, or definite channel belong to the owner of the soil; the owner is generally limited to "reasonable use" of such subsurface waters. However, subterranean waters can be subject to riparian rights when they flow in defined or known channels ("defined" means a contracted or bound channel), although the course may be unascertained by human knowledge ("known" means knowledge, by reasonable inference, from existing and observed facts of the natural or preexisting condition of the surface). In West Virginia, all subterranean waters are presumed to be percolating waters until it is shown that they exist in a well-defined or known channel.

"Reasonable use" criteria are not established; the definition of what is reasonable use varies from case to case and encompasses both quantity and quality considerations. For example, the owner of land who explores for and produces subterranean percolating water within the boundary of his land is limited to a reasonable and beneficial use of such water, when to otherwise use it would deplete the water supply of a valuable natural spring of another on adjoining or neighboring land, and thereby materially injure or destroy such spring. Pence v. Carney, 58 W.Va. 296, 52 S.E. 702 (1905). Any injury that may result by interference with the natural flow of water which is incidental to a lawful and proper use of the property is damnum absque injuria. Henderson v. West Virginia Dept. of Highways, 9 W.Va. Ct.Cl. 182 (1972). To allow filthy water to percolate through the soil so as to injure the cellar and well of any adjoining property owner is an actionable injury. Weaver Mercantile Co. v. Thurmond, 68 W.Va. 530, 70 S.E. 126 (1911).

IX. Safe Drinking Water Act Amendments of 1986 - Wellhead Protection Areas

Section 205 of the amendments, effective June 19, 1986, contains provisions which require the state to establish wellhead protection areas. Section 1428 of the Act as amended now requires the state to adopt and submit its plan to the EPA Administrator within three years of the date of enactment of the amendments (by June 1989), detailing its program "to protect wellhead areas from contaminants which may have any adverse effect on the health of persons." Each state shall then make every reasonable effort to implement such protection program within two years of submitting its program to the EPA Administrator.

Wellhead protection area is defined as "the surface and subsurface area surrounding a water well or wellfield, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield. The extent of a wellhead protection area...necessary to provide protection from contaminants which may have any adverse effect on the health of persons is to be determined by the state in the program submitted." By June 1986, the EPA Administrator shall issue technical guidance to help the states in making such determinations.

The minimum requirements of each state program are outlined in the amendments and include:

1) the specific duties of state and local entities and public water supply systems under the program;

2) determination of the wellhead protection areas;

3) identification of all potential anthropogenic sources of contaminants, within each wellhead protection area, which may adversely affect human health;

4) description of program to protect the water supply within wellhead protection areas from such contaminants;

5) development of contingency plans to provide alternative drinking water supplies for each public water system in the event of contamination.

6) consideration of all potential sources of such contaminants within the wellhead area of new water wells serving a public water supply.

SDWA Amendments of 1986 - Other Provisions

Section 106 — Monitoring for unregulated contaminants; this amends Section 1445(a) of the SDWA to require every public water system to conduct a monitoring program for unregulated contaminants. States may show cause to add or delete contaminants from the list designated by the Administrator.

Section 201	Restrictions on underground injection of hazardous waste; this amends Section 1426 to require states to determine the applicability of revised monitoring methods, including ground water monitoring, to provide the earliest possible detection of fluid migration into or toward underground sources of drinking water from Class I injection wells, based on its assessment of the potential for migration from the injection zone that may be harmful to human health or the environment.
Section 203	Sole source aquifer demonstration program; this adds a new Section 1427 allowing any state or local planning entity that identifies a critical aquifer protection area within its jurisdiction to apply to the EPA Administrator for selection of such area for a demonstration program.

X. General Zoning and Land Use Planning Authorities

Local planning commissions have the authority to develop comprehensive plans and zoning ordinances, with the objective of improving health, safety, convenience, and welfare of citizens (§ 8-24-1 and § 8-24-39), and giving due consideration to such factors as water supply and sanitation requirements (§ 8-24-16). Comprehensive regional and statewide plans are authorized under § 8-25-1 et seq., and should address environmental protection and public services and facilities needs, among others.

The Chief of the Water Resources Division of the DNR has the authority to investigate and study problems relating to the water resources of the state and shal "make and formulate comprehensive plans and recommendations for the further development, improvement, protection, preservation, regulation and use of such water resources" (§ 20-5-5). Under § 20-5A-3, the Chief has the authority to study water problems and make recommendations, and "develop programs for the control and reduction of the pollution of the waters of the state." These broad powers seem to encompass general land use and zoning considerations.

Under § 16-1-7, the State Health Department has the authority to restrict any subdivision or development which might endanger the public health, sanitary condition of streams, or sources of water supply; this is certainly a potentially broad power of land use control.

Under § 22A-3-9(a)(11) and § 22A-3-18(b)(3), the Commissioner of the Department of Energy must make an assessment of the probable cumulative impacts of all

anticipated mining in the area on the hydrologic balance, and no permit may be approved unless the proposed operation has been designed to prevent material damage to the hydrologic balance. Under § 22A-3-22, the Commissioner can designate specific areas unsuitable for surface mining. Both of these statutes involve land use and zoning considerations. Section 22B-1-21 provides a zone of protection around water wells and dwellings by prohibiting the drilling of an oil or gas well nearer than 200 feet from a water well or dwelling without the written consent of the owner.

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Appendix III

GROUND WATER PROGRAMS AND ACTIVITIES ASSESSMENT

Revised, June 1987

TABLE OF CONTENTS

ACKNOWLEDGEMENT

This assessment of existing West Virginia programs related to ground water protection is the result of a cooperative effort of the following state and federal agencies:

WV Department of Natural Resources*
WV Water Resources Board
WV Department of Health*
WV Department of Energy*
WV Department of Agriculture*
WV Department of Highways*
WV Geological and Economic Survey
West Virginia University
WV Soil Conservation Committee
WV Office of Emergency Services
U.S. Environmental Protection Agency
U.S. Soil Conservation Service
U.S. Geological Survey
U.S. Department of Transportation
County Health Departments

*Agencies signatory to the Memorandum of Agreement.

Staff members of these agencies provided the information used in this assessment, reviewed early drafts and provided

valuable suggestions. Without their participation, this report could not have been written.

Special appreciation goes to William Berryhill, who compiled the information and prepared the original text for this report. Also, it is appropriate to recognize the following individuals: Leslie Chincheck, for her work on the graphics; Teresa Bostic and Sherry Smith for typing the report; and Maureen Salamat for editing the report.

I. INTRODUCTION

This document represents a step in the development of a comprehensive ground water protection strategy for West Virginia. In it, an attempt has been made to present the status of ground water protection, with consideration given to potential sources of ground water contamination as well as to regulatory programs.

The present assessment has been limited to discussions of programs in the West Virginia Departments of Natural Resources, Health, Agriculture, Energy, and Highways, and the State Water Resources Board. Also included are brief descriptions of activities in the Public Service Commission, county Departments of Health, West Virginia University, the West Virginia Geological and Economic Survey, U.S. Geological Survey, and the federal Soil Conservation Service, Environmental Protection Agency, and Department of Transportation.

A number of sources of ground water contamination became apparent from reviews conducted in preparation for this report. In addition, several program needs also became apparent. These are not entirely definitive but are included mainly as guides for the preparation of a dynamic ground water protection strategy.

The laws of West Virginia are generally considered adequate to protect the ground water resource. However, in some instances this authority is not implemented through regulatory programs, or where regulatory programs exist, ground

water protection needs to be improved through a comprehensive approach, increased knowledge of the resources, better enforcement or increased funding.

In West Virginia, an effective ground water protection program needs a widespread public awareness of the importance of the ground water resource. A carefully designed public information and education program is essential, since many people across the state, including those in positions of leadership and responsibility, are often unaware of the importance of protecting ground water. Through an increased awareness, the state's comprehensive ground water protection strategy is more likely to succeed.

II. PROGRAMS/ACTIVITIES IN WEST VIRGINIA RELATED TO GROUND WATER PROTECTION

In West Virginia, activities concerned with ground water protection such as regulatory programs, information and education, and research are carried out by a large number of federal, state, and local agencies and institutions. Activity coordination is limited in extent and is commonly conducted on an informal basis.

As a result, on April 3, 1986 the West Virginia Departments of Agriculture, Energy, Health, Highways and Natural Resources signed a Memorandum of Agreement to develop a comprehensive ground water protection program for the state.

Information in this document is summarized in Table 1, which shows the relationship between agencies and institutions with ground water concerns, and sources of ground water contamination.

TABLE 1 – GROUND WATER CONCERNS IN W.Va.

	DNR	WRB	DH	DOE	DOA	DOH	WVGES	WVU	PSC	OES	EPA	SCS	USGS	DOT	CHD	?	
Solid Waste Landfills	●		●	●							●				●		
Open Dumps, etc.	●		●	●							●				●	●	
Hazardous Waste TSD	●										●				●		
Industrial Waste Mgmt.	●										●				●		
Injection Wells	●			●							●						
g.w. Strategy	●	●	●	●	●	●					●						
g.w. Data Management	●	●	●	●	●	●	●	●			●		●				
Municipal Waste Water Treatment	●	●	●								●				●		
On - Site Septic Systems, new			●								●				●		
On - Site Septic Systems, old			●								●				●	●	
g.w. Research							●	●			●		●				
Water Well Complaints	●		●	●	●	●		●		●	●				●	●	
g.w. Monitoring & Testing	●		●	●							●		●		●		
g.w. Standards	●	●	●	●	●	●					●						
g.w. Classification	●	●	●	●	●	●					●						
g.w. Regulations, Promulgation	●	●	●	●	●	●					●						
g.w. Regulations, Appeals	●	●	●	●	●												
Public Drinking Water Systems			●						●	●	●				●		
Private Water Wells, new			●								●				●		
Private Water Wells, old			●								●				●	●	
Porta - Potty Services			●								●				●	●	
Sink Holes	●										●				●	●	
Public Information & Education	●		●		●		●	●			●	●	●		●		
Construction Wastes	●		●								●				●	●	
Coal Mines & Wastes	●			●			●				●					●	
Oil & Gas Wells and Wastes	●			●							●					●	
Above/Below Ground Storage Tanks	●			●							●				●	●	
Agriculture	●				●			●			●	●			●		
Soils					●			●			●	●					
Pesticides					●			●			●				●		
Highway Drainage	●					●					●				●		
De-icing (road) Salt	●					●					●						
Transportation	●		●			●			●	●	●			●	●	●	
Funding											●						
Human Error	●		●	●	●	●		●	●	●	●			●	●	●	
Accidental Spills	●		●			●			●	●	●			●	●	●	

NOTE

Abbreviations are as follows:

DNR	WV Department of Natural Resources
WRB	WV Water Resources Board
DH	WV Department of Health
DOE	WV Department of Energy
DOA	WV Department of Agriculture
DOH	WV Department of Highways
WVGES	WV Geological and Economic Survey
WVU	West Virginia University
PSC	WV Public Service Commission
OES	WV Office of Emergency Services
EPA	U.S. Environmental Protection Agency
SCS	U.S. Soil Conservation Service
USGS	U.S. Geological Survey
DOT	U.S. Department of Transportation
CHD	County Health Departments
?	No Authority, inadequate authority, or unknown
g.w.	Ground Water
TSD	Treatment, Storage, and Disposal

II-A. DEPARTMENT OF NATURAL RESOURCES

The Division of Water Resources of the West Virginia Department of Natural Resources (DNR) carries out many of the ground water-related regulatory programs in the state. These programs, descriptions of which follow, are conducted in the Permits Branch and the Planning Branch. Other Division activities with ground water concerns include Field Operations, Laboratories, Ground Water/Underground Injection Control and Monitoring, as well as the Departmental Public Information Office. Unless otherwise noted, the primary legal authority for all DNR ground water protection activities is the Water Pollution Control Act, Chapter 20-5A of the West Virginia Code.

The Department of Natural Resources' Division of Waste Management also plays a role in the protection of ground water. Following are descriptions of the duties and legal authority of both Divisions.

DIVISION OF WATER RESOURCES

Ground Water and Underground Injection Control Office

The Underground Injection Control (UIC) program regulates the subsurface placement of fluids under Series IX of the Water Resources Board Regulations. The Department of Natural Resources has been designated the lead agency for the Underground Injection Control program. The Department of Energy has the responsibility for regulating Class II well activity in cooperation with the Department of Natural Resources. Wells used for underground injection are classified according to the type of fluid being injected, as follows:

Class I wells are used to inject hazardous, municipal, and industrial wastes beneath the lowest known underground source of drinking water.

Class II wells are used to inject brine for the enhanced recovery of oil or gas, for the disposal of produced fluids (mostly brine) in connection with oil or gas production, or for the storage of liquified hydrocarbons.

Class III wells are used for injecting water or other suitable solvent for the extraction of minerals (solution mining).

Class IV wells are used for the disposal of hazardous (including nuclear) wastes into or above underground drinking water sources. Class IV wells are currently prohibited in West Virginia.

Class V wells are all those which do not fall into Classes I through IV. Examples include ground water recharge wells, and abandoned deep mines into which coal slurry is deposited.

There are no known Class I or Class IV wells in the state. In the Class II category, there are 85 brine disposal wells and about 700 wells for enhanced recovery. The two known Class III facilities, which include 15 wells presently in use, have a low potential for ground water contamination since they inject into relatively non-leaking formations. More likely sources of pollution at this time, besides Class II wells, are certain types of Class V wells, such as dry holes receiving sewage, and percolation holes drilled for disposal of highway runoff into karst formations. A recently completed assessment of Class V wells indicates that there are 83 plus wells of this class in West Virginia.

Since the Underground Injection Control program regulates any material that may be deposited or injected into the earth, it, therefore, shares a concern for the same type of pollutants that are regulated by the hazardous waste management program and the solid waste management program.

Control is exercised in the UIC program through permits for the construction and operation of injection wells. Permit requirements of owners or operators include annulus monitoring and periodic pressure testing in order to detect leakage of injected fluids into the ground water. In addition, performance standards call for fresh-water protective casing, definition of injection zones, and a limit to the maximum

allowable injection pressure. They also prescribe abandonment procedures. These requirements are presently considered adequate for the detection and prevention of ground water pollution. Each well is evaluated individually and specific requirements, e.g. for ground water monitoring, are imposed where they are deemed necessary.

Underground Injection Control staff make site visits to perform inspections and to update the injection well inventory. In addition, they cooperate with the Departments of Health and Energy in investigating water well complaints which may be injection-related.

Opportunities for improvement include the need to determine the status of all injection wells in the state. There may be a few wells unknown to the Underground Injection Control program and, therefore, unregulated.

Permits Branch

Municipal Permits Section

The Municipal Permits Section issues West Virginia National Pollutant Discharge Elimination System (WV/NPDES) permits for publicly-owned treatment works (POTWs) and privately-owned sewage treatment systems. These permits are issued in accordance with Chapter 20-5A-5 of the Code of West Virginia. Permits for proposed systems are issued in cooperation with the West Virginia Department of Health, which issues Certificates of Approval. These Certificates are for the construction phase only.

The impact on ground water from the 300 or so affected facilities is minor. Disposal of sludge from POTWS, however, occasionally presents problems. Sludge management will be addressed in new solid waste rules.

Industrial Permits Section

The Industrial Permits Section issues and enforces WV/NPDES permits for more than 20 industrial source categories, including the following: steam electric, petroleum refining, iron and steel, aluminum forming, non-ferrous metals manufacturing, organic and inorganic chemicals, printing and publishing, and textile mills. In addition, the Section issues State Water Pollution Control permits for industrial landfills and spray irrigation systems.

With respect to ground water pollution, the Section is concerned with the treatment and disposal of non-hazardous (but potentially toxic) industrial wastes and "other wastes" by landfilling, land application, and spray irrigation. It also regulates potential or actual discharges from industrial waste impoundments. Materials controlled include anything that could leach or leak into ground water from the facilities and activities listed above. Industrial wastes and other wastes are specifically defined in Chapter 20-5A-2(h) and (j) of the Water Pollution Control Act.

Regulation is exercised by requiring the installation of ground water monitoring wells along with the maintenance of a quarterly and annual monitoring program, by conducting field inspections and taking samples, and by issuing Administrative Orders or taking civil action to stop pollution or to take necessary corrective and remedial actions. Specific requirements under the permits and Orders, besides monitoring, include liners, appropriate cover material, surface water diversion, and any other means to prevent or mitigate ground water pollution.

One need of the industrial waste program is for the services of a well-equipped, well-trained ground water monitoring team to do compliance sampling.

Planning Branch

A state ground water protection strategy, as authorized by Section 106 of the Federal Clean Water Act, is being developed in the Planning Branch. This document has been prepared in support of the ground water protection strategy, which has the following goals:

1. Creation of a coordinated interagency ground water management plan through assessment of existing programs, elimination of overlapping responsibilities, initiation of programs now lacking, and resolution of institutional obstacles.

2. Generation of a ground water data management system, which will be a uniform repository of information now maintained in different formats by different agencies.

3. Promotion of a public information and education program, to stimulate public awareness of the importance of ground water. Workshops; media events such as television presentations, news releases, slide shows, and lecturers; and educational materials are being planned.

As the state's ground water protection activities progress, the strategy will be updated to reflect new ground water protection objectives.

Field Operations Branch

This Branch oversees the activities of 33 water resource inspectors around the state whose activities include:

-conducting compliance evaluation inspections and performing other routine duties.
-responding to reports of accidents and spills.
-investigating surface and ground water complaints.

Reports and other information from inspectors in the field are directed to the appropriate Branches in the Division. Field Operations inspectors collaborate with county sanitarians as well as field representatives of other DNR Branches, the Department of Health and the Department of Energy.

To be more effective in the protection of ground water, the Field Operations Branch has the following needs:

1. In general, the present emphasis of the Branch, with regard to personnel selection, training and daily activities, is oriented to surface water. Therefore, basic ground water training would be of benefit.

2. Current ground water contamination incident reporting procedure, both within the Branch and between agencies (i.e. Department of Natural Resources, Department of Health and Department of Energy), does not provide a

clear picture of the number of incidents, areas of ground water affected, causes of contamination, etc. As a result, a ground water contamination incident reporting procedure should be developed cooperatively between the agencies to ensure consolidation of information.

3. Current manpower resources are not sufficient for the existing workload. Additional staffing will be needed for ground water involvement.

Monitoring Branch

The Monitoring Branch is divided into the Compliance Section and the Biological Section. Compliance inspectors collect water samples from various facilities, including those with ground water monitoring wells. Biologists conduct aquatic surveys and perform fish tissue analysis and toxicity testing.

The Monitoring Branch circumstances are very similar to those of the Field Operations Branch, i.e. present emphasis is primarily on surface water. Accordingly, their needs are:

1. Basic ground water training.
2. Ground water monitoring equipment, methods and procedures.

Laboratories Branch

The Laboratories Branch analyzes samples submitted by Field Operations, Monitoring and others. It is reasonable to expect that analysis of some ground water samples may exceed current capability. Therefore, a determination must be made of equipment, methods, procedures, etc. necessary to test ground water samples. Additionally, the current workload exceeds staffing. More laboratory personnel will be needed to handle workloads resulting from increased ground water sampling.

Public Information Office

The Public Information Office is responsible for disseminating departmental information (including information concerning ground water) to the general public. The Public Information Office has a major part in ground water protection, since it is responsible for one of the three tasks in the program's development. Ground water activities include:

1. Publicizing open meetings and seminars on ground water issues.
2. Giving talks on ground water protection to school children and other groups.
3. Preparing news releases, especially on government activities affecting ground water.
4. Publishing newsletters and short pamphlets.
5. Preparing educational materials, such as slide shows.
6. Providing photographs, graphic and editing services.

DIVISION OF WASTE MANAGEMENT

Hazardous Waste Management Section

This Section regulates the generation and the storage, treatment, and disposal of hazardous wastes in surface impoundments, landfills, waste piles, tanks, containers, and incinerators.

Legal authority for the Section's activities is the West Virginia Hazardous Waste Management Act, Chapter 20, Article 5E. This act and subsequent regulations is based on the Federal Resource Conservation and Recovery Act (RCRA), Subtitle C. The regulatory program is guided by a "cradle to grave" philosophy for the management of hazardous waste to protect human health and the environment. This program incorporates an anti-degradation ground water policy (regulations of the Water Resources Board, Series I, Section 4) which prohibits significant increases in contaminant levels above existing or background levels. Hazardous wastes and hazardous waste constituents listed in Section 3 and Appendix VIII of the West Virginia Department of Natural Resources Hazardous Waste Managment Regulations are regulated.

In July 1987, records revealed that there are 128 hazardous waste generators in West Virginia. Thirty (30) of these facilities are also classified as Treatment, Storage, and Disposal (TSD) facilities, nine (9) of which are operating land disposal facilities required to have extensive ground water monitoring programs. Initially, there were 53 operating TSD

facilities, 26 of which were for land disposal. Of these, 14 have been shown to have ground water contamination from hazardous waste regulated units. Several others have been shown to have ground water contamination from other sources. Because of various federal and state regulatory requirements, 23 TSD facilities have closed or are going through closure and are no longer operating. Land disposal facilities which are closed or are closing, and cannot meet the demonstration for clean closure, will be required to have a post-closure permit and continuous ground water monitoring for 30 years.

For those facilities still operating, the hazardous waste managment permitting program imposes stringent requirements for all TSD activities. The permit specifies the details of liners, leachate detection systems, number and location of monitoring wells and other specific construction and operating requirements necessary to protect human health and the environment. Performance requirements in the permit may prescribe such things as inspections, monitoring plans, waste storage and handling practices, quality assurance plans, emergency response capabilities, and corrective-action measures to be taken upon detection of releases of hazardous waste, or upon detection of ground water contamination from the release of hazardous waste.

There is room for improvement in the following areas:

1. Need for better coordination between the Department of Natural Resources and the Department of Health when

hazardous wastes are detected in underground drinking water sources. The result could be a more timely and coordinated problem resolution on incidents of this type.

2. Need for more emphasis on the reduction of the volume of generated hazardous wastes (waste minimization).

3. Need for a stronger enforcement posture for all releases of hazardous waste and a uniform corrective action program.

Solid Waste Section

The solid waste management program administered by the Solid Waste Section, regulates non-hazardous waste landfills which receive such materials as domestic garbage and trash, construction waste, land-applied sludge and other non-hazardous waste.

There are about 65 permitted solid waste landfills, including permitted municipal facilities both operating and closed. A significant increase in the number of these facilities is expected within a few years. A very serious problem is the existence of more than 2,000 unpermitted open dumps, and countless thousands of roadside or "promiscuous" dumps.

The solid waste management program depends on the Solid Waste Management Act, Chapter 20-5F of the code, for its legal authority. General provisions are also found in Chapter 20-5A. Under this authority, the Section published in November 1984 a two-part set of Instructions to Applicants for Solid Waste Facility Permit for Sanitary Landfills. The solid waste management program is presently being reviewed and strengthened. The Department is now drafting new regulations.

Concerns include leachate from garbage and sludge, and other conventional and nonconventional pollutants that are occasionally present in landfills and dumps.

Some of the permit requirements are specific performance standards (such as requirements for earth cover, equipment

maintenance, and record-keeping); however, at this time, most of the controls are general.

Program needs include the following:

1. Higher level of funding and other resources to effectively implement existing authorities and program requirements.

2. Regulations on remedial requirements at sites where ground water contamination is present, and regulations to set design standards in order to minimize ground water contamination from landfills and land application sites.

3. More attention given to cleaning up unpermitted open dumps and roadside trash piles. This activity should be coordinated with the new anti-litter efforts and legislation.

Underground Storage Tank Program

This program is responsible for receiving notification forms from owners and operators of underground storage tanks in West Virginia, and for compiling an inventory of notifiers. State regulations to prevent and deal with leaking underground storage tanks and piping are needed and will be developed in the future.

Small Quantity Generator Assistance Program

There are an estimated 5,000 small quantity generators of hazardous waste in West Virginia. A small quantity generator is defined as any business or facility that generates less than 2,200 pounds of hazardous waste per month. Examples include dry cleaners, printers, auto body shops, photographic developers, wood preservers and refinishers, and gasoline stations. The Small Quantity Generator Assistance Program provides technical and practical assistance to small businesses affected by hazardous waste legislation. There is a need for continued and widespread education of affected businesses which may fall into the small quantity generator category.

II-B STATE WATER RESOURCES BOARD

The State Water Resources Board (WRB) is an independent agency of state government. In accordance with Chapters 20-5A and 29A-1-1, et seq., it is responsible for promulgating regulations to protect "the waters of the state" (which includes ground water). Regulations that the Board writes include standards of quality for the waters of the state (surface water standards were published in Series I of the WRB regulations), and rules to facilitate the state's participation in the National Pollutant Discharge Elimination System (NPDES) under the federal Water Pollution Control Act. Solid and hazardous waste regulations, however, are promulgated by the Director of the Department of Natural Resources, not the Water Resources Board. The Water Resources Board has the authority to establish a ground water resource management framework, and associated standards and regulations.

The Board also functions as an appellate body to rule on appeals of Orders and other actions of the Chief of the Division of Water Resources. The Water Resources Board recently ruled that the Division of Water Resources did not have the authority to require ground water monitoring under the federal/state combined NPDES permit program. This is a serious setback to the Division's authority to identify, control and correct ground water pollution.

Chapter 20, Article 5A, Section 1 of the West Virginia Code sets forth the policy to be followed in protecting the

waters of the state, which includes both surface and ground waters. For surface water, this policy is implemented through a resource management framework consisting of a classification scheme, standards (both numerical and narrative) and regulations. There is, however, no similar management framework for implementing this policy for ground water. Therefore, there is a need to develop and implement a resource management framework for ground water.

II-C DEPARTMENT OF HEALTH

The West Virginia Department of Health is responsible for protecting sources of drinking water, and ensuring the proper treatment and safe disposal of water-borne human wastes. The legal authority for these responsibilities is Chapter 16-1 of the West Virginia Code.

There is a distinction in the jurisdiction over water between the Department of Health and the Department of Natural Resources. The Department of Natural Resources is concerned with preventing pollution to the waters of the state. The Department of Health is concerned with protecting and providing safe drinking water for the public, as well as other environmental and human health concerns. With respect to ground water, the Department of Health carries out its responsibilities mainly through two Divisions, whose duties are described below.

ENVIRONMENTAL ENGINEERING DIVISION

This Division regulates all drinking water wells, public and private, regardless of size. Its activities include the following:

1. Promulgation of regulations and design standards for public and private water wells and public water well systems.
2. Enforcement of drinking water regulations and standards on all 2,400 public water supply systems,

which includes about 2,000 ground water supplies. A public water supply system is defined as a system which has 15 service connections or serves at least 25 persons per day for 60 days or more each year.

3. Issuance of permits (construction and operation) for public water supply systems. Approximately 120 construction permits per year are issued to public water supplies. Of these permits, over 50% are related to ground water systems. The Department maintains a large file of public water supply data, which is constantly being updated. Permits are also issued for sewage system construction for those systems not covered by the Construction Grants Branch of the Department of Natural Resources. Over 140 permits of this nature are granted each year. Local health department sanitarians issue over 5,000 septic tank construction permits every year.

4. Assurance of proper operation of public water supply systems by training and certifying operators.

5. Certification of water well drillers. Training by the staff is available prior to examination of water well drillers. Over 430 drillers are currently certified to drill water wells in West Virginia. A Water Well Advisory Board has been established to provide guidance on issues relating to the drillers certification program and water well regulations and standards.

6. Collection and management of data from water well applications, logs, permits, and well completion reports from the approximately 6,000 water wells drilled each year. Since new water well regulations were promulgated, a detailed file has accrued on all water wells drilled in the state since September 1984.
7. Collaboration and consultation with county health departments in private water well-related matters.
8. Technical assistance to county health departments, consulting engineers, cities, public service districts, industries (coal mining in particular), individuals, and school systems. This assistance and advice may cover the following topics: site selection, treatment processes, chemical and microbiological sampling, testing, sources of funding, operator training, and problem resolution. The staff depends heavily on analysis conducted by the three Department of Health laboratories (State Hygienic, Environmental Health Services, and Industrial Hygiene Laboratories) to provide information necessary to verify and resolve problems. the State Hygiene Laboratory analyzes approximately 16,250 microbiological samples for ground water yearly; the Industrial Hygiene Laboratory conducts approximately 90 radiological tests; and the Environmental Health Services Laboratory checks over 36,000 chemical

parameters on approximately 1,800 samples of ground water yearly.

PUBLIC HEALTH SANITATION DIVISION

The Public Health Sanitation Division is responsible for the approval of all on-site septic systems and the certification of installers. It also provides assistance in emergency and disaster conditions.

The Department of Health is concerned about a number of threats to underground drinking water sources. They include the following:

-Polyacrilamides used in processing operations (exclusive of drinking water).

-Destruction or alteration of water supplies by surface and deep mines, and by oil and gas wells.

-Well head and well field protection.

-Percolation holes in the eastern panhandle used for highway drainage.

-Pollution from construction.

-Hazardous and solid waste disposal sites.

-Chemical spills, like one that occurred in a well field near Point Pleasant in 1977.

-Volatile organic chemical (VOC) contamination.

-Effluent from sewage systems.

-Pesticide contamination.

-Inorganic chemical contamination.

-Leaking underground storage tanks.

-Salinity.

-Sanitation problems in deep mines.

-Radiological contamination.

Bacteriological, chemical, and radiological analyses of drinking water are done by Department of Health laboratories. For private wells, the services are available on request. For public supplies, testing is done before a permit is issued, and also as part of the regular inspections. The Department uses the National Interim Primary Drinking Water Regulations, incorporated into the WV Public Drinking Water Regulations, as the standard for chemical contaminants. The U.S. EPA has set maximum contaminant levels (MCLs) for 17 primary chemical contaminants that are linked to health effects, and soon it will establish MCLs for an additional 83. The Department cooperates with other agencies, especially the Department of Natural Resources, in matters affecting drinking water supplies. To enforce its regulations, the Department of Health has the power to issue Administrative Orders, conduct hearings, and take action through the court system.

Program deficiencies and needs that have been expressed include the following:

1. Increased legal services. The entire Department of Health has half-time access to one attorney in the Attorney General's Office.

2. Additional funding. Resources available are barely adequate for existing programs.

3. Stronger enforcement provisions.

II-D. DEPARTMENT OF ENERGY

The Department of Energy (DOE) was organized in the summer of 1985, primarily for the purpose of streamlining the regulation and permitting of the coal and petroleum industries in West Virginia. It was created from the old Department of Mines and the Reclamation Division of the Department of Natural Resources.

New statutes were written to define the structure, authorities, responsibilities, and other activities of the new Department. Old laws referring to disbanded agencies were changed and incorporated into the new laws; however, environmental considerations were retained. A new Chapter 22 describes the Department of Energy; Chapter 22A concerns mining (mainly coal); and Chapter 22B is involved with oil and gas. The Department is divided into two Divisions. They are Mining and Minerals, and Oil and Gas.

DIVISION OF MINING AND MINERALS

Mining activities are the major concern of this Division. According to a 1986 report, there were the following number of permitted mines in the state:

Type	Number Active	Number Inactive
Underground Coal	388	398
Surface Coal	381	245
Non-Fuel Mines and Quarries	88	26

There are thousands of abandoned mines, some of which are used as water sources. Others are used as dumps.

Surface and deep mine operators are now required to take steps to prevent or minimize ground (as well as surface) water contamination, and to prevent changes in the level or quantity of ground water available both on and off the mine site. Land subsidence must also be controlled. The DOE can require mine operators to restore or replace the water supply of a property owner which has been adversely affected by mining activity. Permitting requirements for mines also provide for ground water monitoring. DOE enforcement powers include the right to issue cessation Orders (for instance, when an operation causes or may cause "imminent or significant" harm to water resources), revoke permits, and impose civil and criminal penalties for violations. Citations for violations of DOE regulations are issued on an almost daily basis. Most of these are for safety violations; few are for causing water pollution.

Ground water problems with which the Division is concerned include aquifer depletion, acid drainage, coal mining refuse, and specific pollutants covered under state water quality standards and NPDES permit requirements. These are sulfates, acids, iron, manganese, and suspended solids. Acid mine drainage is mainly a problem in the northern coal fields. In the south, the major pollutants of concern are iron, manganese, and suspended solids.

The Division cooperates with federal and other state agencies concerned with mining issues, environmental protection, safety, wildlife, and preservation of cultural and scenic resources.

DIVISION OF OIL AND GAS

The Division of Oil and Gas regulates oil and gas production wells and, in cooperation with the Department of Natural Resources, Class II injection wells used for enhanced recovery of oil and gas and for disposal of produced fluids (brine). Section 22B-1 contains requirements for ground water protection. Enforcement powers are similar to those retained by the Division of Mining and Minerals, except that they apply to oil and gas well operators. There are about 50,000 operating oil and gas wells in the state. It is estimated that another 20,000 abandoned wells exist, for which there are no records.

In order to obtain a permit, a well operator must install protective casing to keep oil, gas, surface water, and salt water from contaminating fresh water aquifers. Special protective procedures must also be observed in enhanced recovery operations, and in the abandonment of non-producing wells. Ground water monitoring may also be required.

The Division of Oil and Gas believes that locating abandoned oil and gas wells is the number one priority relative to the protection of ground water.

In conclusion, the Department of Energy's ground water concerns and protection needs are listed below:

1. A greater emphasis for protecting ground water is needed by the Department when issuing permits for the production of coal, oil, and gas.

2. Need for a public ground water education program.

3. Need for increased knowledge of technology to remedy ground water damage.

4. Need for improved information and knowledge of ground water flow and the extent of aquifers.

5. Need for a consolidated ground water data management system.

6. Need for more ground water hydrologists.

7. An assessment of the state's abandoned oil and gas wells needs to be completed to determine their location, effect on ground water and method of clean-up.

II-E. DEPARTMENT OF AGRICULTURE

Pollution from nonpoint sources and agricultural chemicals are the primary concerns of the State Soil Conservation Committee (SCC) and the Plant Pest Control Division, respectively, of the West Virginia Department of Agriculture. The Department cooperates with the Soil Conservation Service (SCS) of the U.S. Department of Agriculture, as well as the West Virginia Department of Natural Resources, and other state agencies. It maintains close contacts with farmers across the state through many programs, of which the following are examples:

1. Information services such as the Market Bulletin, a twice-monthly publication; radio and TV programs; news releases; and other information sources.
2. Advisory services which provide assistance with farm ponds, erosion control, and other matters.
3. Animal and plant health services, including advice and regulation of pesticides.

Ground water concerns include wastes from milk houses; vehicle and equipment wastes such as used lubricants and antifreeze; dead animal and plant material; above- and below-ground storage tanks, especially those used for bulk pesticides; and fertilizer use and storage. Animal waste (manure from barns and feed lots) is a special concern. In

karst areas, concrete-lined holding facilities are strongly recommended. Limited funding assistance from federal sources is available, but these facilities cost between $15,000 and $60,000 each. When pollution of waters of the state occurs from agricultural activities, the Department of Natural Resources then has the responsibility for protecting the waters of the state from pollution.

The Plant Pest Control Division is concerned with taking samples of products and residues; stream monitoring; record-keeping requirements; inspections; standards for powerline and railroad right-of-way spraying; and pesticide applicator training and certification. There are about 12,000 pesticide applicators around the state who must apply for recertification every three years. Most of these are farmers, but some are commercial operators who are placed in any of 14 commercial categories. Since pesticide labels are considered to be legal documents for federal as well as state purposes, product misuse is a prosecutable offense.

A high level of voluntary compliance with the rules and guidelines has been observed, especially by commercial firms. This is a true success story in view of the fact that there are only three inspectors in the program who must cover the entire state. Another success story concerns picloram training sessions, which resulted in a reduction of tordon-type stream residues. Approximately 30 percent of samples taken in September 1983 tested positive for tordon, compared to less than two percent of samples collected in August 1985.

Agricultural and soil conservation ground water needs are as follows:

1. Need for stronger enforcement and better coordination with the Department of Natural Resources' Division of Water Resources.

2. Need to convince the judicial system of the seriousness of pesticide violations.

3. A vast need for public ground water protection educational programs, especially tailored to West Virginia farmers.

4. Need for greater inter-agency cooperation in all aspects of ground water protection.

II-F. DEPARTMENT OF HIGHWAYS

The primary ground water protection concern of the Department of Highways (DOH) is de-icing salt control. In this state, more calcium chloride is used for this purpose than sodium chloride. Under the jurisdiction of the Maintenance Division, and at the urging of DNR's Division of Water Resources due to water quality related problems, the DOH has initiated a program of building storage sheds to protect the road salt from weather. Until recently, it has been piled up in highway maintenance yards or covered with large tarps. Less salt is now applied to roads in the winter for economic reasons.

Another concern is highway runoff control. About 20 years ago, percolation holes (dry wells) were drilled in karst areas to drain rain water into porous limestone formations. Sinkholes were also used as drains. The DOH is now diverting runoff away from sinkholes and percolation holes as these situations are discovered and as funds become available. In Mercer County along US Route 460, two million dollars in federal Appalachian Corridor funds have already been expended in this project . In Berkeley County, some percolation holes have become clogged with trash and sediment, which has rendered them useless as drains. Minor flooding has been the result. In one case, fire truck pumps and hoses had to be used to clear a low-lying intersection.

In other matters, leaking underground fuel tanks in maintenance yards are a major concern. A manual has been prepared for use by Department personnel which lists guidelines for monitoring leaks and replacing faulty tanks. For sediment control in highway construction, the DOH is guided by (among other sources) a handbook published by the Soil Conservation Service.

Chapter 17-23 of the West Virginia Code provides the legislative policy for regulating salvage yards as being, "the safety and recreational value of public travel" and preserving "natural beauty." The term "salvage yard" as used in Chapter 17-23 includes in part the keeping and processing of salvage, maintenance of motor vehicle graveyards, garbage dumps and sanitary landfills. This policy does not address protection of the waters of the state. However, the legislative policy, Chapter 17-24, beyond regulating junk and abandoned vehicles, does include consideration for public health, safety, and general welfare, public nuisance and hazards.

Drinking water supplies and septic systems in rest areas, toll booths, maintenance fcilities, and other Department of Highways facilities are maintained the the Highway Services Division under permits from the Department of Health and the Department of Natural Resources. The Highway Services Division is also concerned with accidents involving hazardous materials, although its primary responsibility is protection of the traveling public.

The West Virginia Turnpike is administered by the West Virginia Turnpike Commission, which is independent of the Department of Highways. Its ground water concerns are similar, however.

The Department of Highways is responding to most of their activities that could cause ground water contamination. The only activity of concern is whether the state's management of salvage and junk yards is adequate to protect the waters of the state. The authority to resolve this concern is limited. However, county planning commissions are required to permit salvage facilities before being issued a license by the Department.

II-G. OTHER AGENCIES AND INSTITUTIONS

The agencies and institutions whose activities are discussed here do not, except in a few instances, exercise regulatory authority with regard to ground water protection.

County health departments issue permits for private water wells and septic tanks. They also provide a wide range of health services to the public. They are concerned about many of the same types of threats to ground water as the state Department of Health and Department of Natural Resources; however, sanitarians are close to local problems and are therefore valuable sources of information. In Berkeley and Jefferson counties, concerns include agricultural pollution, faulty septic tanks, badly installed and improperly abandoned water wells, leaking underground storage tanks, highway drainage into karst formations, hazardous wastes, and pesticide abuse. Their needs include increased staff, increased funding, improved understanding of health and environmental concerns by county commissioners, and a need for better state health laboratory facilities.

The West Virginia Public Service Commission, the Office of Emergency Services, and the U.S. Department of Transporatation are concerned with the safe transport of substances capable of polluting ground water. When accidental spills occur that involve such substances, local law-enforcement agencies, emergency health care units, and fire departments may be called upon. Ground water contamination can be worsened in some

instances, as when firemen hose down certain spilled materials. The predominant need is to make more information available, especially to local authorities, concerning what substances are being moved, and how to manage and coordinate accidents involving these substance.

The U.S. Environmental Protection Agency (EPA) provides assistance and funds for ground water protection. Primary statutory authorities include the Clean Water Act, the Safe Drinking Water Act, the Resource Conservation and Recovery Act (RCRA), the Water Pollution Control Act, and The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or the Superfund law. EPA's main contribution to ground water protection is support for ground water protection strategy development and implementation, and for the Underground Injection Control program. In addition, the agency supervises and funds cleanup efforts at Superfund sites. The predominant need in West Virginia is a higher level of funding.

The Soil Conservation Service (SCS) of the U.S. Department of Agriculture is concerned with the preservation of soil quality. Fourteen Soil Conservation Districts around the state provide services to farmers "...and others who needed to disturb land, but who want to conserve soil...". The SCS works closely with a number of state agencies. In October 1985 and April 1986, the SCS Resource Conservation and Development Association coordinated a number of ground water conferences around West Virginia.

Ground water research is conducted by the U.S. Geological Survey (USGS), the West Virginia Geological and Economical Survey (WVGES), and state universities and colleges.

The USGS is mainly concerned with the collection, interpretation, and dissemination of information regarding the quantity and quality of ground water and surface water. In cooperation with WVGES and DNR, an 11-part series of ground water hydrology atlases have been published covering the entire state. The USGS publishes an annual national water summary with ground water information for each state.

The WVGES is "West Virginia's information center for geology, energy resources (coal, oil, and gas), economic minerals, topographic maps, and ground water... Speakers, displays, and assistance with symposia are available for some topics." Publications, copying, computer time, and analytical services are available for nominal fees.

At West Virginia University (WVU), research in ground water and related topics is loosely coordinated by the Water Research Institute. Specific research interests include ground water impacts of mining and oil and gas activity, ground water quality and quantity, pathogenic contamination of springs and wells, the fate of herbicides in soil and ground water, stream basin hydrology and modeling, and other topics. The National Small Flows Clearinghouse at WVU provides advisory services on innovative and alternative technologies for small-volume waste water treatment. And, the WVU Cooperative Extension Service trains pesticide operators, advises farmers on prudent

fertilizer and pesticide usage as well as other ground water concerns, conducts soil analyses, and provides public information and education programs on ground water protection and contamination abatement.

III. SOURCES OF GROUND WATER CONTAMINATION

Up to this point, ground water protection activities in West Virginia have been described from the point of view of the government agencies concerned. The picture is made more realistic with the inclusion of a perspective on activities that may cause ground water contamination.

It is important to keep in mind that no regulatory program is completely effective. Adequate resources are simply not available at this time to support rigorous regulations and enforcement of ground water policies.

In general, the degree of ground water protection depends on the nature of the source, as well as the vigor with which control is exercised by the governmental authority concerned. Highly concentrated and visible sources, like municipal waste water plants and hazardous waste landfills; and new, well-funded regulatory programs staffed with motivated personnel, usually result in a high degree of control. A spirit of cooperation, as cultivated by the Department of Agriculture in its voluntary programs with farmers and pesticide vendors, is also conducive to ground water pollution prevention. On the other hand, the combination of a large number of dispersed sources such as gas wells and septic tanks; and resource-poor, under-staffed programs with other priorities than protecting ground water, can result in a high potential for uncontrolled contamination.

Following is a list of the known sources of ground water pollution in West Virginia. They are grouped into three categories according to the degree to which they are considered to be regulated.

Well-Regulated Activities

-Municipal Waste Water (sewage) Treatment Facilities. These are controlled through joint WV/NPDES permits issued by the Department of Natural Resources and construction certificates issued by the Department of Health.

-Underground Injection Wells. The UIC program is generally effective in controlling most underground injection wells. Some oil and gas-related (Class II) and miscellaneous (Class V) wells, however, may need attention.

-Hazardous Waste Facilities. Treatment, storage and disposal are well-regulated under the hazardous waste management program.

-Large Industries. Industrial wastes are regulated by the Industrial Permits Section of DNR's Division of Water Resources. In addition, manufacturing processes are usually under internal control through company-managed safety, efficiency, and public relations policies.

-Highway De-Icing Salt. Road salt is for practical purposes completely under the control of the Department of Highways. The DOH is making progress, at the urging of DNR's Division of Water Resources, in putting salt storage piles under cover and, for the sake of economy,

now uses less salt on the roads than it did in the past. Even though there have been some ground water-related problems, the program is considered under control.

Under-Regulated Activities

The following sources are under-regulated because of a lack of inspectors, sanitarians, and other resources:

-Domestic Septic Systems. Many are old or improperly installed. Few receive adequate maintenance.

-Small Community Waste Water Systems (package plants) need better operations and maintenance procedures.

-Septic Tank Cleaners and Portable Toilet Service Operators. Most of these allegedly dump their waste at municipal waste water plants; however, some may use improper disposal methods.

-Coal Mines. Impoundments (slurry lagoons), refuse piles (tailings), coal storage areas, coal processing plants, abandoned mines, and surface mines being reclaimed are spread out over much of the state. These facilities are under-regulated because (a) coal mining inherently results in unavoidable ground water contamination, (b) in the Department of Energy, ground water protection occupies a lower priority than other concerns, and (c) there are not enough inspectors with training and experience in ground water protection.

-Oil and Gas Wells. Active and abandoned petroleum production facilities are, like coal mines, dispersed over large parts of West Virginia, and ground water protection

is a low priority concern. A few oil and gas well drillers have disregarded the regulations, for instance, by failing to install fresh water protective casing. Leaking brine pits and some Class II injection wells may also be under-regulated sources of ground water pollution.

-Transportation of Materials. All kinds of materials, includ ing hazardous and non-hazardous substances capable of polluting ground water, are moved through West Virginia continuously. The potential for spills is high, due not only to the state's rugged terrain, but also to the fact that training programs, inspection, and enforcement are either inadequate or spread too thin.

-Class V Injection Wells. Class V is the miscellaneous category. It includes everything from non-polluting ground water recharge wells to abandoned mines receiving coal wastes, to dry wells and percolation holes into which almost everything (dead animals, sewage, highway runoff, etc.) can be placed.

-Agricultural Operations. Prevention of pollution due to the use, storage, and transport of agricultural chemicals depends largely on voluntary compliance by farmers, vendors, pesticide applicators, and manufacturers. However, the potential for abuse is very real, especially in the karst areas in the eastern part of the state where pollutants can enter the ground water very quickly. Of special concern are erosion and sediment, drainage from areas treated with pesticides and fertilizers (including tree farm nurseries where methyl

bromide is used as a biocide), and pollution from feedlots, barns, and manure storage.

-Construction. Scrap materials, sediment, chemicals, and other wastes can contaminate ground water from sites where buildings, highways, and dams are under construction. Economic considerations frequently dictate inattention to environmental protection.

-Solid Waste Landfills. These have been severely under-regulated in the past; however, with recent improvements in the solid waste management program, ground water problems are being addressed.

-Small Industries. Users and disposers of potential ground water pollutants such as dry cleaners, automotive repair shops, hospitals, food processors, supermarkets, military facilities, sawmills, etc. Rules for small quantity generators of hazardous waste are listed in Section 10 of the recently revised Hazardous Waste Management Regulations, however, these resources are still relatively uncontrolled in West Virginia.

-Open Dumps, Promiscuous (Roadside) Dumps, and Junkyards.

-Underground Storage Tanks and Pipelines. Federal regulations are being developed for privately-owned active as well as abandoned tanks.

-Pesticides, fertilizers, cleaners, and automotive products stored or abandoned in basements and garages, and improperly discarded containers.

Unregulated Activities

The following sources are either largely uncontrolled or are currently disregarding ground water protection measures:

-Certain Sewage Sludge Disposal Activities. Sludge is often given away to farmers and homeowners with no warnings or restrictions as to its safe and proper use.

-Certain Agricultural Operations. These include dry and liquid chemical storage, vehicle maintenance and wastes, and disposal of animal and plant waste materials.

-Aquifer Dewate ing. Due to pumping of deep coal mines and other withdrawal activities.

-Sink Holes. When used as dumps for dead animals, sewage, runoff, consumer products and other contaminating materials.

-Substandard Water Wells. Wells with leaky casings or covers, dug wells, and improperly abandoned wells.

-Abandoned Oil and Gas Wells. This category includes improperly abandoned wells and wells from which the casing was pulled during World War II to be sold for scrap.

-Urban Run-Off.

IV. CONCLUSION

In conclusion, the purpose of this Assessment has been achieved, in that it identifies present ground water concerns and improvements needed to reach a comprehensive West Virginia ground water program. It is now the function of the state ground water management strategy to establish the priorities for addressing these concerns and needs. The strategy itself is long range and dynamic, and is subject to revision as concerns/priorities arise, and knowledge about the state's ground water resource is expanded.

STATEMENT OF POLICY REGARDING THE EQUAL OPPORTUNITY TO USE FACILITIES AND PARTICIPATE IN PROGRAMS

It is the policy of the Department of Natural Resources to provide its facilities, accommodations, services and programs to all persons without regard to sex, race, color, age, religion, national origin, or handicap. Proper licenses/registration and compliance with official rules and regulations are the only sources of restrictions for facility use or program participation.

The Department of Natural Resources is an equal opportunity employer.

West Virginia GROUND WATER MANAGEMENT STRATEGY

1987

Department of Natural Resources
Division of Water Resources
Charleston, West Virginia 25311

West Virginia
GROUND WATER MANAGEMENT STRATEGY

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Arch A. Moore, Jr.
Governor

Ronald R. Potesta
Director
Department of Natural Resources

David W. Robinson
Chief
Division of Water Resources

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INTRODUCTION

The importance of West Virginia's ground water resource is emphasized by the state's reliance upon ground water as the major source of drinking water for its population. Fifty-three percent of the state's total population, including 95% of the rural population, rely upon ground water for their source of drinking water. The remaining 47% of the state's population obtain their drinking water from surface water sources. For a substantial period of time each year, however, ground water is the source of this surface water. In addition to supplying domestic water needs, ground water supplies 18% of industry's self-supplied water needs, excluding thermoelectric power withdrawals. This usage by industry represents 68% of the total ground water withdrawal.

Ground water is truly a valuable state resource. It can also be a very vulnerable resource, subject to depletion and/or contamination, if not properly managed.

West Virginia's ground water management strategy sets forth a long-range, dynamic plan which, when fully implemented, will manage the ground water resources to achieve beneficial uses for the people of the state, consistent with the protection of public health and the environment. The strategy stresses a comprehensive approach for managing water withdrawals and potential sources of contamination in order to protect the ground water resources for present and future West Virginians.

This strategy is by necessity long-range, primarily because there are not enough financial resources available to address all ground water management needs simultaneously. The strategy is also long-range and dynamic due to the present limited knowledge regarding the nature and condition of the state's ground water resources.

Existing ground water resource, statutory and programmatic information developed in preparing the three appendices to this document provides the foundation upon which the state ground water management strategy is based. Input and council from the Department of Natural Resources' Ground Water Advisory Committee and its subcommittees were utilized in developing the strategy. The ground water management strategy, as presented in this document, represents a consensus view of many of the ground water interests in West Virginia.

ASSESSMENTS

Ground Water Resources

In December 1985, the Division of Water Resources, based upon existing information, completed an assessment of the state's ground water resource. This assessment indicated that there does not appear to be massive widespread pollution of ground water in West Virginia. In general, the state's ground water is clean and plentiful, with geological conditions producing natural variations in quality and quantity. This is not to say that there are no ground water problems in West Virginia. Public and private ground water contamination complaints received by the Departments of Energy, Health and Natural Resources indicate that there are localized areas of pollution and dewatering. These complaints often occur as a result of relatively current land-use practices. In addition, there is a potential for significant ground water contamination as a result of past land-use activities in the state.

It can be concluded from the assessment of ground water resources that West Virginia is fortunate. The state apparently does not have to react to a major ground water contamination crisis while developing and implementing its ground water management program.

An updated and more complete assessment of the state's ground water resource is underway and is expected to be available by mid-1987. This work is being done by the Ground

Water Advisory Committee's resource subcommittee and the U.S. Geological Survey.

Ground Water Statutes

In August 1986, the West Virginia Attorney General's Office completed a review of existing state statutes pertaining to ground water. Existing statutory authorities were found to be adequate for managing the state's ground water. Some revision of existing statutes, in addition to the development of new or umbrella legislation, may be desirable to eliminate conflicts and ensure a comprehensive approach to ground water management. The conclusions of this assessment were further supported by the Ground Water Advisory Committee's statutes and programs subcommittee report of November 1986 which stated, "...that West Virginia need not necessarily adopt new legislation with respect to ground water protection in order to accomplish much of the objective of protecting ground water quality; however, the adoption of new ground water legislation would have the benefit of simplifying the ground water regulatory process and clarifying responsibilities among various agencies...". New legislation could also provide the framework for the management of ground water use.

Ground Water Programs and Activities

In September 1986, the Departments of Agriculture, Energy, Health, Highways, Natural Resources, along with the State Water Resources Board and other state and federal agencies, completed

the identification and assessment of current programs and activities directly or indirectly related to ground water management. In general, the present approach to ground water management was found to be large, complex and incomplete. This assessment was, for the most part, supported by the statutes and programs subcommittee's findings which stated that new legislation would simplify the ground water regulatory process and clarify responsibilities among agencies. The primary cause for such a complex approach is that state programs and activities were developed piecemeal in response to specific problems, rather than with the goal of overall ground water management objectives. As a result, some aspects of ground water management are either not being addressed or are not adequately financed, implemented or enforced. Moreover, some authorities are overlapping and unclear, allowing for potential conflict.

ASSESSMENT RESULTS AND ACTION

Review of the assessments found in Appendix I, II and III indicates that several functions fundamental to achieving a comprehensive approach to ground water management need to be addressed. A discussion of identified needs follows, with the order of discussion indicating their relative priority.

Regulatory Framework

The highest priority is assigned to development and implementation of a regulatory framework.

As indicated in both the statutory, and programs and activities assessments, existing statutory authority is adequate for managing ground water quality. For surface water this authority is implemented through policies, classifications, standards and regulations. However, for ground water there is no corresponding regulatory framework implementing the authority.

Action - The regulatory subcommittee, of the Ground Water Advisory Committee will implement the ground water resource management policy by developing an appropriate regulatory framework. This subcommittee has already begun work compiling and reviewing different ground water classification and standard options. Concurrent with this last objective, the Ground Water Advisory Committee, through its statutes and programs subcommittee and in conjunction with the Legislature,

will pursue the concept of new ground water legislation to simplify the regulatory process, clarify responsibilities and address ground water use/quality issues.

Institutionalize Coordination

With the development of the ground water resource management policy, classification, standards and supporting regulations, each regulatory agency may have to establish regulations to implement the basic ground water regulatory framework. To ensure that each agency's approach to ground water management contributes to a comprehensive state program, a mechanism for continued coordination and cooperation between state agencies needs to be institutionalized.

Action - The Ground Water Advisory Committee, through its interagency coordination subcommittee, will consider alternatives to achieve continued coordination and cooperation between agencies.

Data Management

A cooperative ground water data management project between the U.S. Geological Survey and West Virginia's Underground Injection Control (UIC) program was initiated in 1983. With the establishment of West Virginia's ground water strategy, this cooperative project has been continued. The data management system in this period has progressed from a conceptual to a nearly mature stage. Continued expansion of

the data base is needed to provide the information necessary for management of the state's ground water resource.

Action - The Division of Water Resources, in cooperation with the U.S. Geological Survey, will continue compiling and entering information into the ground water data base.

Pollution Complaint Response

At present, public and private ground water complaints are received by the Departments of Health, Energy, and Natural Resources. Each agency tends to respond individually to the complaints they receive. As a result, no one agency has an overall picture of the contamination incidents, what their cumulative effects are on ground water or whether programs for protecting ground water are adequate. A mechanism needs to be established for coordinating among the various agencies, the compilation, review and response for ground water pollution complaints.

Action - Develop agreements and procedures to facilitate cooperation between agencies in resolving and analyzing ground water contamination complaints. A prototype of the information collection and response systsem is ready for trial within the Division of Water Resources, and will be made available to other agencies as appropriate.

Characterize Ground Water Resources

Not enough is known about the use, nature and condition of West Virginia's ground water. The information that is available is the result of specialized research projects that were not intended to provide information useful in an overall characterization of the state's ground water. Currently, there are 37 ground water monitoring stations. Until recently, only water level data was collected from this monitoring network. Even with the collection of water quality data, it is estimated that the existing network will be grossly inadequate for characterizing the ground water resource. Additional knowledge is needed to describe the nature and condition of the state's ground water resource and its use, so that management programs can be developed to adequately protect the resource.

Action - The resource subcommittee of the Ground Water Advisory Committee will develop for consideration of the full committee a proposal for a state ambient ground water monitoring network.

Ground Water Training

State program emphasis has been on surface water. Therefore, personnel selection and training activities have been oriented to surface water objectives. Recent interest and new ground water protection concerns make it imperative to recruit personnel with ground water expertise, and to continue training the existing staff in order to develop ground water expertise within agencies.

Action - Agencies will evaluate staffing/training needs relative to ground water management, and will develop appropriate training and job description criteria to meet needs. Training and technical information resources will be made available to other state agencies as developed.

Public Information

Over the past two years, West Virginia's ground water program actively engaged in informing the public of the state's effort to develop a ground water management strategy. Now, with the strategy completed, public participation during the implementation of the strategy will ensure that issues and concerns are identified and addressed.

Action - It is planned that a combination of advisory committees, public speaking engagements, ground water newsletter articles, etc., will be used to maintain public contact. These activities will assist ground water program development and provide opportunity for public participation.

Strategy Update

Traditionally, as new programs are developed, adjustments in program direction/objectives are needed to take into consideration new information and concerns. The state's ground water program is not expected to be an exception.

Action - In cooperation with EPA and through the EPA grant application process, ground water management strategy, priorities and program budget should continue to be updated.

The state's ground water management effort currently receives all of its funding from the federal government. In order for the state ground water management program to be effective, West Virginia must make a commitment to provide the resources necessary to fully implement and enforce the program. In addition, the various agencies responsible for the program must make a commitment towards its implementation and enforcement.

GROUND WATER MANAGEMENT POLICY

The West Virginia State Code sets forth in Chapter 20, Article 5A, Part I the general provisions and public policy of the Water Pollution Control Act. This policy provides adequate authority for protecting the waters of the state, which by definition include both surface and ground water.

The authority for managing surface water is implemented through Series I of the West Virginia Administrative Regulations. Section 4 of the Series describes an anti-degradation policy which is based on water use criteria. This policy contains provisions for limited degradation, non-degradation and improvement when necessary or appropriate.

The state's ground water resource management policy is consistent with the surface water anti-degradation policy, in that it closely parallels and supports that policy. The ground water management policy provides that the state shall maintain and protect the ground water resources as necessary to support the present and prospective future beneficial uses (20-5A-3a) and further, to protect ground water at existing quality where the existing quality is better than the criteria established for the designated use, unless otherwise provided for by regulations set forth by the Water Resources Board.

ORGANIZATIONAL STRUCTURE

The West Virginia Department of Natural Resources was designated by the Governor as the lead agency to develop the state ground water management program. To coordinate program development, a Ground Water/Underground Injection Control Office was established within the Division of Water Resources.

A Memorandum of Agreement, signed in April 1986 by the Departments of Agriculture, Energy, Health, Highways and Natural Resources, recognized the importance of protecting the state's ground water resources. More importantly, it stated the agencies' willingness to participate in the development of the ground water management program. As a result of this Memorandum of Agreement, an interagency ground water group was established. This group presently has representatives from the Department of Agriculture; Department of Energy's Divisions of Mining and Minerals, and Oil and Gas; Department of Health; Department of Highways; Department of Natural Resources' Divisions of Water Resources and Waste Management; and the State Water Resources Board. The function of this group is the coordination of ground water management program development among agencies.

In July 1986, the Director of the Department of Natural Resources established a Ground Water Advisory Committee. This committee has representatives from the West Virginia Manufacturers Association, the State Water Resources Board, League of Women Voters, U.S. Geological Survey, West Virginia

Chamber of Commerce, State Soil Conservation Committee, U.S. Environmental Protection Agency, Sierra Club, West Virginia Mining and Reclamation Association, West Virginia Water Well Drillers Association, and West Virginia Association of County Officials. The committee is chaired by the Director of the Department of Natural Resources. The purpose of this committee is to represent public and private interests by advising the Department of Natural Resources of issues and concerns throughout development and implementation of the state ground water management program. Relatively unlimited participation in the development of the ground water program is accomplished through five subcommittees formed to address major issues.

In addition, consideration is being given to a recommendation that the WV Legislature establish a Select Committee on Ground Water. The purpose of this proposed committee would be to work with the various state agencies in addressing ground water program statutory and regulatory needs. Cooperation and coordination are the processes through which objectives are to be achieved.

Appendix I

GROUND WATER RESOURCE ASSESSMENT

Excerpted from West Virginia Water Quality Status Assessment

1983-1985

D. Ground Water Quality

1. Overview

Ground water in West Virginia is, on the average, adequate and clean. Across the state, however, quantity and quality vary widely. The best sources are found in the east, although agricultural pollution is a problem in the karst areas of the eastern panhandle. In parts of the western and southwestern two-thirds of the state, however, well yields are marginal and water quality is affected locally by factors such as salt-water intrusion and acid drainage. Although insufficient data were found on which to base a general assessment of the presence of pathogenic agents in West Virginia ground water, high levels of fecal coliform bacteria have been reported in a few areas (Bissonnette, 1985). In most parts of the state, ground water is hard and contains moderate to high levels of iron and manganese. Presently, there is no indication that contamination by synthetic organic compounds is a serious threat to water guality, although there is a potential for damage from accidental spills and nonpoint sources.

"West Virginia is divided into three physiographic provinces, each with distinctive principal rock types and ground water characteristics. The western and central parts of the state are in the Appalachian Plateaus physiographic province. The nearly flat-lying, consolidated sedimentary rocks that underlie this area

have been eroded by streams and rivers to form steep hills and deeply incised valleys. The Allegheny Mountains section of the Appalachian Plateaus province is underlain by gently to moderately folded strata. The eastern part of the state is in the Valley and Ridge physiographic province. The consolidated sedimentary rocks underlying this area are faulted extensively and folded sharply; the folded strata form a series of northeast-trending valleys and ridges. The Blue Ridge province includes only a very small area along the easternmost part of the State." (Puente, 1985)

Precipitation is the primary source of recharge to the ground water systems of West Virginia. Average annual precipitation across the state ranges from about 30 to 60 inches. Of this amount, about two to 12 inches becomes ground water, however very little moves into deeper aquifers. Most of this new ground water quickly becomes surface water as it re-emerges at springs and seeps and contributes to the flow of surface streams (Puente, 1985). An exception is noted in the karst areas of the state, where there are few streams on the surface and where ground water can flow quickly for miles underground through solution channels, caves, and fissures in the limestone.

Ground water and surface water are therefore intimately related. Since one readily becomes the other, what affects one also causes changes in the other.

For example, the effects of the floods of November 1985 will become apparent in future ground water studies.

While this report is a summary of the best information available to date, some gaps were found, such as the lack of data on organic and pathogenic contamination. It is hoped this situation will be remedied as the West Virginia Ground Water Protection Program is implemented. This program will coordinate ground water programs presently in place in a number of state agencies, and will seek to fill gaps and to eliminate overlaps and conflicting responsibility. It will also establish a ground water data base in which information now maintained in separate files in the West Virginia Departments of Natural Resources, Health, Energy, Agriculture, and Highways, the U.S. Environmental Protection Agency and the U.S. Geological Survey will be stored in a uniform system accessible by all.

The following discussions of ground water conditions in West Virginia are based on U.S. Geological Survey (U.S.G.S.) divisions of the state into 11 basins drained by major rivers or their minor tributaries. The correspondence between the U.S.G.S. basins and their equivalents as designated in the stream classification system of the West Virginia Department of Natural Resources (DNR) is shown in Table D-1. Figure D-1 shows

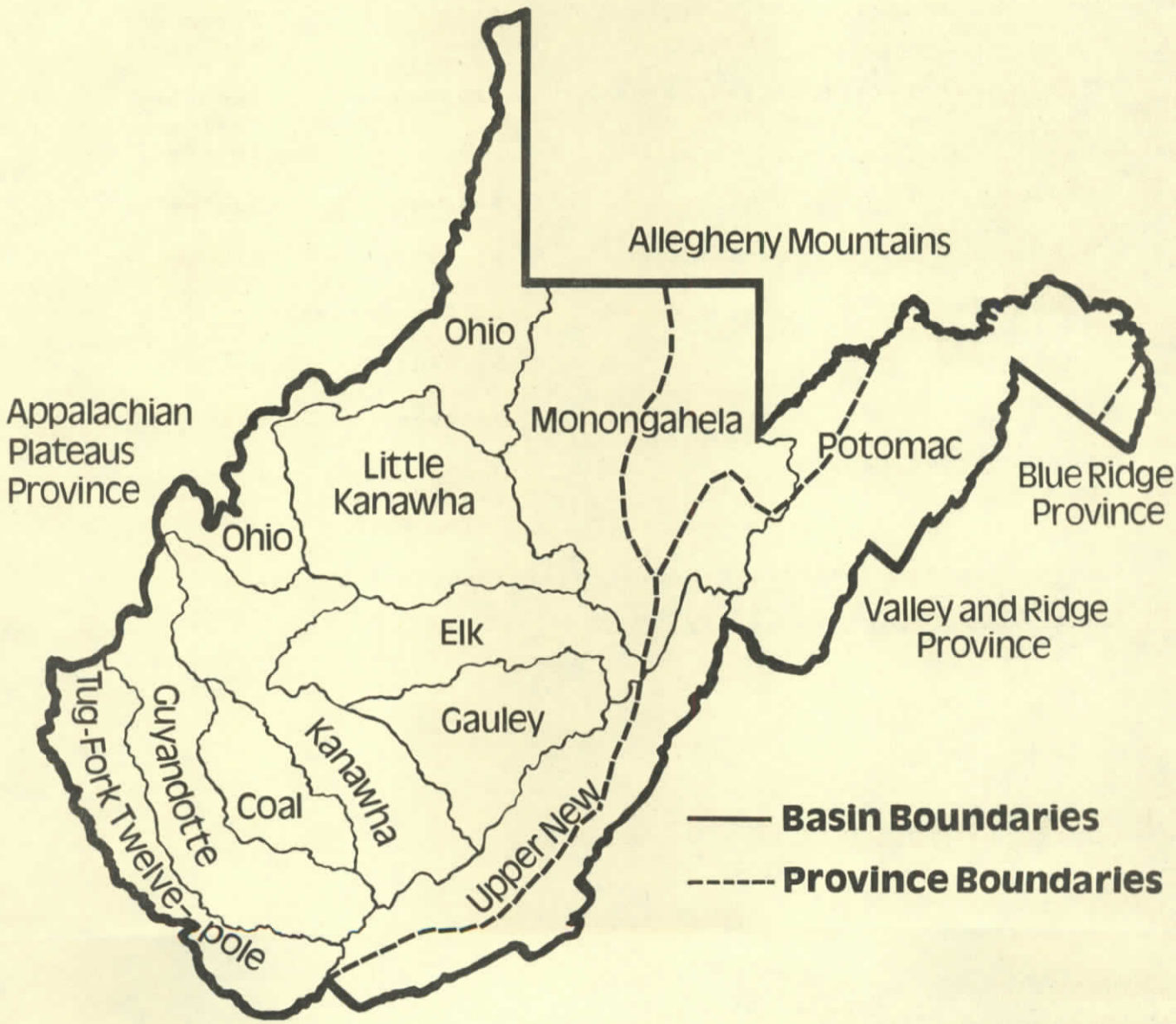
the approximate boundaries of the basins and the physiographic provinces of the state.

TABLE D-1

U.S.G.S. Drainage Basins	DNR Drainage Basins major	DNR Drainage Basins minor
Monongahela	Monongahela	
Potomac	Potomac	
Upper New	Kanawha	New Bluestone Greenbrier
Minor tributaries of the Ohio	Ohio	Upper Ohio Middle Ohio
Minor tributaries of the Kanawha	Kanawha	Kanawha mainstem Pocatalico
Gauley	Kanawha	Gauley
Elk	Kanawha	Elk
Little Kanawha	Little Kanawha	
Guyandotte	Guyandotte	
Coal	Kanawha	Coal
Tug Fork-Twelvepole	Ohio Big Sandy-Tug Fork	Lower Ohio

Correspondence between U.S.G.S.-designated and WV DNR-designated drainage basins.

Figure D-I Physiographic provinces of West Virginia and USGS-designated drainage basins. (Adapted from Puente, 1985 and USGS, 1973-1985)



2. Quality

Threats to the quality of ground water vary widely across the state, due in part to different geologic and topographic conditions. In the karst areas of the east, nonpoint sources such as drainage from farms, septic tanks, municipal wastewater facilities, highways, and construction constitute the greatest threat.

In the Appalachian Plateaus province most ground water pollution, actual and potential, results from coal mining activities and from oil and gas well operations. Mine drainage and runoff can cause high levels of iron, manganese, sulfate, total dissolved solids, and hardness. In the northern (high-sulfur) coal fields north of the Kanawha River, mine drainage is typically acidic. In the south, however, acid drainage is less of a problem and abandoned mines have become valuable sources of drinking water for about 70 communities. Oil and gas wells can allow salt water (from deep aquifers), drilling fluids, and natural gas to enter freshwater aquifers and contaminate nearby wells. This condition is especially prevalent in the Little Kanawha and Pocatalico basins.

Few data were found to indicate contamination of ground water, since 1983, from the following sources: chemical manufacturing in the Kanawha Valley, transportation of hazardous materials by rail or highway, underground storage tanks and pipelines,

underground injection wells, and (except in the eastern panhandle and other small isolated areas) domestic sewage.

Background information is provided in Table D-2 and Figures D-2 through D-16. The table is a summary of major contaminants and their sources, as well as precipitation and ground water demand. Figures D-2 through D-14 show the means and ranges of the levels of iron, manganese, chloride, fluoride, sodium, sulfate, calcium, magnesium, potassium, dissolved solids, hardness, specific conductance, and temperature of water from wells in West Virginia. Figure D-15 gives the range (only) of pH values of ground water in the 11 basins. (Means or medians are not given since for a logarithmic parameter they are apt to be misleading.) Figure D-16, which shows depth to water, is an indication of the water table level across the state.

Many things can be learned from Table D-2 and Figures D-2 through D-16. For instance, federal drinking water standards are exceeded for several parameters. Almost all the ground water in the state exceeds the standard for iron, especially in the Guyandotte Basin. Sodium and dissolved solids levels are also very high. Most of the ground water in the state is moderately hard to very hard (Figure D-12), except in the Gauley Basin, where the mean hardness is about 57 milligrams per liter.

Table D-2
Groundwater Supply, Demand and Contamination

Basin	Annual Precipitation (inches) mean	range	Area sq. mi.	Groundwater Demand (mgd_1)	Sources of Contamination	Major Contaminants
Monongahela	50	40-70	4225	8	coal mines	acid drainage
Potomac	38	32-55	3464	15	farms, septic systems	agricultural chemicals and waste, sewage, petroleum products
Upper New	40	36-44	2570	3	farms	agricultural chemicals and waste
Ohio	40	37-48	2500	~20	coal mines, oil and gas wells	acid drainage, brine
Kanawha		39-50	2135	16	chemical industry, coal mines, oil and gas wells	brine, chemical wastes
Gauley		48-70	1420	<1	coal mines	acid drainage
Elk		42-66	1532	4	coal mines, oil and gas wells	acid drainage, brine
Little Kanawha	~45		2310	1	oil and gas wells	brine, gas
Guyandotte	45		1680	~1	coal mines, oil and gas wells, septic systems	mine drainage and runoff, brine, gas, decaying material
Coal	45		890	~1	coal mines	mine drainage
Tug Fork - Twelvepole	45		1440	~1	coal mines	mine drainage

1. mgd= million gallons per day

Figure D-2 Levels of Iron (Fe) in West Virginia ground water.

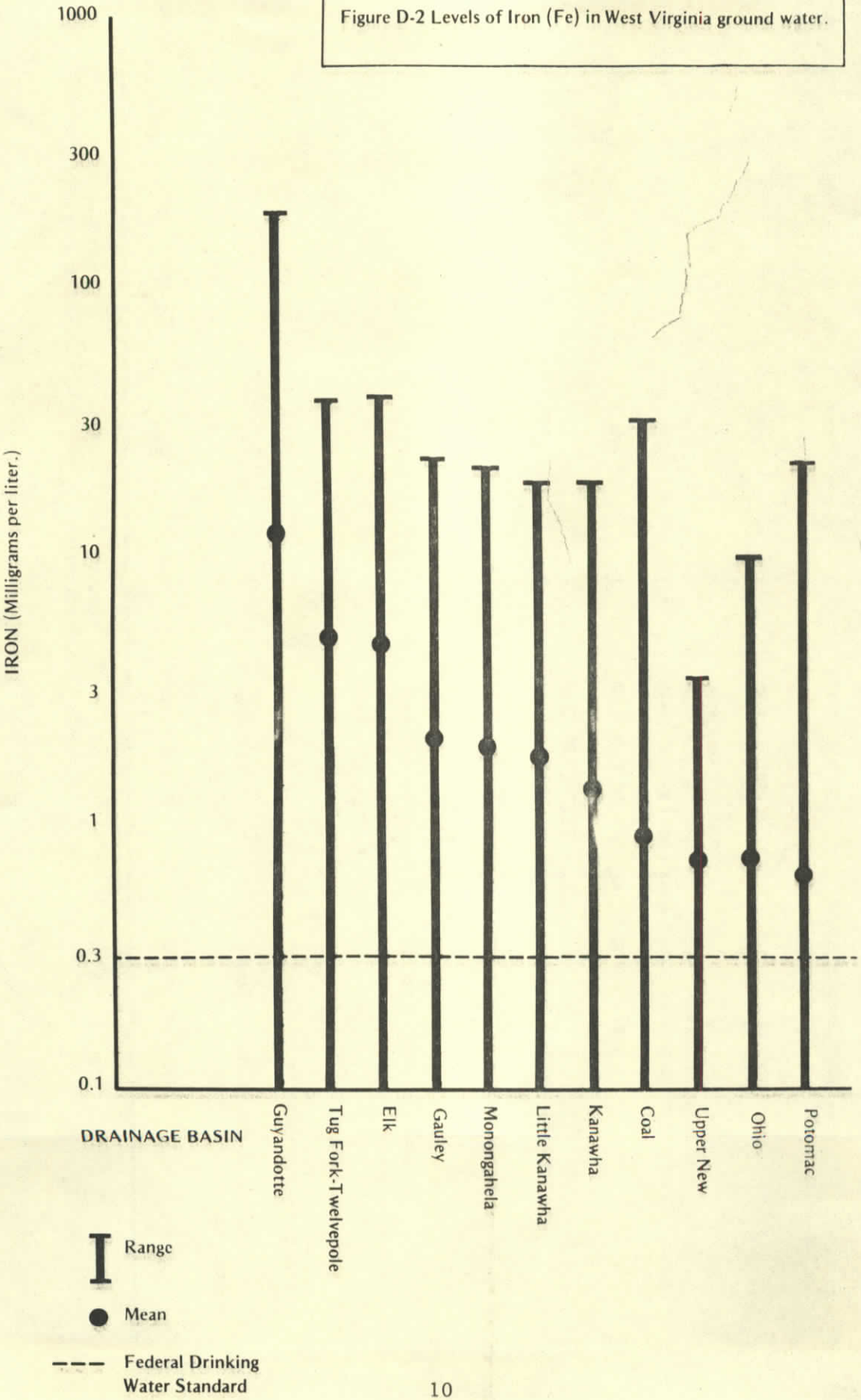


Figure D-3 Level of Manganese (Mn) in West Virginia ground water.

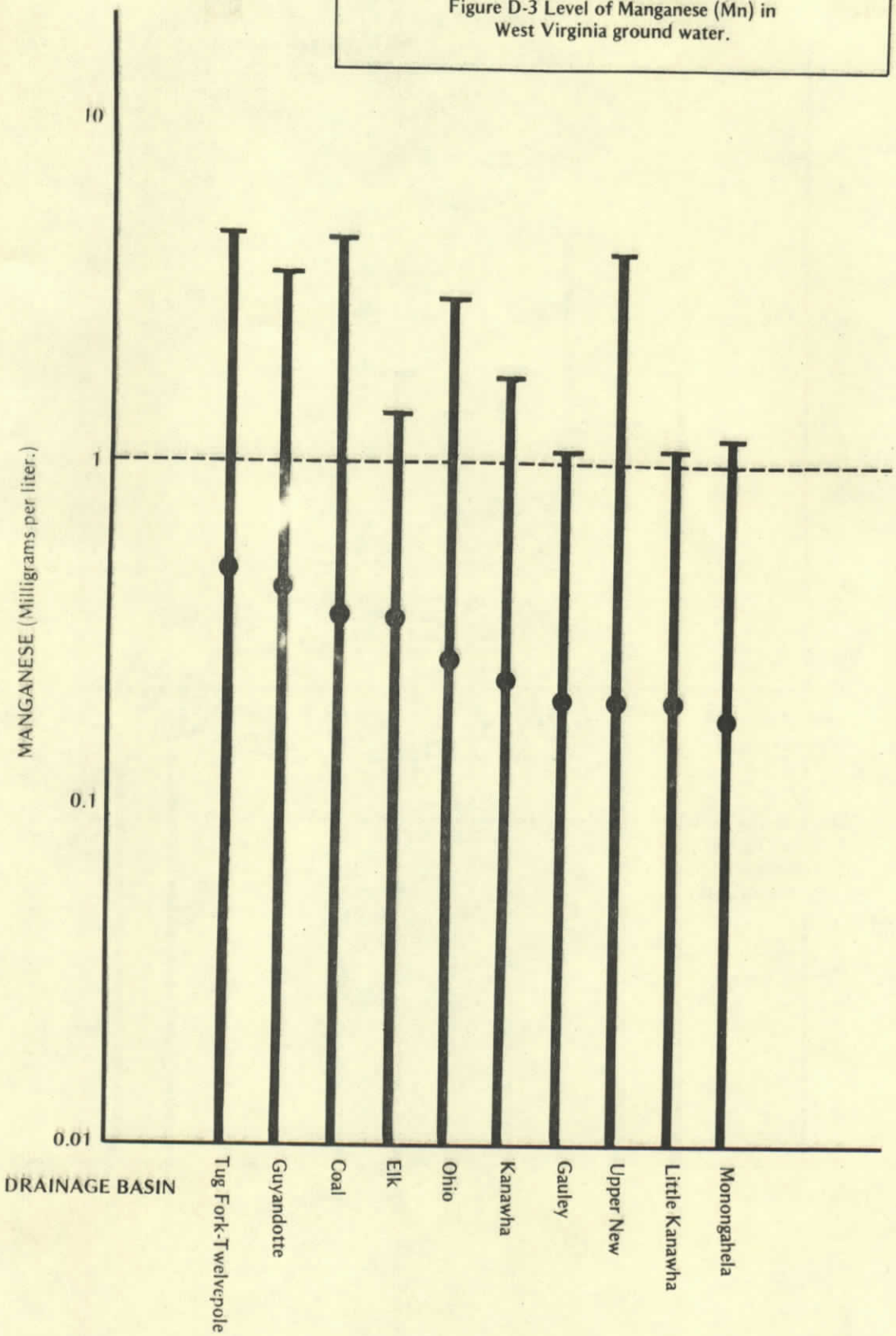


Figure D-4 Levels of Chloride (Cl) in West Virginia ground water.

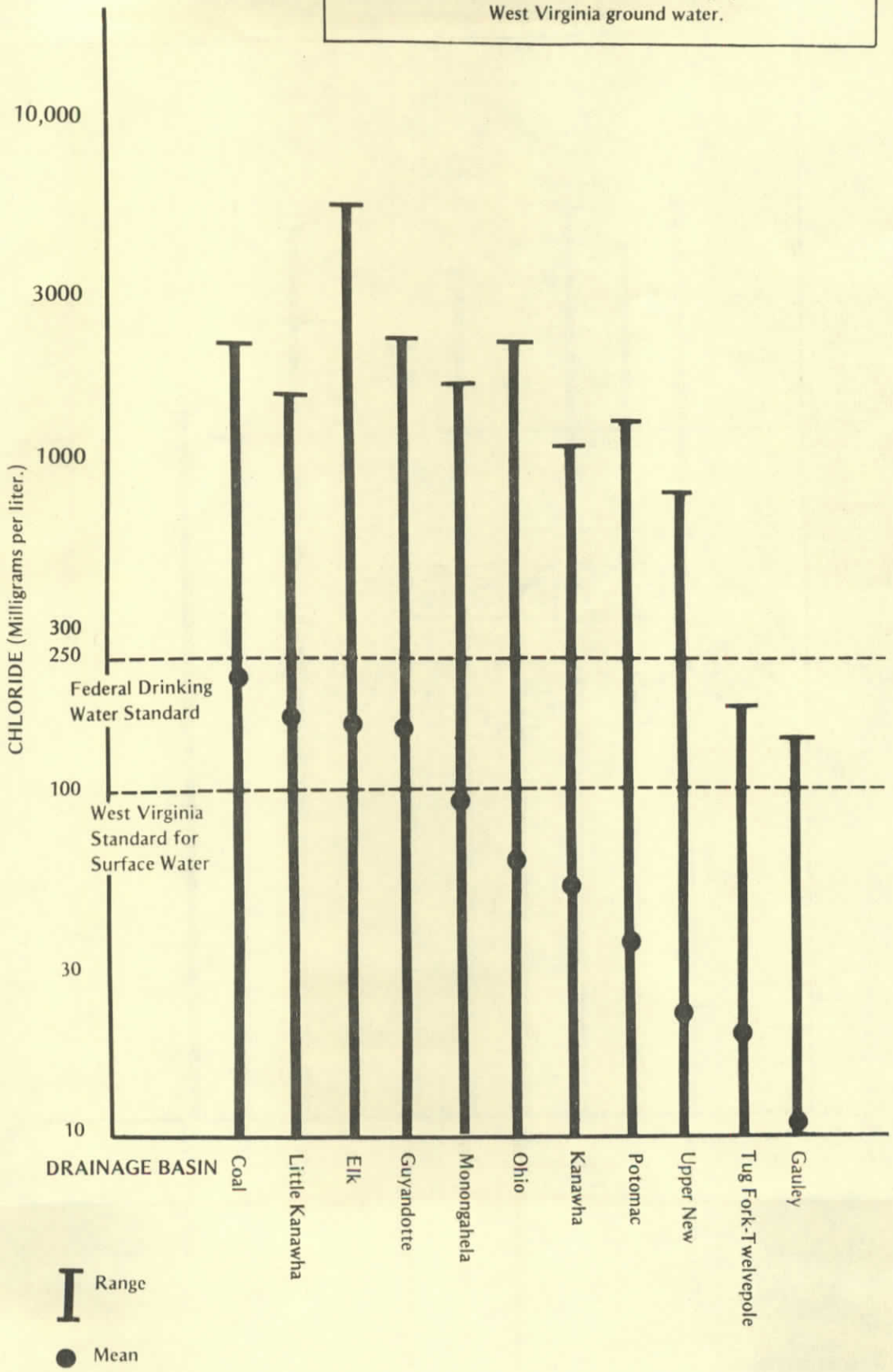


Figure D-5 Levels of Fluoride (F) in West Virginia ground water.

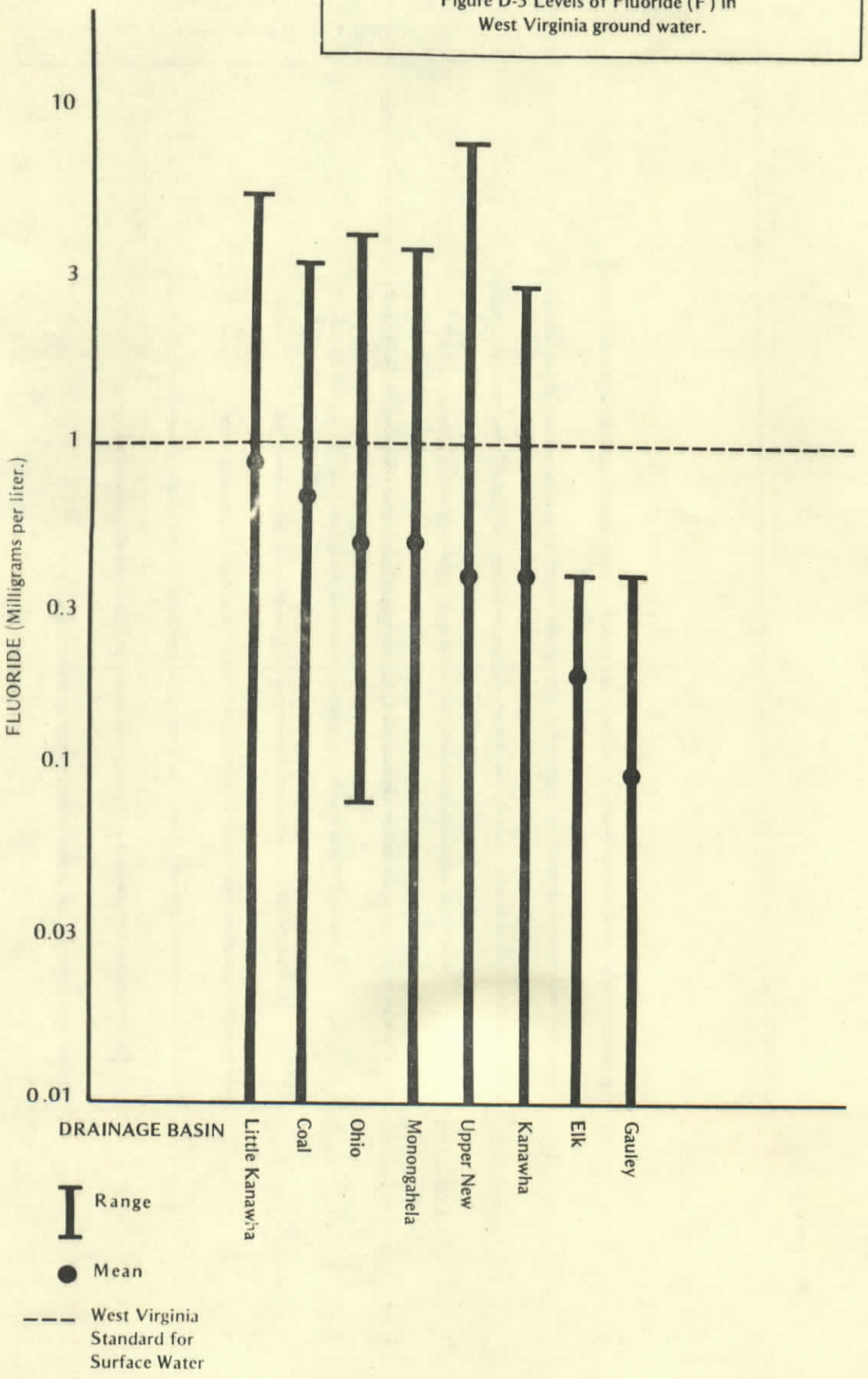


Figure D-6 Levels of Sodium (Na) in West Virginia ground water.

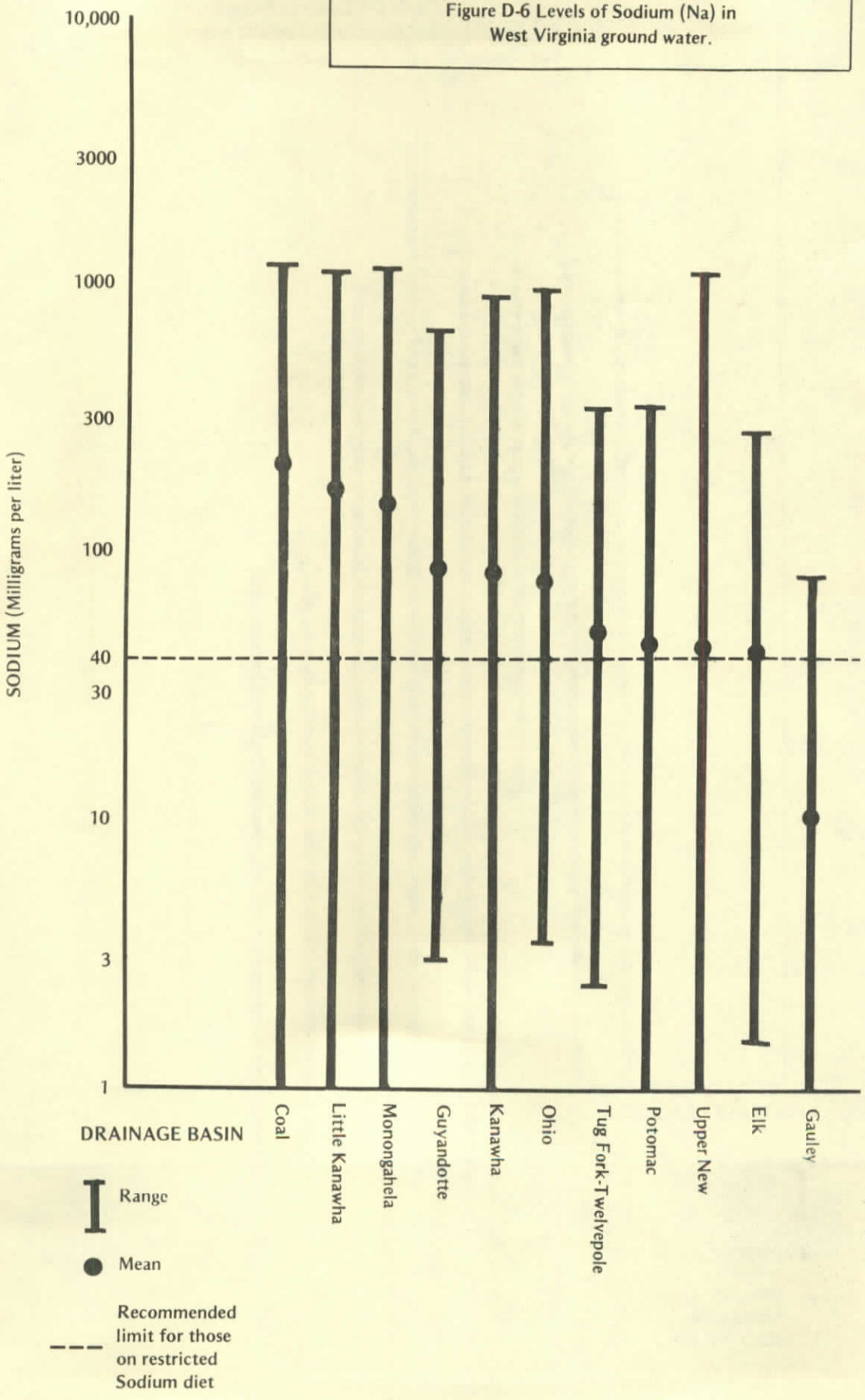


Figure D-7 Levels of Sulfate ($SO_4^=$) in West Virginia ground water.

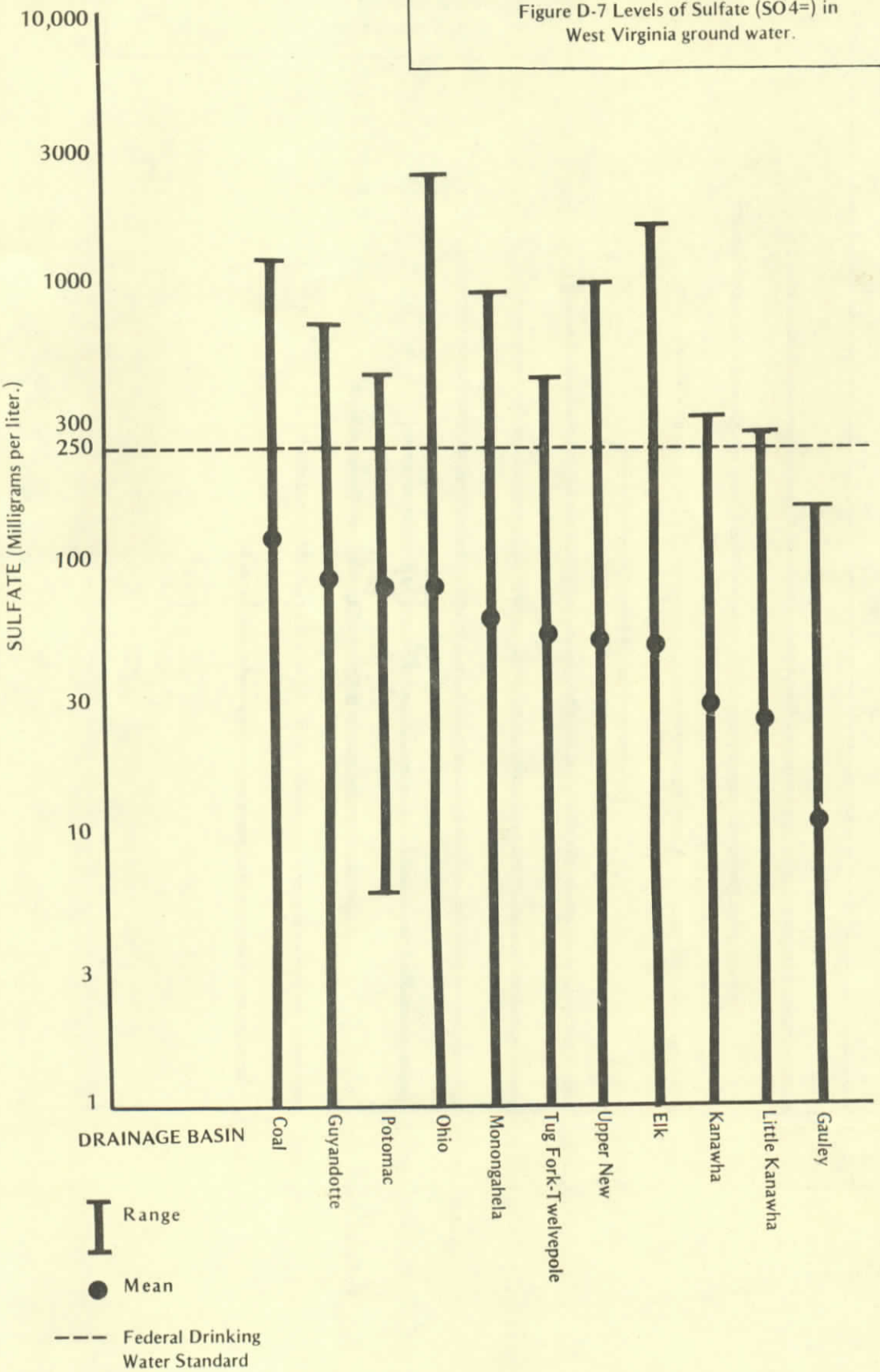


Figure D-8 Levels of Calcium (Ca) in West Virginia ground water.

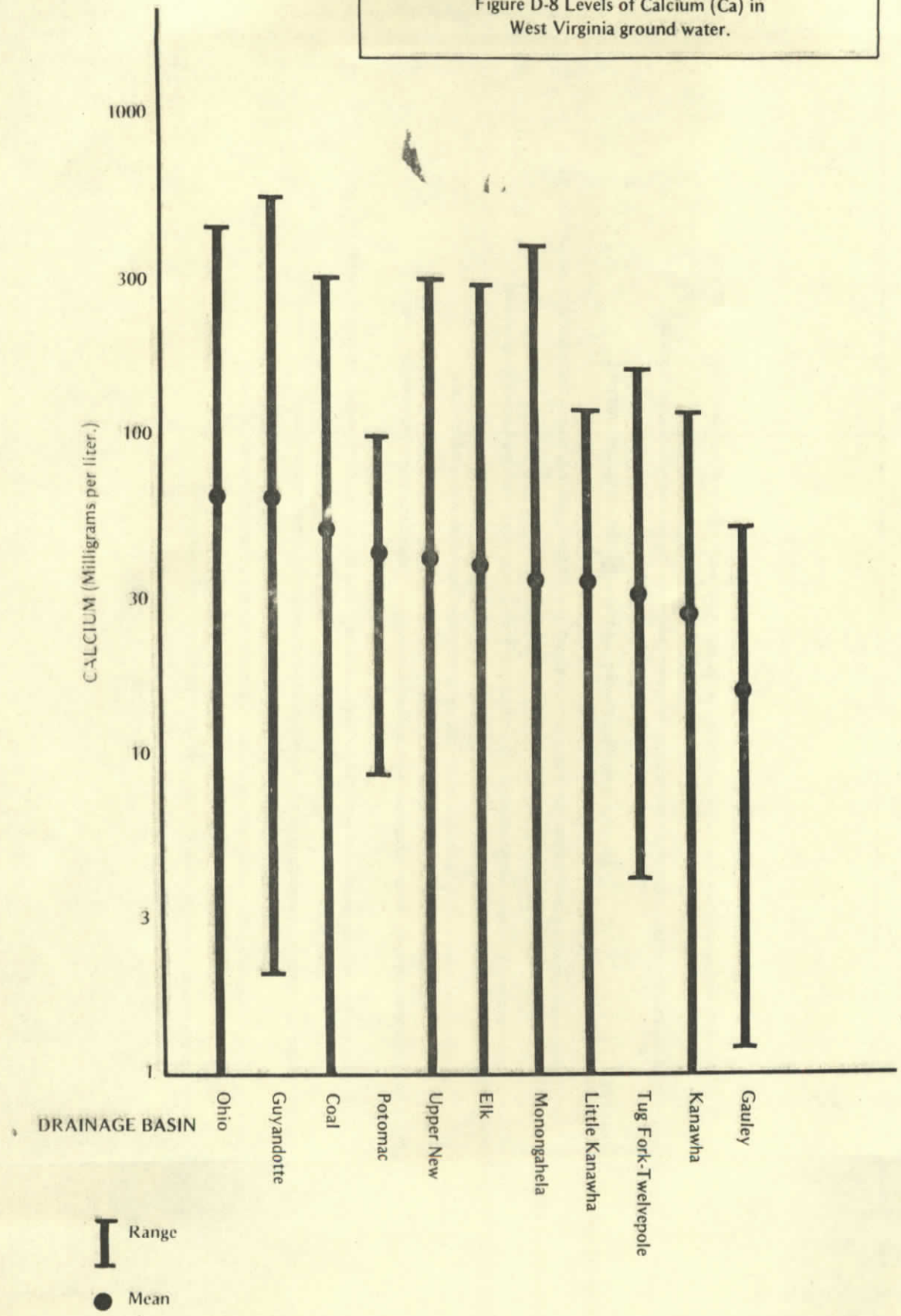


Figure D-9 Levels of Magnesium (Mg) in West Virginia ground water.

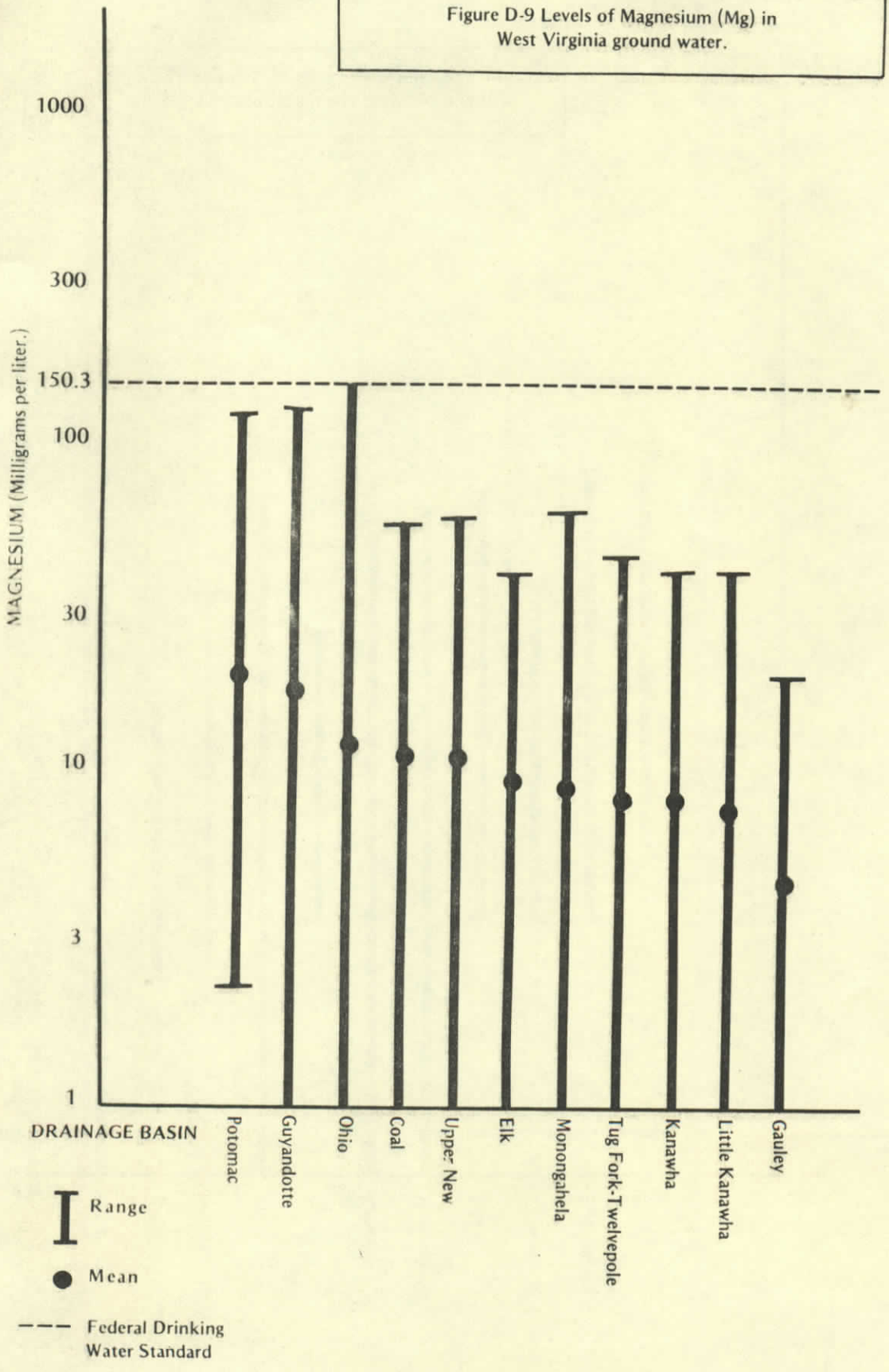


Figure D-10 Levels of Potassium (K) in West Virginia ground water.

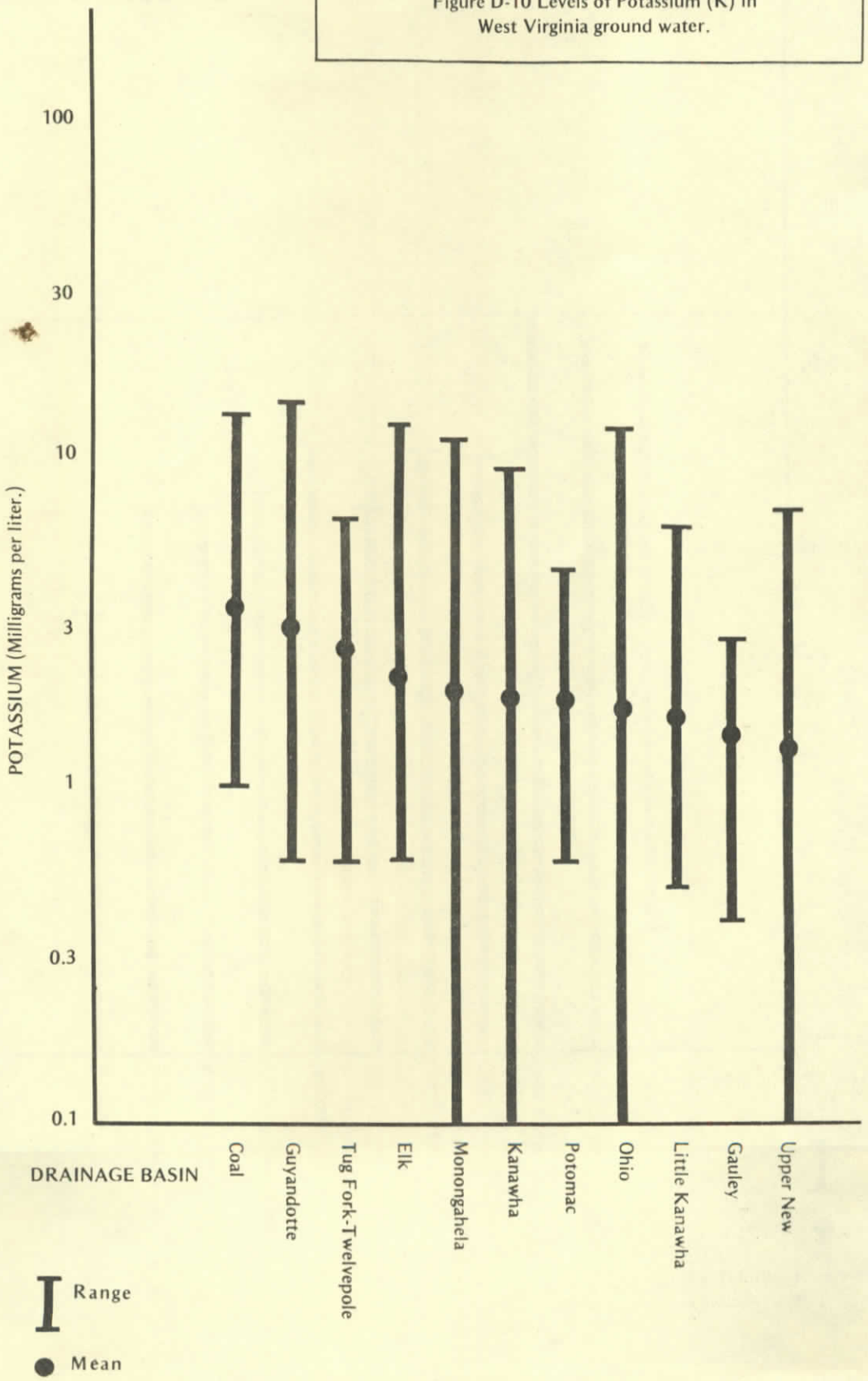


Figure D-11 Levels of dissolved solids in West Virginia ground water.

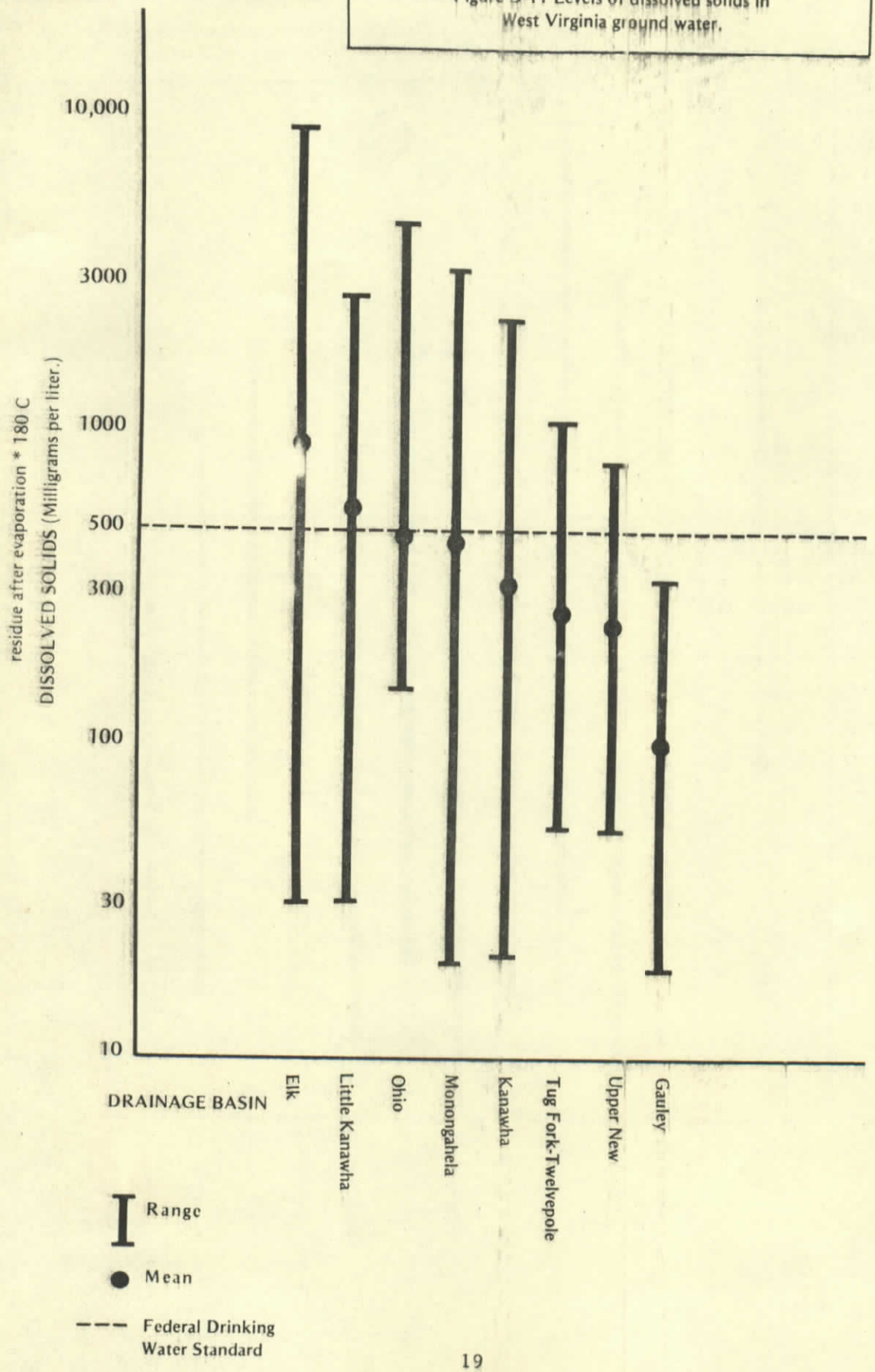


Figure D-12 Hardness as CaCO 3 (Ca,Mg) in West Virginia ground water.

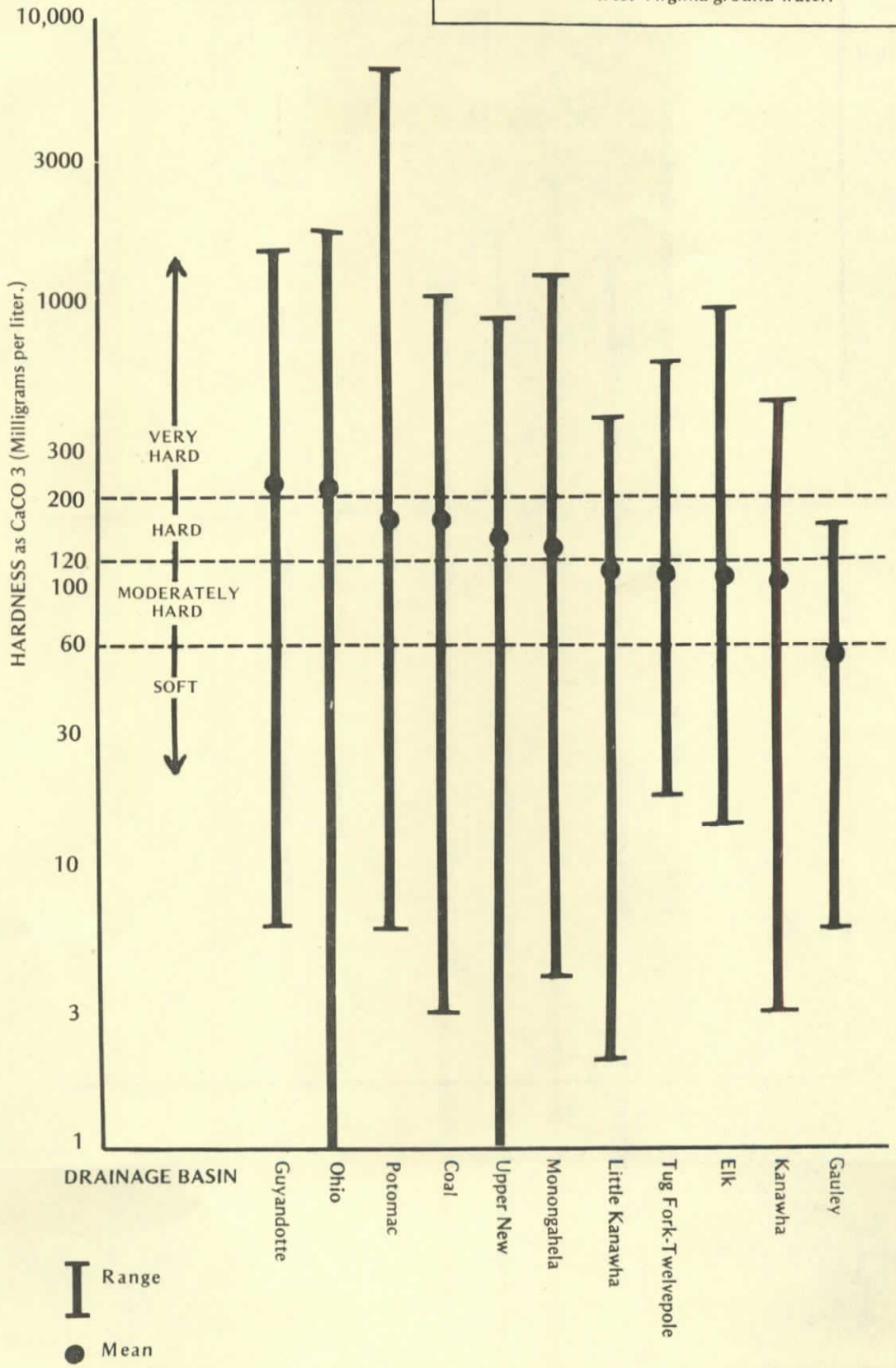


Figure D-13 Specific conductance of West Virginia ground water.

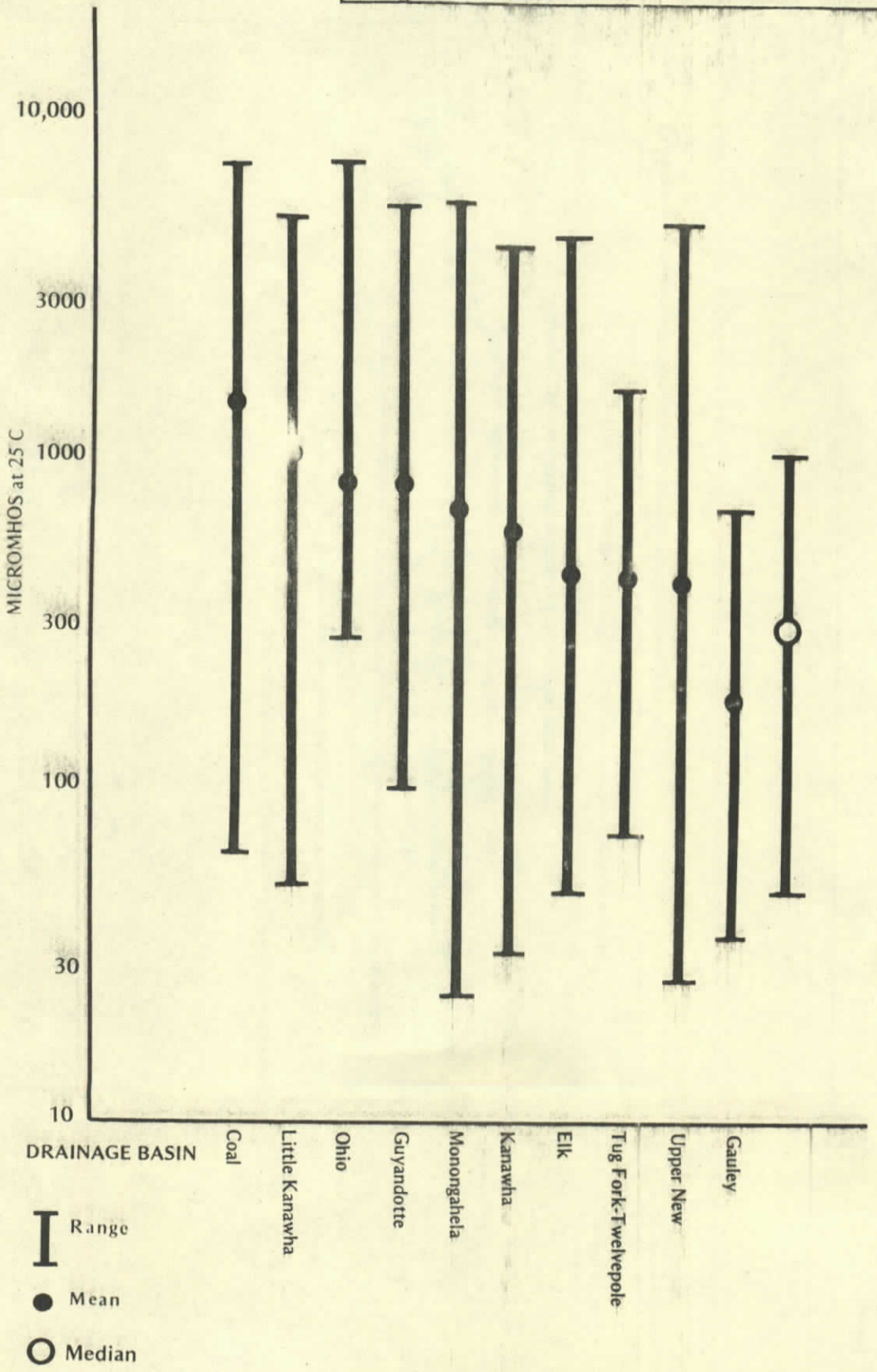


Figure D-14 Temperature of West Virginia ground water at the wells.

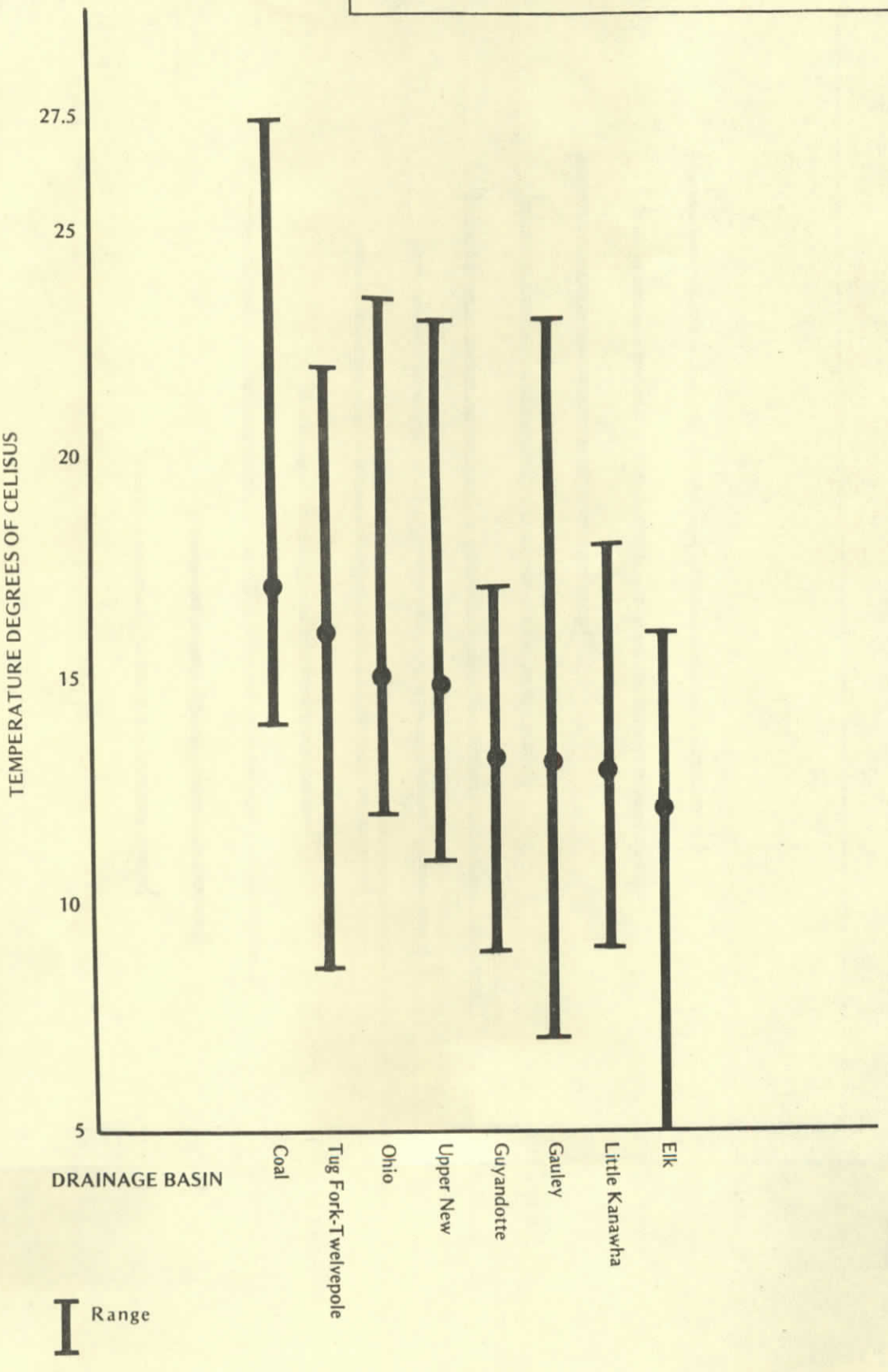


Figure D-15 Levels of pH in West Virginia ground water.

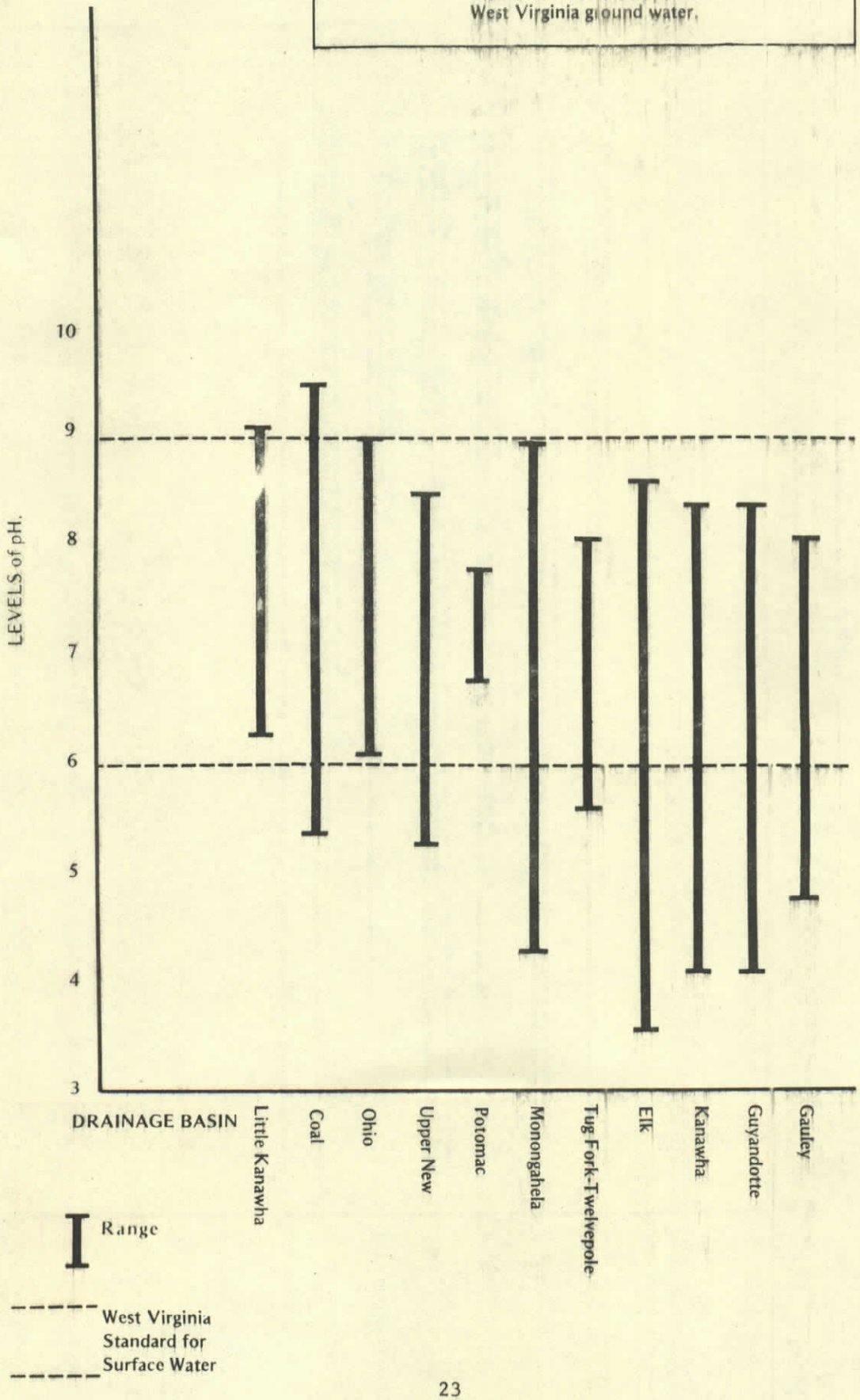
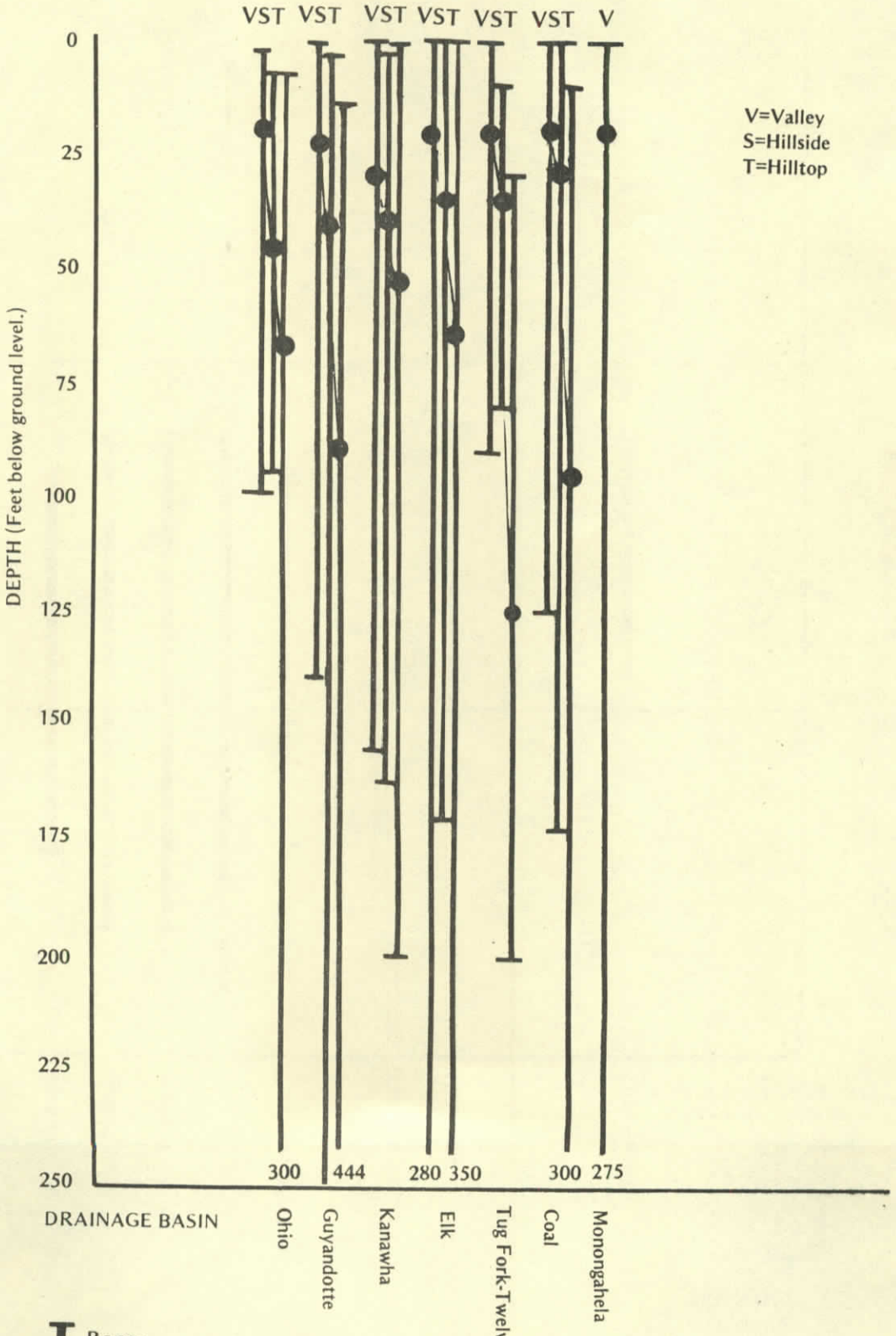


Figure D-16 Depth to Water by topographic site of wells.



In each figure (expect for Figure D-15, pH of ground water) the basins are arranged by mean value in descending order from left to right. This enabled a ranking of the basins by water quality. Based on the statistics for iron, chloride, sodium, sulfate, calcium, magnesium, potassium, hardness, and specific conductance (the figures with means in which all 11 basins are represented), the basins were given scores according to their positions on each figure and were ranked accordingly. The ranking is shown in Table D-3.

TABLE D-3

1. Gauley	7. Potomac
2. Upper New	8. Monongahela
3. Kanawha	9. Ohio
4. Tug Fork-Twelvepole	10. Coal
5. Little Kanawha	11. Guyandotte
6. Elk	

Rankings of the 11 drainage basins of West Virginia by ground water quality, based on 9 parameters. (No. 1 is highest quality. See Text.)

In Figures D-2, D-3, D-4, D-5, D-6, D-7, D-11, D-12, and D-15, applicable federal drinking water standards, West Virginia Stream quality standards, and other levels are indicated. Most of the figures were generated on a logarithmic scale.

Sources of the preceding tables and figures are 11 U.S. Geological Survey Ground Water Hydrology Atlases, one for each drainage basin in West Virginia (U.S.G.S. 1973-1985).

3. Recent Concerns

Since the data on which these atlases were based are all from years prior to 1983, attempts were made to obtain more recent data. The major source chosen was the West Virginia Department of Health, which between September 1984 and October 1985 conducted approximately 1,144 chemical analyses on water samples taken from privately owned wells from all areas of the state. Analyses such as these are not performed on a regular basis but only in response to complaints and requests by citizens. (See Table D-4). Because of this, the information given in Table D-5 is not an update of information previously presented but only an indication of recently-discovered trouble spots across the state.

Another source of recent information is the Division of Water Resources, which also maintains files of private water well complaints. Sources of data for these files are usually rural home owners who notify county sanitarians or DNR district water resources inspectors of sudden changes in their well water. Many of the complaints concern damage which has been relatively easy to trace to nearby oil and gas drilling operations. For other types of contamination, however,

it has been very difficult or impossible to determine the cause. These include the appearance of gasoline and fuel hydrocarbons (from leaking underground tanks?), salt (from highway maintenance road salt piles?), and chlordane (vandalism?), as well as imagined or suspected problems ("it must have been something in the water").

Table D-5 shows unusually high levels detected above a threshold (arbitrarily chosen for iron, manganese, sodium, alkalinity, hardness and pH) for 17 parameters, and the presence of several others, some of which cannot be quantified, for the 11 drainage basins. In eight basins, a total of 17 wells were declared unfit for household use, mostly because of sodium levels greater than 1,000 milligrams per liter and correspondingly high chloride levels.

Table D-4
Citizen Concerns for Groundwater Quality:
Approximate number of complaints and requests for chemical analysis of domestic well water
(WVDOH 1986)

Citizen Concerns	Monongahela	Potomac	Upper New	Ohio	Kanawha	Gauley	Elk	Little Kanawha	Guyandotte	Coal	Tug-Fork Twelvepole
Odor	3	6	7	12	10	1	2	18	4	4	1
Taste	2	2		5	4		1	11			1
Appearance	2	1		2	3		1	6	2	2	1
Oil and gas Drilling	2			7	4		4	21	8	3	1
Mining	1	1			1			1			
Petroleum product		5	2					1	1		
Oily film			1	1	3	1		2		1	
Synthetic organic compounds	2	3	1	2	2			1	1		
Salt	2			1	2	1	1		4		
Other inorganics	8[1]	2	2			1	1				
Sediment		1		5	2			2	1		
Stains/residue			3	2				4		1	1
Corrosivity			1	1							1
Physician's request			3		4			3	2		3
Health related	1	1	2	1	2		1	5			2
Sewage		1					1	1		3	
Other[2]	2			2	2		1	4	6		3
Total Analyses (9/84-10/85)	175	78	64	106	181	23	66	273	73	64	41

1. Mostly selenium and arsenic.
2. Includes mechanical well problems, vandalism, and presence of jellylike material, rodent hairs, etc.

Table D-5
Groundwater Contamination, Sep. 1984-Oct. 1985 (WVDOH, 1986)

Quantified Contaminants	Threshold, mg/l[1]	Drainage Basins[2]										
		Monongahela	Potomac	Upper New	Ohio	Kanawha	Gauley	Elk	Little Kanawha	Guyandotte	Coal	Tug Fork-Twelvepole
Iron	1.0	8	4	6	5	14	1	19	11	14	19	5
Manganese	0.3	9	4	3	3	9	1	11	15	9	11	2
Chloride	250	9		1	4	13		2	19	3	2	2
Sodium	100	12	1	4	21	22		15	36	5	12	5
TDS	500	16	1	6	19	28		2	33	5	11	3
H_2S	0	5	4	3	6	5	1		10		2	2
Sulfate	250	2		4		1			3	1	1	2
Alkalinity	300	6	3	2	15	19			25	2	3	1
Hardness	200	13	9	7	6	16		2	21	6	3	2
Fluoride	1.0	5		1	13	10			16		1	1
Copper	1.0								1			1
Petroleum	0	3	4			1			1			
Selenium	0.01	8										
Arsenic	0.05	1										
Synthetic Organics	0	3	2		2	2	1					1
Phenols	0.001			1								
Other Parameters												
Hydrocarbon Odor		5	3	1	4	5			12	4	3	1
Musty Odor		1	1	2	2	1			2			
Putrid Odor				1	1	1				1		
Other Odor			1						2			
pH[3]	5	7	1	1				3		1		1
Turbidity			1	1		1				2		
Sewage						1						
MBAS (foaming agent)									1	1		1
Gelatinous material					2				3			
Iron or sulfur bacteria						1			3			
Particulate material					2	1		1		1	1	
Other material			1		1					1		1
Corrosivity						1			1	1		1
Unusable		3	2			3		2	4	1	1	2
Total Analyses, (9/84-10/85)		175	78	64	106	181	23	66	273	73	64	41

1. mg/l = milligrams per liter
2. Reports of wells exceeding threshold (exc. pH)
3. Reports of wells with pH below threshold

Appendix II

GROUND WATER STATUTE ASSESSMENT

August 1986

UPDATED GROUND WATER STATUTORY REVIEW

AUGUST, 1986

SUMMARY OF AGENCIES AND STATUTES INCLUDED IN GROUND WATER REVIEW

Department of Natural Resources, Water Resources Division

20-5	Water Resources
20-5A	Water Pollution Control Act
20-5C	West Virginia Water Development Authority
20-5E	Hazardous Waste Management Act
20-5F	Solid Waste Management Act
20-5G	Hazardous Waste Emergency Response Fund

Department of Energy

20-5E	Hazardous Waste Management Act
22-3	Abandoned Mine Lands and Reclamation Act
22A-3	West Virginia Surface Coal Mining and Reclamation Act
22A-4	Surface Mining and Reclamation of Minerals other than coal
22B-1	Oil and Gas Wells
22B-2	Oil and Gas Production Damage Compensation

Department of Health

16-1	State Department of Health
16-9	Offenses Generally
20-5E	Hazardous Waste Management Act

Department of Agriculture

19-16B	West Virginia Pesticide Use and Application Act

Department of Highways

17-2A	West Virginia Commissioner of Highways
17-23	Salvage Yards
17-24	Disposal of junk and abandoned vehicles

Public Service Commission

20-5E Hazardous Waste Management Act

Air Pollution Control Commission

20-5E Hazardous Waste Management Act

Common Law Rule in West Virginia on Ground Water

Safe Drinking Water Act Amendments of 1986

General Zoning and Land Use Planning Authorities

GROUND WATER REVIEW

I. Department of Natural Resources

Division of Water Resources

Code Section	Comment
20-5-1	Gives the Division of Water Resources jurisdiction to enforce and administer all laws relative to the "conservation, development, protection, enjoyment and use" of the state water resources.
20-5-1a	Public policy that water resources of the state shall be available for reasonable use by all citizens.
20-5-2(e)	Defines "water resources", "water", and "waters" to include water on or beneath the surface, including wells. This section, when read with § 20-5-1 gives the Division jurisdiction over all ground water found in the state.
20-5-4	Chief shall make surveys of the state's water resources; investigate and study problems of water pollution; and formulate comprehensive plans and recommendations for protection and uses of water resources.

Code Section	Comment
20-5A-1	Establishes as the public policy of the state the maintaining of the purity and quality of state waters so as to be consistent with public health and enjoyment, propagation of plant and animal life, and commercial opportunities.
20-5A-2	Defines water resources and water to include ground water, thus establishing that it is the policy of the state to keep the ground water of sufficient quality to promote enumerated purposes.
20-5A-3(a)(1)-(14) and (d)	Powers and authority of Chief in controlling water pollution, e.g., studies, collecting information, sampling ground water, developing control programs, enforcing rules and regulations, requiring data from persons who discharge wastes into or near ground waters or underground strata, requiring monitoring by owner or operator of point sources.
20-5A-3(b)	Authority of the Water Resources Board to adopt regulations that, among other things, prevent, control and abate pollution, and that establish standards of quality for state waters to prevent, abate and control pollution.
20-5A-3a(a)	Gives the Water Resources Board, in order to carry out the purposes of Article 5, the authority to promulgate regulations setting water quality standards and effluent limitations to protect public health and welfare...and present and future uses of waters.
20-5A-3a(c)	Chief has the authority to revoke or modify any permit for noncompliance.
20-5A-4	Designates Water Resources as the water pollution control agency for the state and authorizes the Chief to cooperate with other state and federal agencies on any water pollution problem.
20-5A-5(a)	Gives the Chief the authority to issue a permit to discharge pollutants into state waters.

Code Section	Comment
20-5A-5(b)(1)	Prohibits discharge from a point source into waters of the state without a permit.
20-5A-5(b)(2)	Prohibits making or enlarging an outlet, without a permit, that would discharge into state waters.
20-5A-5(b)(3)	Prohibits, without a permit, construction, etc., of a waste disposal system that directly or indirectly discharges into state waters.
20-5A-5(b)(4)	Prohibits the increasing in volume or concentration of any discharge permitted under an existing permit.
20-5A-5(b)(5)	Prohibits, without a permit, the extension or modification of any permit source so as to increase the volume or concentration of the discharge from the point source.
20-5A-5(b)(6)	Applies to coal operations and when a permit is required. Coal operations that pollute or may pollute ground water will require a permit, and all coal preparation plants require a permit.
20-5A-5(b)(7)	Prohibits, without a permit, the operation of any disposal well for the injection or reinjection of any industrial wastes. Also prohibits, without a permit, converting a well to a disposal well, or plugging or abandoning any disposal well.
20-5A-8	Power of Chief to compel compliance; may revoke, suspend, or modify permits for cause.
20-5A-9	Requires any person who directly or indirectly discharges into or near any waters of the state, to file with the Division whatever information the Chief may require relative to that discharge. Further, if the Chief has reason to believe that the discharge is causing pollution, he may require further information and run tests as necessary to determine if such pollution does in fact exist.

Code Section	Comment
20-5A-10	Under this section, when the Chief determines that a person who does not have a permit is causing pollution of any waters of the state, the Chief can order that person to cease the pollution or he can enter an Order requiring that corrective or remedial action be taken. The Chief shall also direct that the person apply for a permit. The section does give the person the option to close down a facility, if doing so will abate the pollution.
20-5A-11	This section directs a person issued an Order under § 10 to comply with that Order. Section 11 also states that a person who is ordered to take remedial action cannot begin such action until a permit has been issued. This limits the ability of the Chief to order immediate action be taken. However, a permit is not required when a cease pollution Order is issued.
20-5A-11a	Gives a person the ability to exercise the power of eminent domain, when necessary, to comply with an Order of the Chief under § 10.
20-5A-12a	Whenever the Chief finds that any discharge, etc., into any waters of this state constitutes a "clear, present and immediate danger to the health of the public, or to the fitness of a private or public water supply for drinking purposes," he may, under § 12a issue an Order, with the concurrence of the Directors of the Depa tment of Natural Resources and Health Department, requiring the person discharging into the state waters to immediately cease or abate the discharge. Such an Order is effective immediately.
20-5A-14	Under this section, no one can claim a right or easement to pollute state waters on the basis of past pollution. This section gives the state the right to control state water quality. This section also makes it clear that even though a person complies with state law and Orders of the Chief or Board, he may still be required to take additional action with the passage of time and as conditions change.
20-5A-17	Civil penalties and injunctive relief for violations.

Code Section	Comment
20-5A-19	Criminal penalties.
20-5C	The West Virginia Water Development Authority has responsibility and authority for water development projects, improving the purity and quality of the state's waters, and preventing and abating water pollution.
20-5E-2	This section sets out the purpose of Article 5E, the "Hazardous Waste Management Act." Part of that purpose is to protect the public health and safety, as well as the environment, from the dangers inherent in hazardous waste materials and handling.
20-5E-3(3)	Disposal into <u>any</u> waters, including ground waters.
20-5E-3(6)	Defines hazardous waste as waste that poses a "substantial present or potential hazard" to human health or the environment. Water is part of the environment.
20-5E-4	DNR is lead agency for state hazardous waste management.
20-5E-6	Promulgation of rules and regulations by the Director.
20-5E-7	Other state agencies' authorities under the Act to promulgate rules and regulations for their areas of responsibility: Department of Highways, Public Service Commission, Department of Health, Air Pollution Control Commission, Department of Energy, and Water Resources Board.
20-5E-7(i)	In consultation with the Director of the DNR, the Water Resources Board shall promulgate rules and regulations governing discharges into the waters of this state of hazardous waste resulting from the treatment, storage, or disposal of hazardous waste.
20-5E-8(a)	Prohibits, without a permit from the Chief of Water Resources, the construction, modification, operation or closing of any facility or site for the treatment, disposal or storage of hazardous waste. Prohibits, without a permit, the storage, treatment or disposal of any hazardous waste. "Disposal

Code Section	Comment
	is defined to include any waters, including ground waters. However, these rules and regulations are not applicable to treatment, storage, or disposal of coal mining wastes and overburden.
20-5E-12	Chief's inspection and sampling authority.
20-5E-13(a)	Under § 13(a), if the Chief determines that the presence of hazardous waste at a facility or site at which such waste has been or is being stored, treated or disposed of, or, that the release of any waste from such facility or site may present a substantial hazard to human health or the environment, the Chief may order the owner or operator of such a facility or site to monitor, test, analyze and report to the Chief as necessary to determine the nature and extent of the hazard.
20-5E-13(b)	It is possible that an owner or operator of a facility or site as referred to in § 13(a) might not reasonably be expected to have actual knowledge of the presence of hazardous waste at his site. In that case, § 13(b) gives the Chief the authority to require the work referred to in § 13(a) and to require the owner or operator to reimburse the Chief for the costs of such work.
20-5E-13(d)	Section 13(d) gives the Chief the authority, under certain conditions, to do the work set out in § 13(a), and to equire the owner or operator to reimburse the Chief for the costs of such work.
20-5E-13(f)	Gives the Chief the authority to institute civil actions against persons failing to comply with Orders issued under § 13.
20-5E-14(a)	Grants the Chief the authority to issue various types of Orders, including cease and desist Orders, when the Chief discovers or learns of violations of Article 5E, a permit or an Order.
20-5E-15	Criminal penalties
20-5E-16	Civil penalties and injunctive relief for violations.

Code Section	Comment
20-5E-17	Gives the Chief the authority to request legal assistance to restrain any person from handling, storing, transporting, treating or disposing of a hazardous waste in such a manner as to present an imminent and substantial danger to the public health, safety or the environment.
20-5E-21	Use of hazardous waste management fund to administer the costs of this article.
20-5F-2(b)	"Waters" and "water resources" have same meaning as defined in 20-5A-2.
20-5F-4(a)	The Director of the DNR has the authority to adopt rules and regulations governing solid waste disposal; the Director may consider environmental impact, soil and geological conditions, and other considerations.
20-5F-4(b)	The Chief may deny a permit if the facility may cause adverse impacts on environmental concerns.
20-5F-6	Enforcement Orders, civil and criminal penalties.
20-5G-5	The Director has authority to collect fees to administer the Hazardous Waste Emergency Response Fund, and expend the money in responding to hazardous waste emergencies when there is a significant risk of harm to human health, safety, or the environment from hazardous wastes, when no federal funds are immediately available for clean up or containment.

II. Department of Energy

A. Division of Mines and Minerals

20-5E-7(g) and (h)	The Department of Energy has responsibility for hazardous waste management and regulations in coal mining, reclamation, oil and gas wells, liquid injection wells, and waste disposal wells, provided such authority does not diminish or alter the authority and responsibility of the Chief of Water Resources or the Water Resources Board under § 20-5 and § 20-5A.

Code Section	Comment
22-3-4	The Abandoned Mine Land Reclamation Fund may be used to reclaim and restore land and water resources adversely affected by past coal mining, and for prevention, abatement, treatment, and control of water pollution caused by coal mining. "Water" and "water resources" are not defined in this article or 22A, but it can be reasonably presumed that the terms pertain to all waters, surface and ground.
22-3-9	The Commissioner has the authority to construct and operate facilities to control and treat water pollution resulting from mine drainage - the extent dependent on the ultimate use of the water.
22A-3-2(b)	One of the purposes of the West Virginia Surface Coal Mining and Reclamation Act is to protect the public and the environment from the adverse effects of surface mining.
22A-3-2(c)	The Commissioner has the authority to promulgate and enforce regulations.
22A-3-3(b)	"Affected area" means all land and water resources.
22A-3-3(y)	"Significant, imminent environmental harm to land, air, or water resources, means any condition or violations which could reasonably be expected to cause appreciable and not immediately repairable adverse impact on land, air, or water resources." "Water resources" is not further defined, but can be reasonably presumed to include ground water.
22A-3-9(a)(11)	Requires that all surface mining permit applications include a determination of the probable hydrologic consequences of the proposed surface mining and reclamation activities, on and off the mine site with respect to the hydrologic regime and the quantity and quality of surface and ground water, and collection of sufficient data so that the Commissioner can determine the cumulative impacts of all anticipated mining in the area on the hydrology and water availability.

Code Section	Comment
22A-3-9(a)(13)	Requires that all permit applications contain maps showing the location of subsurface water and its quality, the location of significant aquifers, and the estimated elevation of the water table.
22A-3-9a	When surface-mining of two acres or less, a permittee shall conduct operations so as to minimize disturbances to the prevailing hydrologic balance and to the quality and quantity of water in surface and ground water systems, during and after mining and during reclamation by: avoiding acid and toxic mine drainage, preventing suspended solids runoff, etc.
22A-3-10(a)(11)	Requires that each surface mine reclamation plan contain a detailed description of the measures to be taken during the mining and reclamation process, to assure the protection of the quality and quantity of surface and ground water systems, on and off the mine site, from the adverse effects of the mining. If adequate protection cannot be assured, then the plan must contain means as to how alternative sources of water will be provided to those persons whose water supply will be affected.
22A-3-10(a)(12)	Reclamation plan shall include information which details the location of subsurface water, and a chemical analysis of the mineral and overburden, including acid forming properties.
22A-3-12(b)	General environmental protection performance standards for surface mining:
22A-3-12(b)(2)	restore so as not to pose any actual or probable threat of water diminution or pollution.
22A-3-12(b)(3)	cover acid forming and toxic materials in a way to prevent water pollution.
22A-3-12(b)(4)	stabilize spoil piles to control water pollution.
22A-3-12(b)(9)	prevent adverse water quality impacts due to augering.

Code Section	Comment
22A-3-12(b)(10)	minimize disturbances to the prevailing hydrologic balance, on and off-site, and to the quantity and quality of surface and ground water, during and after mining and during reclamation by: avoiding acid and toxic mine drainage, preventing suspended solids runoff, and other means.
22A-3-12(b)(14)	bury and compact or dispose of debris, acid forming materials, and toxics, to prevent contamination of ground and surface water.
22A-3-12(b)(17)	ensure that access and haul roads are constructed and maintained so as to control or prevent pollution of water.
22A-3-14(b)	General environmental protection performance standards for surface effects of underground mining:
22A-3-14(b)(4)	disposal of wastes so as not to degrade surface or ground waters below water quality standards.
22A-3-14(b)(9)	minimize disturbances to the prevailing hydrologic balance, on and off-site, and to quality and quantity of water in surface and ground systems, during and after mining and during reclamation by: avoiding acid or other toxic mine drainage, preventing suspended solids runoff. Monitoring of water from underground workings is done in accordance with provisions of Clean Water Act of 1977.
22A-3-14(b)(10)	ensure that access and haul roads are constructed and maintained so as to control or prevent pollution of water.
22A-3-15(b)(2)	When a surface mining operation removes or disturbs strata that serve as aquifers which significantly ensure the hydrologic balance of water either on or off the mine site, the Director, under this section, shall require that monitoring sites be established so as to record information (i.e., level, amount and quality) concerning the ground water that could potentially be affected.

Code Section	Comment
22A-3-16(a)	Under this section, a reclamation inspector can require the immediate cessation of any part of, or the entire surface mine operation when the operation "is causing or can reasonably be expected to cause significant, imminent, environmental harm to land, air or water resources." (Defined in 22A-3-3(y) above)
22A-3-17	Enforcement proceedings - notice of violation, cessation orders, civil and criminal penalties, permit revocation, bond forfeiture.
22A-3-22	Areas may be designated unsuitable for all or certain types of surface mining if:
22A-3-22(a)(1)	reclamation is not technologically or economically feasible.
22A-3-22(a)(2)	operations affect renewable resource lands, including significant aquifers and aquifer recharge areas, in which operations could result in a substantial loss or reduction of long-range productivity of water supply.
22A-3-23(b)	Before performance bond is released, the Commissioner shall inspect and evaluate the reclamation to determine whether pollution of surface or subsurface water is occurring, the probability of continuance or future occurrence of such pollution, and the estimated cost of abatement.
22A-3-24	This section requires an operator to replace the water supply of an owner of real property whose water supply has been contaminated, diminished or interrupted by such surface mining.
22A-3-40	NPDES permit required, presently still administered by Division of Water Resources.
22A-4-7	In surface mining and reclamation of minerals other than coal, a reclamation and mining plan is required and must include measures to eliminate water pollution, and maps showing:
22A-4-7(h)	drainage plan
22A-4-7(i)	presence of acid-producing material in the overburden.

Code Section	Comment
22A-4-10	The Commissioner may delete areas in the permit application where acid water pollution cannot feasibly be prevented.
22A-4-13	Operator is required to:
22A-4-13(2)	bury acid-producing and toxic materials.
22A-4-13(3)	seal acid breakthroughs.
22A-4-13(4)	treat runoff waters to reduce pollution of streams and other waters.
22A-4-14	Inspectors may order immediate cessation for non-compliance or when public welfare or safety calls for it.
22A-4-16	Bonds shall not be released until all acid-producing spoil has been treated adequately.
22A-4-21	Non-compliance actions - cessation Orders, permit suspension, permit revocation, and bond forfeiture.

B. Division of Oil and Gas

22B-1-1	For oil and gas purposes, "waters" are defined the same as under 20-5A-2(e), to include all waters.
22B-1-3	Upon inspection, if an oil and gas inspector determines that there is an "imminent danger that a fresh water source or supply will be contaminated or lost," he shall order the facility to cease operations until the danger is abated.
22B-1-6(a)	A permit is required for any well work.
22B-1-6(d)	The Director of the Oil and Gas Division shall consult with the Director of the DNR to ascertain whether the well work will cause or contribute to a pollution problem. Also, an erosion and sediment plan is required with each permit application.
22B-1-7(a)	NPDES Water Pollution Control Permit also required; presently still administered by the Division of Water Resources.

Code Section	Comment
22B-1-11	The well permit shall not be issued, or it shall be conditioned if:
22B-1-11(4)	the proposed well work fails to protect fresh water sources or supplies.
22B-1-14	In applying for a permit to introduce liquids, wastes, or pollutants into wells:
22B-1-14(a)(7)	the operator shall show the location of all water-bearing horizons above and below the formation.
22B-1-14(c)	The Director of the Water Resources Division shall comment on
22B-1-16(b)	If the Chief of Water Resources determines that the proposed well will affect detrimentally the reasonable standards of purity and quality of waters of the state, the Chief shall object and/or suggest protective conditions.
22B-1-16(e)(2)	After a hearing on the subject, if the Director of the Oil and Gas Division determines that reasonable standards of purity and quality of such waters will be endangered, the permit will not be issued. ("Reasonable standards of purity and quality" not defined)
22B-1-19	All water-protecting strings of casing shall remain in place until the well is plugged or abandoned.
22B-1-21	Well operators shall permanently cement a string of casing through fresh-water strata; no oil or gas well shall be drilled nearer than 200 feet from an existing water well or dwelling without written consent of the owner.
22B-1-22	Well operators shall report fresh water encountered.
22B-1-25	Liquid injection shall be controlled so that no water-bearing strata shall be affected thereby.
22B-1-26	Performance bond required.

Code Section	Comment
22B-1-29	Special reclamation fund for reclaiming and plugging abandoned wells.
22B-1-30	Reclamation requirements - oil, saltwater, and debris pits shall be removed.
22B-1-35	Civil action for contamination or deprivation of freshwater source or supply; within 1,000 feet of a drilling site, there is a rebuttable presumption that such drilling or well was the proximate cause of deprivation or contamination.
22B-2-3(a)	Compensation to surface owners - the oil and gas developer shall pay the surface owner compensation for:
22B-2-3(a)(3)	any damage to a water supply.

III. Department of Health

16-1-7	This section discusses the ability of the State Board of Health to promulgate regulations. The section also discusses limitations on that ability. However, § 7 makes it clear that there are not limits as to the ability of the Health Department to restrict any development or subdivision whose construction might endanger sources of water. There is no definition of sources of water in § 16-1. It can be assumed though, that water includes both surface and ground.
16-1-9	Prohibits <u>any</u> person, etc., from installing or establishing <u>any</u> system or method of water supply, drainage, sewage disposal or solid waste disposal without first obtaining a written permit from the Director of the Department. Not only is a permit required, but the plans for such a system or method must be approved by the Director prior to construction. These requirements apply to everything from single home wells to the largest public water systems.

Code Section	Comment
	Performance bonds are now required for the construction and operation of sewage facilities serving three or more single-family residences, any privately owned multi-unit residence with more than two units, or any commercial enterprise. If a bond is forfeited to the state, the Department of Health is required to use the proceeds to remedy the problem. If the Director or his representative becomes aware of a situation where the above stated requirements have not been met, the Director can issue an Order requiring the owner or operator to do whatever is necessary to correct the condition. Also, failure to comply with this section makes the owner or operator subject to civil and criminal liability. The presence of sewage, excreta, or solid waste being disposed of in an unapproved manner is prima facie evidence of a condition endangering public health.
16-1-9(a)	Defines a public water system. Also requires the State Board of Health to promulgate maximum contaminant levels for public water systems. A source for a public water system may be surface or ground water. Violation of this section subjects the owner or operator to various civil and criminal penalties.
16-1-10(2)	Gives the Director the authority to enforce all the laws in the state concerning public health, and health generally.
16-1-10(15)	Authorizes the Director to enforce rules and regulations and make inspections with regard to sources of water supply.
16-9-2	Pursuant to this section, any person who knowingly or willfully throws, causes to be thrown, or releases dead animals or offensive substances into any well or other body of water is guilty of a misdemeanor.

Code Section	Comment
20-5E-7(d)	In consultation with the Director of the DNR, the State Board of Health and Department of Health shall promulgate rules and regulations establishing standards applicable to permitting, licensing, and operation of facilities that treat, store, or dispose of hazardous waste with infectious characteristics.

IV. Department of Agriculture

19-16B-2	Pesticides may cause injury to man or may cause unreasonable adverse effects on the environment if not properly used. "Environment" includes water, air, land, all plants, and man and other animals.
19-16B-4(a)	The Commissioner of Agriculture shall promulgate and enforce regulations on the application of pesticides.
19-16B-4(c)	The Commissioner may restrict the use or application of any pesticide if he determines it may cause "unreasonable adverse effects on the environment."
19-16B-20	No person shall transport, store, or dispose of any pesticide or pesticide containers in such a manner as to cause injury to humans. This could include contaminating a ground water supply.

V. Department of Highways

17-2A-8	Although specific reference to road salts and de-icing could not be located, the Commissioner does have broad powers of supervision over the state road program, including maintenance, and the authority to set standards.
17-23-1	The legislative policy behind regulating salvage yards does not mention protecting waters or ground water, but only "the safety and recreational value of public travel" and preserving "natural beauty."
17-23-2	The term "salvage yard" includes garbage dumps and sanitary fills.

Code Section	Comment
17-24-2	The legislative policy behind regulating junked and abandoned vehicles does include considerations of public health, safety, and general welfare, public nuisances, and hazards.
17-24-6	The Department of Highways administers funds for abating the problems of junked and abandoned property and promulgates rules and regulations on the subject.
17-24-7 and 9	The enforcement agency has authority to take possession and dispose of abandoned and junked property.
17-24-10	Proceeds from the sale of any such property are to be used for other abatement efforts.
20-5E-7(a) and (c)	In consultation with the Director of the DNR, the Department of Highways shall promulgate rules and regulations governing the transportation of hazardous wastes by vehicle upon roads and highways, interstate and intrastate in scope, consistent with applicable rules and regulations of the Federal Department of Transportation, as necessary to protect public health, safety, and the environment.

VI. Public Service Commission

20-5E-7(b) and (c)	In consultation with the Director of the DNR, the PSC shall promulgate rules and regulations governing the transportation of hazardous wastes by railroad, interstate and intrastate, and consistent with federal rules and regulations, as necessary to protect public health, safety, and the environment.

VII. Air Pollution Control Commission

20-5E-7(f)	In consultation with the Director of the DNR, APPC shall promulgate rules and regulations establishing air pollution performance standards, and permit requirements and procedures. (Airborne pollutants can impact ground water quality.)

VIII. Common Law Rules in West Virginia on Ground Water

In West Virginia, subsurface waters which merely percolate, ooze, or filter through the soil and which do not flow in any permanent, district, or definite channel belong to the owner of the soil; the owner is generally limited to "reasonable use" of such subsurface waters. However, subterranean waters can be subject to riparian rights when they flow in defined or known channels ("defined" means a contracted or bound channel), although the course may be unascertained by human knowledge ("known" means knowledge, by reasonable inference, from existing and observed facts of the natural or preexisting condition of the surface). In West Virginia, all subterranean waters are presumed to be percolating waters until it is shown that they exist in a well-defined or known channel.

"Reasonable use" criteria are not established; the definition of what is reasonable use varies from case to case and encompasses both quantity and quality considerations. For example, the owner of land who explores for and produces subterranean percolating water within the boundary of his land is limited to a reasonable and beneficial use of such water, when to otherwise use it would deplete the water supply of a valuable natural spring of another on adjoining or neighboring land, and thereby materially injure or destroy such spring. Pence v. Carney, 58 W.Va. 296, 52 S.E. 702 (1905). Any injury that may result by interference with the natural flow of water which is incidental to a lawful and proper use of the property is damnum absque injuria. Henderson v. West Virginia Dept. of Highways, 9 W.Va. Ct.Cl. 182 (1972). To allow filthy water to percolate through the soil so as to injure the cellar and well of any adjoining property owner is an actionable injury. Weaver Mercantile Co. v. Thurmond, 68 W.Va. 530, 70 S.E. 126 (1911).

IX. Safe Drinking Water Act Amendments of 1986 - Wellhead Protection Areas

Section 205 of the amendments, effective June 19, 1986, contains provisions which require the state to establish wellhead protection areas. Section 1428 of the Act as amended now requires the state to adopt and submit its plan to the EPA Administrator within three years of the date of enactment of the amendments (by June 1989), detailing its program "to protect wellhead areas from contaminants which may have any adverse effect on the health of persons." Each state shall then make every reasonable effort to implement such protection program within two years of submitting its program to the EPA Administrator.

Wellhead protection area is defined as "the surface and subsurface area surrounding a water well or wellfield, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield. The extent of a wellhead protection area...necessary to provide protection from contaminants which may have any adverse effect on the health of persons is to be determined by the state in the program submitted." By June 1986, the EPA Administrator shall issue technical guidance to help the states in making such determinations.

The minimum requirements of each state program are outlined in the amendments and include:

1) the specific duties of state and local entities and public water supply systems under the program;

2) determination of the wellhead protection areas;

3) identification of all potential anthropogenic sources of contaminants, within each wellhead protection area, which may adversely affect human health;

4) description of program to protect the water supply within wellhead protection areas from such contaminants;

5) development of contingency plans to provide alternative drinking water supplies for each public water system in the event of contamination.

6) consideration of all potential sources of such contaminants within the wellhead area of new water wells serving a public water supply.

SDWA Amendments of 1986 - Other Provisions

Section 106 — Monitoring for unregulated contaminants; this amends Section 1445(a) of the SDWA to require every public water system to conduct a monitoring program for unregulated contaminants. States may show cause to add or delete contaminants from the list designated by the Administrator.

Section 201	Restrictions on underground injection of hazardous waste; this amends Section 1426 to require states to determine the applicability of revised monitoring methods, including ground water monitoring, to provide the earliest possible detection of fluid migration into or toward underground sources of drinking water from Class I injection wells, based on its assessment of the potential for migration from the injection zone that may be harmful to human health or the environment.
Section 203	Sole source aquifer demonstration program; this adds a new Section 1427 allowing any state or local planning entity that identifies a critical aquifer protection area within its jurisdiction to apply to the EPA Administrator for selection of such area for a demonstration program.

X. General Zoning and Land Use Planning Authorities

Local planning commissions have the authority to develop comprehensive plans and zoning ordinances, with the objective of improving health, safety, convenience, and welfare of citizens (§ 8-24-1 and § 8-24-39), and giving due consideration to such factors as water supply and sanitation requirements (§ 8-24-16). Comprehensive regional and statewide plans are authorized under § 8-25-1 et seq., and should address environmental protection and public services and facilities needs, among others.

The Chief of the Water Resources Division of the DNR has the authority to investigate and study problems relating to the water resources of the state and shal "make and formulate comprehensive plans and recommendations for the further development, improvement, protection, preservation, regulation and use of such water resources" (§ 20-5-5). Under § 20-5A-3, the Chief has the authority to study water problems and make recommendations, and "develop programs for the control and reduction of the pollution of the waters of the state." These broad powers seem to encompass general land use and zoning considerations.

Under § 16-1-7, the State Health Department has the authority to restrict any subdivision or development which might endanger the public health, sanitary condition of streams, or sources of water supply; this is certainly a potentially broad power of land use control.

Under § 22A-3-9(a)(11) and § 22A-3-18(b)(3), the Commissioner of the Department of Energy must make an assessment of the probable cumulative impacts of all

anticipated mining in the area on the hydrologic balance, and no permit may be approved unless the proposed operation has been designed to prevent material damage to the hydrologic balance. Under § 22A-3-22, the Commissioner can designate specific areas unsuitable for surface mining. Both of these statutes involve land use and zoning considerations. Section 22B-1-21 provides a zone of protection around water wells and dwellings by prohibiting the drilling of an oil or gas well nearer than 200 feet from a water well or dwelling without the written consent of the owner.

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Appendix III

GROUND WATER PROGRAMS AND ACTIVITIES ASSESSMENT

Revised, June 1987

TABLE OF CONTENTS

ACKNOWLEDGEMENT

This assessment of existing West Virginia programs related to ground water protection is the result of a cooperative effort of the following state and federal agencies:

WV Department of Natural Resources*
WV Water Resources Board
WV Department of Health*
WV Department of Energy*
WV Department of Agriculture*
WV Department of Highways*
WV Geological and Economic Survey
West Virginia University
WV Soil Conservation Committee
WV Office of Emergency Services
U.S. Environmental Protection Agency
U.S. Soil Conservation Service
U.S. Geological Survey
U.S. Department of Transportation
County Health Departments

*Agencies signatory to the Memorandum of Agreement.

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I. INTRODUCTION

This document represents a step in the development of a comprehensive ground water protection strategy for West Virginia. In it, an attempt has been made to present the status of ground water protection, with consideration given to potential sources of ground water contamination as well as to regulatory programs.

The present assessment has been limited to discussions of programs in the West Virginia Departments of Natural Resources, Health, Agriculture, Energy, and Highways, and the State Water Resources Board. Also included are brief descriptions of activities in the Public Service Commission, county Departments of Health, West Virginia University, the West Virginia Geological and Economic Survey, U.S. Geological Survey, and the federal Soil Conservation Service, Environmental Protection Agency, and Department of Transportation.

A number of sources of ground water contamination became apparent from reviews conducted in preparation for this report. In addition, several program needs also became apparent. These are not entirely definitive but are included mainly as guides for the preparation of a dynamic ground water protection strategy.

The laws of West Virginia are generally considered adequate to protect the ground water resource. However, in some instances this authority is not implemented through regulatory programs, or where regulatory programs exist, ground

water protection needs to be improved through a comprehensive approach, increased knowledge of the resources, better enforcement or increased funding.

In West Virginia, an effective ground water protection program needs a widespread public awareness of the importance of the ground water resource. A carefully designed public information and education program is essential, since many people across the state, including those in positions of leadership and responsibility, are often unaware of the importance of protecting ground water. Through an increased awareness, the state's comprehensive ground water protection strategy is more likely to succeed.

II. PROGRAMS/ACTIVITIES IN WEST VIRGINIA RELATED TO GROUND WATER PROTECTION

In West Virginia, activities concerned with ground water protection such as regulatory programs, information and education, and research are carried out by a large number of federal, state, and local agencies and institutions. Activity coordination is limited in extent and is commonly conducted on an informal basis.

As a result, on April 3, 1986 the West Virginia Departments of Agriculture, Energy, Health, Highways and Natural Resources signed a Memorandum of Agreement to develop a comprehensive ground water protection program for the state.

Information in this document is summarized in Table 1, which shows the relationship between agencies and institutions with ground water concerns, and sources of ground water contamination.

TABLE 1 – GROUND WATER CONCERNS IN W.Va.

	DNR	WRB	DH	DOE	DOA	DOH	WVGES	WVU	PSC	OES	EPA	SCS	USGS	DOT	CHD	?	
Solid Waste Landfills	●		●	●							●				●		
Open Dumps, etc.	●		●	●							●				●	●	
Hazardous Waste TSD	●										●				●		
Industrial Waste Mgmt.	●										●				●		
Injection Wells	●			●							●						
g.w. Strategy	●	●	●	●	●	●					●						
g.w. Data Management	●	●	●	●	●	●	●	●			●		●				
Municipal Waste Water Treatment	●	●	●								●				●		
On - Site Septic Systems, new			●								●				●		
On - Site Septic Systems, old			●								●				●	●	
g.w. Research							●	●			●		●				
Water Well Complaints	●		●	●	●	●		●		●	●				●	●	
g.w. Monitoring & Testing	●		●	●							●		●		●		
g.w. Standards	●	●	●	●	●	●					●						
g.w. Classification	●	●	●	●	●	●					●						
g.w. Regulations, Promulgation	●	●	●	●	●	●					●						
g.w. Regulations, Appeals	●	●	●	●	●												
Public Drinking Water Systems			●						●	●	●				●		
Private Water Wells, new			●								●				●		
Private Water Wells, old			●								●				●	●	
Porta - Potty Services			●								●				●	●	
Sink Holes	●										●				●	●	
Public Information & Education	●		●		●		●	●			●	●	●		●		
Construction Wastes	●		●								●				●	●	
Coal Mines & Wastes	●			●			●				●					●	
Oil & Gas Wells and Wastes	●			●							●					●	
Above/Below Ground Storage Tanks	●			●							●				●	●	
Agriculture	●				●			●			●	●			●		
Soils					●			●			●	●					
Pesticides					●			●			●				●		
Highway Drainage	●					●					●				●		
De-icing (road) Salt	●					●					●						
Transportation	●		●			●			●	●	●			●	●	●	
Funding											●						
Human Error	●		●	●	●	●		●	●	●	●			●	●	●	
Accidental Spills	●		●			●			●	●	●			●	●	●	

NOTE

Abbreviations are as follows:

DNR	WV Department of Natural Resources
WRB	WV Water Resources Board
DH	WV Department of Health
DOE	WV Department of Energy
DOA	WV Department of Agriculture
DOH	WV Department of Highways
WVGES	WV Geological and Economic Survey
WVU	West Virginia University
PSC	WV Public Service Commission
OES	WV Office of Emergency Services
EPA	U.S. Environmental Protection Agency
SCS	U.S. Soil Conservation Service
USGS	U.S. Geological Survey
DOT	U.S. Department of Transportation
CHD	County Health Departments
?	No Authority, inadequate authority, or unknown
g.w.	Ground Water
TSD	Treatment, Storage, and Disposal

II-A. DEPARTMENT OF NATURAL RESOURCES

The Division of Water Resources of the West Virginia Department of Natural Resources (DNR) carries out many of the ground water-related regulatory programs in the state. These programs, descriptions of which follow, are conducted in the Permits Branch and the Planning Branch. Other Division activities with ground water concerns include Field Operations, Laboratories, Ground Water/Underground Injection Control and Monitoring, as well as the Departmental Public Information Office. Unless otherwise noted, the primary legal authority for all DNR ground water protection activities is the Water Pollution Control Act, Chapter 20-5A of the West Virginia Code.

The Department of Natural Resources' Division of Waste Management also plays a role in the protection of ground water. Following are descriptions of the duties and legal authority of both Divisions.

DIVISION OF WATER RESOURCES

Ground Water and Underground Injection Control Office

The Underground Injection Control (UIC) program regulates the subsurface placement of fluids under Series IX of the Water Resources Board Regulations. The Department of Natural Resources has been designated the lead agency for the Underground Injection Control program. The Department of Energy has the responsibility for regulating Class II well activity in cooperation with the Department of Natural Resources. Wells used for underground injection are classified according to the type of fluid being injected, as follows:

Class I wells are used to inject hazardous, municipal, and industrial wastes beneath the lowest known underground source of drinking water.

Class II wells are used to inject brine for the enhanced recovery of oil or gas, for the disposal of produced fluids (mostly brine) in connection with oil or gas production, or for the storage of liquified hydrocarbons.

Class III wells are used for injecting water or other suitable solvent for the extraction of minerals (solution mining).

Class IV wells are used for the disposal of hazardous (including nuclear) wastes into or above underground drinking water sources. Class IV wells are currently prohibited in West Virginia.

Class V wells are all those which do not fall into Classes I through IV. Examples include ground water recharge wells, and abandoned deep mines into which coal slurry is deposited.

There are no known Class I or Class IV wells in the state. In the Class II category, there are 85 brine disposal wells and about 700 wells for enhanced recovery. The two known Class III facilities, which include 15 wells presently in use, have a low potential for ground water contamination since they inject into relatively non-leaking formations. More likely sources of pollution at this time, besides Class II wells, are certain types of Class V wells, such as dry holes receiving sewage, and percolation holes drilled for disposal of highway runoff into karst formations. A recently completed assessment of Class V wells indicates that there are 83 plus wells of this class in West Virginia.

Since the Underground Injection Control program regulates any material that may be deposited or injected into the earth, it, therefore, shares a concern for the same type of pollutants that are regulated by the hazardous waste management program and the solid waste management program.

Control is exercised in the UIC program through permits for the construction and operation of injection wells. Permit requirements of owners or operators include annulus monitoring and periodic pressure testing in order to detect leakage of injected fluids into the ground water. In addition, performance standards call for fresh-water protective casing, definition of injection zones, and a limit to the maximum

allowable injection pressure. They also prescribe abandonment procedures. These requirements are presently considered adequate for the detection and prevention of ground water pollution. Each well is evaluated individually and specific requirements, e.g. for ground water monitoring, are imposed where they are deemed necessary.

Underground Injection Control staff make site visits to perform inspections and to update the injection well inventory. In addition, they cooperate with the Departments of Health and Energy in investigating water well complaints which may be injection-related.

Opportunities for improvement include the need to determine the status of all injection wells in the state. There may be a few wells unknown to the Underground Injection Control program and, therefore, unregulated.

Permits Branch

Municipal Permits Section

The Municipal Permits Section issues West Virginia National Pollutant Discharge Elimination System (WV/NPDES) permits for publicly-owned treatment works (POTWs) and privately-owned sewage treatment systems. These permits are issued in accordance with Chapter 20-5A-5 of the Code of West Virginia. Permits for proposed systems are issued in cooperation with the West Virginia Department of Health, which issues Certificates of Approval. These Certificates are for the construction phase only.

The impact on ground water from the 300 or so affected facilities is minor. Disposal of sludge from POTWS, however, occasionally presents problems. Sludge management will be addressed in new solid waste rules.

Industrial Permits Section

The Industrial Permits Section issues and enforces WV/NPDES permits for more than 20 industrial source categories, including the following: steam electric, petroleum refining, iron and steel, aluminum forming, non-ferrous metals manufacturing, organic and inorganic chemicals, printing and publishing, and textile mills. In addition, the Section issues State Water Pollution Control permits for industrial landfills and spray irrigation systems.

With respect to ground water pollution, the Section is concerned with the treatment and disposal of non-hazardous (but potentially toxic) industrial wastes and "other wastes" by landfilling, land application, and spray irrigation. It also regulates potential or actual discharges from industrial waste impoundments. Materials controlled include anything that could leach or leak into ground water from the facilities and activities listed above. Industrial wastes and other wastes are specifically defined in Chapter 20-5A-2(h) and (j) of the Water Pollution Control Act.

Regulation is exercised by requiring the installation of ground water monitoring wells along with the maintenance of a quarterly and annual monitoring program, by conducting field inspections and taking samples, and by issuing Administrative Orders or taking civil action to stop pollution or to take necessary corrective and remedial actions. Specific requirements under the permits and Orders, besides monitoring, include liners, appropriate cover material, surface water diversion, and any other means to prevent or mitigate ground water pollution.

One need of the industrial waste program is for the services of a well-equipped, well-trained ground water monitoring team to do compliance sampling.

Planning Branch

A state ground water protection strategy, as authorized by Section 106 of the Federal Clean Water Act, is being developed in the Planning Branch. This document has been prepared in support of the ground water protection strategy, which has the following goals:

1. Creation of a coordinated interagency ground water management plan through assessment of existing programs, elimination of overlapping responsibilities, initiation of programs now lacking, and resolution of institutional obstacles.

2. Generation of a ground water data management system, which will be a uniform repository of information now maintained in different formats by different agencies.

3. Promotion of a public information and education program, to stimulate public awareness of the importance of ground water. Workshops; media events such as television presentations, news releases, slide shows, and lecturers; and educational materials are being planned.

As the state's ground water protection activities progress, the strategy will be updated to reflect new ground water protection objectives.

Field Operations Branch

This Branch oversees the activities of 33 water resource inspectors around the state whose activities include:

-conducting compliance evaluation inspections and performing other routine duties.
-responding to reports of accidents and spills.
-investigating surface and ground water complaints.

Reports and other information from inspectors in the field are directed to the appropriate Branches in the Division. Field Operations inspectors collaborate with county sanitarians as well as field representatives of other DNR Branches, the Department of Health and the Department of Energy.

To be more effective in the protection of ground water, the Field Operations Branch has the following needs:

1. In general, the present emphasis of the Branch, with regard to personnel selection, training and daily activities, is oriented to surface water. Therefore, basic ground water training would be of benefit.

2. Current ground water contamination incident reporting procedure, both within the Branch and between agencies (i.e. Department of Natural Resources, Department of Health and Department of Energy), does not provide a

clear picture of the number of incidents, areas of ground water affected, causes of contamination, etc. As a result, a ground water contamination incident reporting procedure should be developed cooperatively between the agencies to ensure consolidation of information.

3. Current manpower resources are not sufficient for the existing workload. Additional staffing will be needed for ground water involvement.

Monitoring Branch

The Monitoring Branch is divided into the Compliance Section and the Biological Section. Compliance inspectors collect water samples from various facilities, including those with ground water monitoring wells. Biologists conduct aquatic surveys and perform fish tissue analysis and toxicity testing.

The Monitoring Branch circumstances are very similar to those of the Field Operations Branch, i.e. present emphasis is primarily on surface water. Accordingly, their needs are:

1. Basic ground water training.
2. Ground water monitoring equipment, methods and procedures.

Laboratories Branch

The Laboratories Branch analyzes samples submitted by Field Operations, Monitoring and others. It is reasonable to expect that analysis of some ground water samples may exceed current capability. Therefore, a determination must be made of equipment, methods, procedures, etc. necessary to test ground water samples. Additionally, the current workload exceeds staffing. More laboratory personnel will be needed to handle workloads resulting from increased ground water sampling.

Public Information Office

The Public Information Office is responsible for disseminating departmental information (including information concerning ground water) to the general public. The Public Information Office has a major part in ground water protection, since it is responsible for one of the three tasks in the program's development. Ground water activities include:

1. Publicizing open meetings and seminars on ground water issues.
2. Giving talks on ground water protection to school children and other groups.
3. Preparing news releases, especially on government activities affecting ground water.
4. Publishing newsletters and short pamphlets.
5. Preparing educational materials, such as slide shows.
6. Providing photographs, graphic and editing services.

DIVISION OF WASTE MANAGEMENT

Hazardous Waste Management Section

This Section regulates the generation and the storage, treatment, and disposal of hazardous wastes in surface impoundments, landfills, waste piles, tanks, containers, and incinerators.

Legal authority for the Section's activities is the West Virginia Hazardous Waste Management Act, Chapter 20, Article 5E. This act and subsequent regulations is based on the Federal Resource Conservation and Recovery Act (RCRA), Subtitle C. The regulatory program is guided by a "cradle to grave" philosophy for the management of hazardous waste to protect human health and the environment. This program incorporates an anti-degradation ground water policy (regulations of the Water Resources Board, Series I, Section 4) which prohibits significant increases in contaminant levels above existing or background levels. Hazardous wastes and hazardous waste constituents listed in Section 3 and Appendix VIII of the West Virginia Department of Natural Resources Hazardous Waste Managment Regulations are regulated.

In July 1987, records revealed that there are 128 hazardous waste generators in West Virginia. Thirty (30) of these facilities are also classified as Treatment, Storage, and Disposal (TSD) facilities, nine (9) of which are operating land disposal facilities required to have extensive ground water monitoring programs. Initially, there were 53 operating TSD

facilities, 26 of which were for land disposal. Of these, 14 have been shown to have ground water contamination from hazardous waste regulated units. Several others have been shown to have ground water contamination from other sources. Because of various federal and state regulatory requirements, 23 TSD facilities have closed or are going through closure and are no longer operating. Land disposal facilities which are closed or are closing, and cannot meet the demonstration for clean closure, will be required to have a post-closure permit and continuous ground water monitoring for 30 years.

For those facilities still operating, the hazardous waste managment permitting program imposes stringent requirements for all TSD activities. The permit specifies the details of liners, leachate detection systems, number and location of monitoring wells and other specific construction and operating requirements necessary to protect human health and the environment. Performance requirements in the permit may prescribe such things as inspections, monitoring plans, waste storage and handling practices, quality assurance plans, emergency response capabilities, and corrective-action measures to be taken upon detection of releases of hazardous waste, or upon detection of ground water contamination from the release of hazardous waste.

There is room for improvement in the following areas:

1. Need for better coordination between the Department of Natural Resources and the Department of Health when

hazardous wastes are detected in underground drinking water sources. The result could be a more timely and coordinated problem resolution on incidents of this type.

2. Need for more emphasis on the reduction of the volume of generated hazardous wastes (waste minimization).

3. Need for a stronger enforcement posture for all releases of hazardous waste and a uniform corrective action program.

Solid Waste Section

The solid waste management program administered by the Solid Waste Section, regulates non-hazardous waste landfills which receive such materials as domestic garbage and trash, construction waste, land-applied sludge and other non-hazardous waste.

There are about 65 permitted solid waste landfills, including permitted municipal facilities both operating and closed. A significant increase in the number of these facilities is expected within a few years. A very serious problem is the existence of more than 2,000 unpermitted open dumps, and countless thousands of roadside or "promiscuous" dumps.

The solid waste management program depends on the Solid Waste Management Act, Chapter 20-5F of the code, for its legal authority. General provisions are also found in Chapter 20-5A. Under this authority, the Section published in November 1984 a two-part set of Instructions to Applicants for Solid Waste Facility Permit for Sanitary Landfills. The solid waste management program is presently being reviewed and strengthened. The Department is now drafting new regulations.

Concerns include leachate from garbage and sludge, and other conventional and nonconventional pollutants that are occasionally present in landfills and dumps.

Some of the permit requirements are specific performance standards (such as requirements for earth cover, equipment

maintenance, and record-keeping); however, at this time, most of the controls are general.

Program needs include the following:

1. Higher level of funding and other resources to effectively implement existing authorities and program requirements.

2. Regulations on remedial requirements at sites where ground water contamination is present, and regulations to set design standards in order to minimize ground water contamination from landfills and land application sites.

3. More attention given to cleaning up unpermitted open dumps and roadside trash piles. This activity should be coordinated with the new anti-litter efforts and legislation.

Underground Storage Tank Program

This program is responsible for receiving notification forms from owners and operators of underground storage tanks in West Virginia, and for compiling an inventory of notifiers. State regulations to prevent and deal with leaking underground storage tanks and piping are needed and will be developed in the future.

Small Quantity Generator Assistance Program

There are an estimated 5,000 small quantity generators of hazardous waste in West Virginia. A small quantity generator is defined as any business or facility that generates less than 2,200 pounds of hazardous waste per month. Examples include dry cleaners, printers, auto body shops, photographic developers, wood preservers and refinishers, and gasoline stations. The Small Quantity Generator Assistance Program provides technical and practical assistance to small businesses affected by hazardous waste legislation. There is a need for continued and widespread education of affected businesses which may fall into the small quantity generator category.

II-B STATE WATER RESOURCES BOARD

The State Water Resources Board (WRB) is an independent agency of state government. In accordance with Chapters 20-5A and 29A-1-1, et seq., it is responsible for promulgating regulations to protect "the waters of the state" (which includes ground water). Regulations that the Board writes include standards of quality for the waters of the state (surface water standards were published in Series I of the WRB regulations), and rules to facilitate the state's participation in the National Pollutant Discharge Elimination System (NPDES) under the federal Water Pollution Control Act. Solid and hazardous waste regulations, however, are promulgated by the Director of the Department of Natural Resources, not the Water Resources Board. The Water Resources Board has the authority to establish a ground water resource management framework, and associated standards and regulations.

The Board also functions as an appellate body to rule on appeals of Orders and other actions of the Chief of the Division of Water Resources. The Water Resources Board recently ruled that the Division of Water Resources did not have the authority to require ground water monitoring under the federal/state combined NPDES permit program. This is a serious setback to the Division's authority to identify, control and correct ground water pollution.

Chapter 20, Article 5A, Section 1 of the West Virginia Code sets forth the policy to be followed in protecting the

waters of the state, which includes both surface and ground waters. For surface water, this policy is implemented through a resource management framework consisting of a classification scheme, standards (both numerical and narrative) and regulations. There is, however, no similar management framework for implementing this policy for ground water. Therefore, there is a need to develop and implement a resource management framework for ground water.

II-C DEPARTMENT OF HEALTH

The West Virginia Department of Health is responsible for protecting sources of drinking water, and ensuring the proper treatment and safe disposal of water-borne human wastes. The legal authority for these responsibilities is Chapter 16-1 of the West Virginia Code.

There is a distinction in the jurisdiction over water between the Department of Health and the Department of Natural Resources. The Department of Natural Resources is concerned with preventing pollution to the waters of the state. The Department of Health is concerned with protecting and providing safe drinking water for the public, as well as other environmental and human health concerns. With respect to ground water, the Department of Health carries out its responsibilities mainly through two Divisions, whose duties are described below.

ENVIRONMENTAL ENGINEERING DIVISION

This Division regulates all drinking water wells, public and private, regardless of size. Its activities include the following:

1. Promulgation of regulations and design standards for public and private water wells and public water well systems.
2. Enforcement of drinking water regulations and standards on all 2,400 public water supply systems,

which includes about 2,000 ground water supplies. A public water supply system is defined as a system which has 15 service connections or serves at least 25 persons per day for 60 days or more each year.

3. Issuance of permits (construction and operation) for public water supply systems. Approximately 120 construction permits per year are issued to public water supplies. Of these permits, over 50% are related to ground water systems. The Department maintains a large file of public water supply data, which is constantly being updated. Permits are also issued for sewage system construction for those systems not covered by the Construction Grants Branch of the Department of Natural Resources. Over 140 permits of this nature are granted each year. Local health department sanitarians issue over 5,000 septic tank construction permits every year.

4. Assurance of proper operation of public water supply systems by training and certifying operators.

5. Certification of water well drillers. Training by the staff is available prior to examination of water well drillers. Over 430 drillers are currently certified to drill water wells in West Virginia. A Water Well Advisory Board has been established to provide guidance on issues relating to the drillers certification program and water well regulations and standards.

6. Collection and management of data from water well applications, logs, permits, and well completion reports from the approximately 6,000 water wells drilled each year. Since new water well regulations were promulgated, a detailed file has accrued on all water wells drilled in the state since September 1984.
7. Collaboration and consultation with county health departments in private water well-related matters.
8. Technical assistance to county health departments, consulting engineers, cities, public service districts, industries (coal mining in particular), individuals, and school systems. This assistance and advice may cover the following topics: site selection, treatment processes, chemical and microbiological sampling, testing, sources of funding, operator training, and problem resolution. The staff depends heavily on analysis conducted by the three Department of Health laboratories (State Hygienic, Environmental Health Services, and Industrial Hygiene Laboratories) to provide information necessary to verify and resolve problems. the State Hygiene Laboratory analyzes approximately 16,250 microbiological samples for ground water yearly; the Industrial Hygiene Laboratory conducts approximately 90 radiological tests; and the Environmental Health Services Laboratory checks over 36,000 chemical

parameters on approximately 1,800 samples of ground water yearly.

PUBLIC HEALTH SANITATION DIVISION

The Public Health Sanitation Division is responsible for the approval of all on-site septic systems and the certification of installers. It also provides assistance in emergency and disaster conditions.

The Department of Health is concerned about a number of threats to underground drinking water sources. They include the following:

-Polyacrilamides used in processing operations (exclusive of drinking water).

-Destruction or alteration of water supplies by surface and deep mines, and by oil and gas wells.

-Well head and well field protection.

-Percolation holes in the eastern panhandle used for highway drainage.

-Pollution from construction.

-Hazardous and solid waste disposal sites.

-Chemical spills, like one that occurred in a well field near Point Pleasant in 1977.

-Volatile organic chemical (VOC) contamination.

-Effluent from sewage systems.

-Pesticide contamination.

-Inorganic chemical contamination.

-Leaking underground storage tanks.

-Salinity.

-Sanitation problems in deep mines.

-Radiological contamination.

Bacteriological, chemical, and radiological analyses of drinking water are done by Department of Health laboratories. For private wells, the services are available on request. For public supplies, testing is done before a permit is issued, and also as part of the regular inspections. The Department uses the National Interim Primary Drinking Water Regulations, incorporated into the WV Public Drinking Water Regulations, as the standard for chemical contaminants. The U.S. EPA has set maximum contaminant levels (MCLs) for 17 primary chemical contaminants that are linked to health effects, and soon it will establish MCLs for an additional 83. The Department cooperates with other agencies, especially the Department of Natural Resources, in matters affecting drinking water supplies. To enforce its regulations, the Department of Health has the power to issue Administrative Orders, conduct hearings, and take action through the court system.

Program deficiencies and needs that have been expressed include the following:

1. Increased legal services. The entire Department of Health has half-time access to one attorney in the Attorney General's Office.

2. Additional funding. Resources available are barely adequate for existing programs.

3. Stronger enforcement provisions.

II-D. DEPARTMENT OF ENERGY

The Department of Energy (DOE) was organized in the summer of 1985, primarily for the purpose of streamlining the regulation and permitting of the coal and petroleum industries in West Virginia. It was created from the old Department of Mines and the Reclamation Division of the Department of Natural Resources.

New statutes were written to define the structure, authorities, responsibilities, and other activities of the new Department. Old laws referring to disbanded agencies were changed and incorporated into the new laws; however, environmental considerations were retained. A new Chapter 22 describes the Department of Energy; Chapter 22A concerns mining (mainly coal); and Chapter 22B is involved with oil and gas. The Department is divided into two Divisions. They are Mining and Minerals, and Oil and Gas.

DIVISION OF MINING AND MINERALS

Mining activities are the major concern of this Division. According to a 1986 report, there were the following number of permitted mines in the state:

Type	Number Active	Number Inactive
Underground Coal	388	398
Surface Coal	381	245
Non-Fuel Mines and Quarries	88	26

There are thousands of abandoned mines, some of which are used as water sources. Others are used as dumps.

Surface and deep mine operators are now required to take steps to prevent or minimize ground (as well as surface) water contamination, and to prevent changes in the level or quantity of ground water available both on and off the mine site. Land subsidence must also be controlled. The DOE can require mine operators to restore or replace the water supply of a property owner which has been adversely affected by mining activity. Permitting requirements for mines also provide for ground water monitoring. DOE enforcement powers include the right to issue cessation Orders (for instance, when an operation causes or may cause "imminent or significant" harm to water resources), revoke permits, and impose civil and criminal penalties for violations. Citations for violations of DOE regulations are issued on an almost daily basis. Most of these are for safety violations; few are for causing water pollution.

Ground water problems with which the Division is concerned include aquifer depletion, acid drainage, coal mining refuse, and specific pollutants covered under state water quality standards and NPDES permit requirements. These are sulfates, acids, iron, manganese, and suspended solids. Acid mine drainage is mainly a problem in the northern coal fields. In the south, the major pollutants of concern are iron, manganese, and suspended solids.

The Division cooperates with federal and other state agencies concerned with mining issues, environmental protection, safety, wildlife, and preservation of cultural and scenic resources.

DIVISION OF OIL AND GAS

The Division of Oil and Gas regulates oil and gas production wells and, in cooperation with the Department of Natural Resources, Class II injection wells used for enhanced recovery of oil and gas and for disposal of produced fluids (brine). Section 22B-1 contains requirements for ground water protection. Enforcement powers are similar to those retained by the Division of Mining and Minerals, except that they apply to oil and gas well operators. There are about 50,000 operating oil and gas wells in the state. It is estimated that another 20,000 abandoned wells exist, for which there are no records.

In order to obtain a permit, a well operator must install protective casing to keep oil, gas, surface water, and salt water from contaminating fresh water aquifers. Special protective procedures must also be observed in enhanced recovery operations, and in the abandonment of non-producing wells. Ground water monitoring may also be required.

The Division of Oil and Gas believes that locating abandoned oil and gas wells is the number one priority relative to the protection of ground water.

In conclusion, the Department of Energy's ground water concerns and protection needs are listed below:

1. A greater emphasis for protecting ground water is needed by the Department when issuing permits for the production of coal, oil, and gas.

2. Need for a public ground water education program.

3. Need for increased knowledge of technology to remedy ground water damage.

4. Need for improved information and knowledge of ground water flow and the extent of aquifers.

5. Need for a consolidated ground water data management system.

6. Need for more ground water hydrologists.

7. An assessment of the state's abandoned oil and gas wells needs to be completed to determine their location, effect on ground water and method of clean-up.

II-E. DEPARTMENT OF AGRICULTURE

Pollution from nonpoint sources and agricultural chemicals are the primary concerns of the State Soil Conservation Committee (SCC) and the Plant Pest Control Division, respectively, of the West Virginia Department of Agriculture. The Department cooperates with the Soil Conservation Service (SCS) of the U.S. Department of Agriculture, as well as the West Virginia Department of Natural Resources, and other state agencies. It maintains close contacts with farmers across the state through many programs, of which the following are examples:

1. Information services such as the Market Bulletin, a twice-monthly publication; radio and TV programs; news releases; and other information sources.
2. Advisory services which provide assistance with farm ponds, erosion control, and other matters.
3. Animal and plant health services, including advice and regulation of pesticides.

Ground water concerns include wastes from milk houses; vehicle and equipment wastes such as used lubricants and antifreeze; dead animal and plant material; above- and below-ground storage tanks, especially those used for bulk pesticides; and fertilizer use and storage. Animal waste (manure from barns and feed lots) is a special concern. In

karst areas, concrete-lined holding facilities are strongly recommended. Limited funding assistance from federal sources is available, but these facilities cost between $15,000 and $60,000 each. When pollution of waters of the state occurs from agricultural activities, the Department of Natural Resources then has the responsibility for protecting the waters of the state from pollution.

The Plant Pest Control Division is concerned with taking samples of products and residues; stream monitoring; record-keeping requirements; inspections; standards for powerline and railroad right-of-way spraying; and pesticide applicator training and certification. There are about 12,000 pesticide applicators around the state who must apply for recertification every three years. Most of these are farmers, but some are commercial operators who are placed in any of 14 commercial categories. Since pesticide labels are considered to be legal documents for federal as well as state purposes, product misuse is a prosecutable offense.

A high level of voluntary compliance with the rules and guidelines has been observed, especially by commercial firms. This is a true success story in view of the fact that there are only three inspectors in the program who must cover the entire state. Another success story concerns picloram training sessions, which resulted in a reduction of tordon-type stream residues. Approximately 30 percent of samples taken in September 1983 tested positive for tordon, compared to less than two percent of samples collected in August 1985.

Agricultural and soil conservation ground water needs are as follows:

1. Need for stronger enforcement and better coordination with the Department of Natural Resources' Division of Water Resources.

2. Need to convince the judicial system of the seriousness of pesticide violations.

3. A vast need for public ground water protection educational programs, especially tailored to West Virginia farmers.

4. Need for greater inter-agency cooperation in all aspects of ground water protection.

II-F. DEPARTMENT OF HIGHWAYS

The primary ground water protection concern of the Department of Highways (DOH) is de-icing salt control. In this state, more calcium chloride is used for this purpose than sodium chloride. Under the jurisdiction of the Maintenance Division, and at the urging of DNR's Division of Water Resources due to water quality related problems, the DOH has initiated a program of building storage sheds to protect the road salt from weather. Until recently, it has been piled up in highway maintenance yards or covered with large tarps. Less salt is now applied to roads in the winter for economic reasons.

Another concern is highway runoff control. About 20 years ago, percolation holes (dry wells) were drilled in karst areas to drain rain water into porous limestone formations. Sinkholes were also used as drains. The DOH is now diverting runoff away from sinkholes and percolation holes as these situations are discovered and as funds become available. In Mercer County along US Route 460, two million dollars in federal Appalachian Corridor funds have already been expended in this project . In Berkeley County, some percolation holes have become clogged with trash and sediment, which has rendered them useless as drains. Minor flooding has been the result. In one case, fire truck pumps and hoses had to be used to clear a low-lying intersection.

In other matters, leaking underground fuel tanks in maintenance yards are a major concern. A manual has been prepared for use by Department personnel which lists guidelines for monitoring leaks and replacing faulty tanks. For sediment control in highway construction, the DOH is guided by (among other sources) a handbook published by the Soil Conservation Service.

Chapter 17-23 of the West Virginia Code provides the legislative policy for regulating salvage yards as being, "the safety and recreational value of public travel" and preserving "natural beauty." The term "salvage yard" as used in Chapter 17-23 includes in part the keeping and processing of salvage, maintenance of motor vehicle graveyards, garbage dumps and sanitary landfills. This policy does not address protection of the waters of the state. However, the legislative policy, Chapter 17-24, beyond regulating junk and abandoned vehicles, does include consideration for public health, safety, and general welfare, public nuisance and hazards.

Drinking water supplies and septic systems in rest areas, toll booths, maintenance fcilities, and other Department of Highways facilities are maintained the the Highway Services Division under permits from the Department of Health and the Department of Natural Resources. The Highway Services Division is also concerned with accidents involving hazardous materials, although its primary responsibility is protection of the traveling public.

The West Virginia Turnpike is administered by the West Virginia Turnpike Commission, which is independent of the Department of Highways. Its ground water concerns are similar, however.

The Department of Highways is responding to most of their activities that could cause ground water contamination. The only activity of concern is whether the state's management of salvage and junk yards is adequate to protect the waters of the state. The authority to resolve this concern is limited. However, county planning commissions are required to permit salvage facilities before being issued a license by the Department.

II-G. OTHER AGENCIES AND INSTITUTIONS

The agencies and institutions whose activities are discussed here do not, except in a few instances, exercise regulatory authority with regard to ground water protection.

County health departments issue permits for private water wells and septic tanks. They also provide a wide range of health services to the public. They are concerned about many of the same types of threats to ground water as the state Department of Health and Department of Natural Resources; however, sanitarians are close to local problems and are therefore valuable sources of information. In Berkeley and Jefferson counties, concerns include agricultural pollution, faulty septic tanks, badly installed and improperly abandoned water wells, leaking underground storage tanks, highway drainage into karst formations, hazardous wastes, and pesticide abuse. Their needs include increased staff, increased funding, improved understanding of health and environmental concerns by county commissioners, and a need for better state health laboratory facilities.

The West Virginia Public Service Commission, the Office of Emergency Services, and the U.S. Department of Transporatation are concerned with the safe transport of substances capable of polluting ground water. When accidental spills occur that involve such substances, local law-enforcement agencies, emergency health care units, and fire departments may be called upon. Ground water contamination can be worsened in some

instances, as when firemen hose down certain spilled materials. The predominant need is to make more information available, especially to local authorities, concerning what substances are being moved, and how to manage and coordinate accidents involving these substance.

The U.S. Environmental Protection Agency (EPA) provides assistance and funds for ground water protection. Primary statutory authorities include the Clean Water Act, the Safe Drinking Water Act, the Resource Conservation and Recovery Act (RCRA), the Water Pollution Control Act, and The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or the Superfund law. EPA's main contribution to ground water protection is support for ground water protection strategy development and implementation, and for the Underground Injection Control program. In addition, the agency supervises and funds cleanup efforts at Superfund sites. The predominant need in West Virginia is a higher level of funding.

The Soil Conservation Service (SCS) of the U.S. Department of Agriculture is concerned with the preservation of soil quality. Fourteen Soil Conservation Districts around the state provide services to farmers "...and others who needed to disturb land, but who want to conserve soil...". The SCS works closely with a number of state agencies. In October 1985 and April 1986, the SCS Resource Conservation and Development Association coordinated a number of ground water conferences around West Virginia.

Ground water research is conducted by the U.S. Geological Survey (USGS), the West Virginia Geological and Economical Survey (WVGES), and state universities and colleges.

The USGS is mainly concerned with the collection, interpretation, and dissemination of information regarding the quantity and quality of ground water and surface water. In cooperation with WVGES and DNR, an 11-part series of ground water hydrology atlases have been published covering the entire state. The USGS publishes an annual national water summary with ground water information for each state.

The WVGES is "West Virginia's information center for geology, energy resources (coal, oil, and gas), economic minerals, topographic maps, and ground water... Speakers, displays, and assistance with symposia are available for some topics." Publications, copying, computer time, and analytical services are available for nominal fees.

At West Virginia University (WVU), research in ground water and related topics is loosely coordinated by the Water Research Institute. Specific research interests include ground water impacts of mining and oil and gas activity, ground water quality and quantity, pathogenic contamination of springs and wells, the fate of herbicides in soil and ground water, stream basin hydrology and modeling, and other topics. The National Small Flows Clearinghouse at WVU provides advisory services on innovative and alternative technologies for small-volume waste water treatment. And, the WVU Cooperative Extension Service trains pesticide operators, advises farmers on prudent

fertilizer and pesticide usage as well as other ground water concerns, conducts soil analyses, and provides public information and education programs on ground water protection and contamination abatement.

III. SOURCES OF GROUND WATER CONTAMINATION

Up to this point, ground water protection activities in West Virginia have been described from the point of view of the government agencies concerned. The picture is made more realistic with the inclusion of a perspective on activities that may cause ground water contamination.

It is important to keep in mind that no regulatory program is completely effective. Adequate resources are simply not available at this time to support rigorous regulations and enforcement of ground water policies.

In general, the degree of ground water protection depends on the nature of the source, as well as the vigor with which control is exercised by the governmental authority concerned. Highly concentrated and visible sources, like municipal waste water plants and hazardous waste landfills; and new, well-funded regulatory programs staffed with motivated personnel, usually result in a high degree of control. A spirit of cooperation, as cultivated by the Department of Agriculture in its voluntary programs with farmers and pesticide vendors, is also conducive to ground water pollution prevention. On the other hand, the combination of a large number of dispersed sources such as gas wells and septic tanks; and resource-poor, under-staffed programs with other priorities than protecting ground water, can result in a high potential for uncontrolled contamination.

Following is a list of the known sources of ground water pollution in West Virginia. They are grouped into three categories according to the degree to which they are considered to be regulated.

Well-Regulated Activities

-Municipal Waste Water (sewage) Treatment Facilities. These are controlled through joint WV/NPDES permits issued by the Department of Natural Resources and construction certificates issued by the Department of Health.

-Underground Injection Wells. The UIC program is generally effective in controlling most underground injection wells. Some oil and gas-related (Class II) and miscellaneous (Class V) wells, however, may need attention.

-Hazardous Waste Facilities. Treatment, storage and disposal are well-regulated under the hazardous waste management program.

-Large Industries. Industrial wastes are regulated by the Industrial Permits Section of DNR's Division of Water Resources. In addition, manufacturing processes are usually under internal control through company-managed safety, efficiency, and public relations policies.

-Highway De-Icing Salt. Road salt is for practical purposes completely under the control of the Department of Highways. The DOH is making progress, at the urging of DNR's Division of Water Resources, in putting salt storage piles under cover and, for the sake of economy,

now uses less salt on the roads than it did in the past. Even though there have been some ground water-related problems, the program is considered under control.

Under-Regulated Activities

The following sources are under-regulated because of a lack of inspectors, sanitarians, and other resources:

-Domestic Septic Systems. Many are old or improperly installed. Few receive adequate maintenance.

-Small Community Waste Water Systems (package plants) need better operations and maintenance procedures.

-Septic Tank Cleaners and Portable Toilet Service Operators. Most of these allegedly dump their waste at municipal waste water plants; however, some may use improper disposal methods.

-Coal Mines. Impoundments (slurry lagoons), refuse piles (tailings), coal storage areas, coal processing plants, abandoned mines, and surface mines being reclaimed are spread out over much of the state. These facilities are under-regulated because (a) coal mining inherently results in unavoidable ground water contamination, (b) in the Department of Energy, ground water protection occupies a lower priority than other concerns, and (c) there are not enough inspectors with training and experience in ground water protection.

-Oil and Gas Wells. Active and abandoned petroleum production facilities are, like coal mines, dispersed over large parts of West Virginia, and ground water protection

is a low priority concern. A few oil and gas well drillers have disregarded the regulations, for instance, by failing to install fresh water protective casing. Leaking brine pits and some Class II injection wells may also be under-regulated sources of ground water pollution.

-Transportation of Materials. All kinds of materials, includ ing hazardous and non-hazardous substances capable of polluting ground water, are moved through West Virginia continuously. The potential for spills is high, due not only to the state's rugged terrain, but also to the fact that training programs, inspection, and enforcement are either inadequate or spread too thin.

-Class V Injection Wells. Class V is the miscellaneous category. It includes everything from non-polluting ground water recharge wells to abandoned mines receiving coal wastes, to dry wells and percolation holes into which almost everything (dead animals, sewage, highway runoff, etc.) can be placed.

-Agricultural Operations. Prevention of pollution due to the use, storage, and transport of agricultural chemicals depends largely on voluntary compliance by farmers, vendors, pesticide applicators, and manufacturers. However, the potential for abuse is very real, especially in the karst areas in the eastern part of the state where pollutants can enter the ground water very quickly. Of special concern are erosion and sediment, drainage from areas treated with pesticides and fertilizers (including tree farm nurseries where methyl

bromide is used as a biocide), and pollution from feedlots, barns, and manure storage.

-Construction. Scrap materials, sediment, chemicals, and other wastes can contaminate ground water from sites where buildings, highways, and dams are under construction. Economic considerations frequently dictate inattention to environmental protection.

-Solid Waste Landfills. These have been severely under-regulated in the past; however, with recent improvements in the solid waste management program, ground water problems are being addressed.

-Small Industries. Users and disposers of potential ground water pollutants such as dry cleaners, automotive repair shops, hospitals, food processors, supermarkets, military facilities, sawmills, etc. Rules for small quantity generators of hazardous waste are listed in Section 10 of the recently revised Hazardous Waste Management Regulations, however, these resources are still relatively uncontrolled in West Virginia.

-Open Dumps, Promiscuous (Roadside) Dumps, and Junkyards.

-Underground Storage Tanks and Pipelines. Federal regulations are being developed for privately-owned active as well as abandoned tanks.

-Pesticides, fertilizers, cleaners, and automotive products stored or abandoned in basements and garages, and improperly discarded containers.

Unregulated Activities

The following sources are either largely uncontrolled or are currently disregarding ground water protection measures:

-Certain Sewage Sludge Disposal Activities. Sludge is often given away to farmers and homeowners with no warnings or restrictions as to its safe and proper use.

-Certain Agricultural Operations. These include dry and liquid chemical storage, vehicle maintenance and wastes, and disposal of animal and plant waste materials.

-Aquifer Dewate ing. Due to pumping of deep coal mines and other withdrawal activities.

-Sink Holes. When used as dumps for dead animals, sewage, runoff, consumer products and other contaminating materials.

-Substandard Water Wells. Wells with leaky casings or covers, dug wells, and improperly abandoned wells.

-Abandoned Oil and Gas Wells. This category includes improperly abandoned wells and wells from which the casing was pulled during World War II to be sold for scrap.

-Urban Run-Off.

IV. CONCLUSION

In conclusion, the purpose of this Assessment has been achieved, in that it identifies present ground water concerns and improvements needed to reach a comprehensive West Virginia ground water program. It is now the function of the state ground water management strategy to establish the priorities for addressing these concerns and needs. The strategy itself is long range and dynamic, and is subject to revision as concerns/priorities arise, and knowledge about the state's ground water resource is expanded.

STATEMENT OF POLICY REGARDING THE EQUAL OPPORTUNITY TO USE FACILITIES AND PARTICIPATE IN PROGRAMS

It is the policy of the Department of Natural Resources to provide its facilities, accommodations, services and programs to all persons without regard to sex, race, color, age, religion, national origin, or handicap. Proper licenses/registration and compliance with official rules and regulations are the only sources of restrictions for facility use or program participation.

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