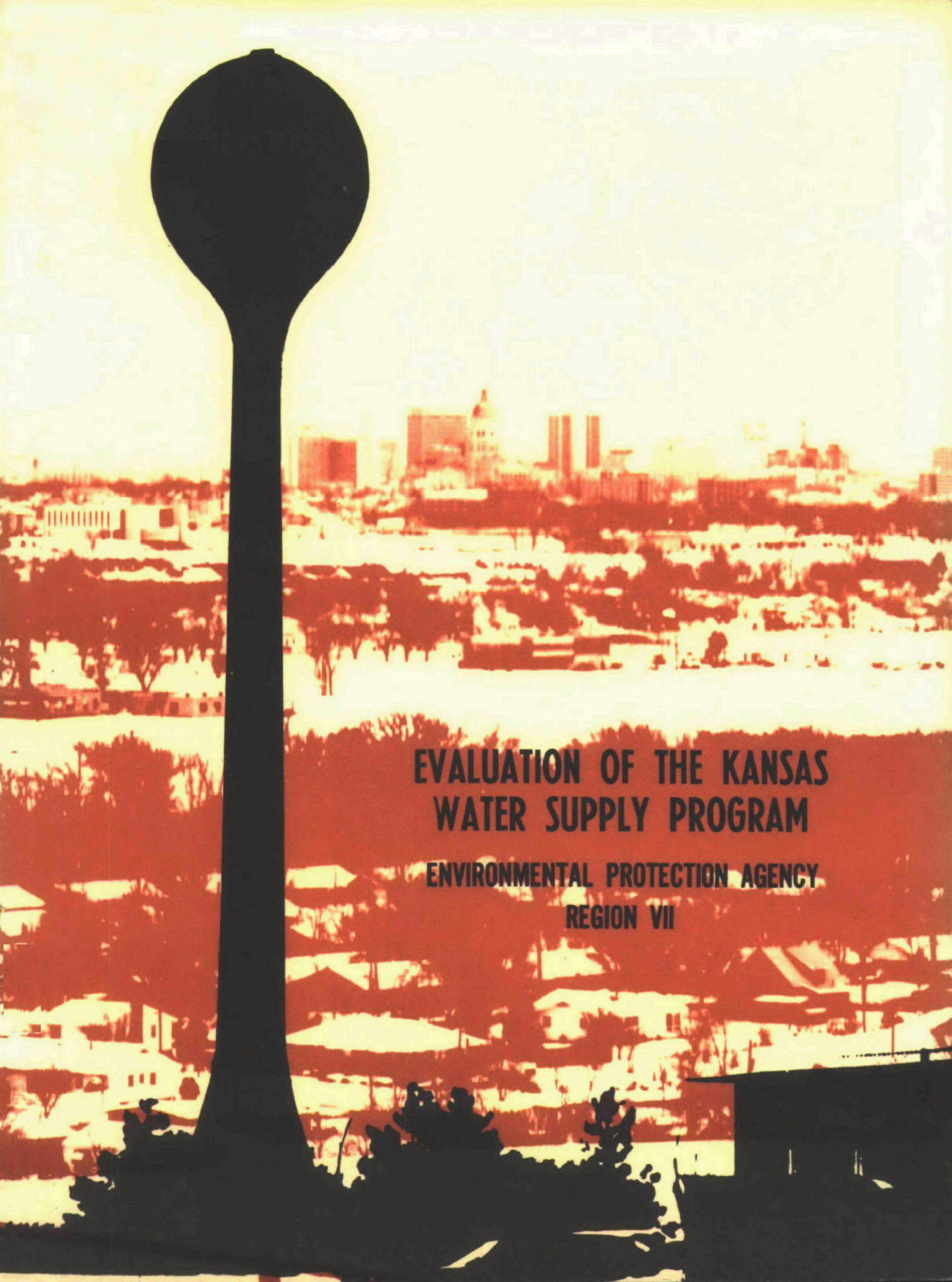

EVALUATION OF THE KANSAS WATER SUPPLY PROGRAM

ENVIRONMENTAL PROTECTION AGENCY
REGION VII

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EVALUATION OF THE KANSAS WATER SUPPLY PROGRAM

WATER SUPPLY PROGRAM

ENVIRONMENTAL PROTECTION AGENCY

REGION VII

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PREFACE

This report is based on the findings of field investigations and a review of the activities of the Kansas Water Supply Program. This study was undertaken, after discussions with Dr. Edwin D. Lyman, Director of the Kansas State Health Department, to evaluate the State's Water Supply Program and to provide recommendations for any needed improvement.

The data utilized in this report were collected from three separate field surveys conducted by members of the Environmental Protection Agency Water Supply program; they consisted of the following:

1. A field survey of 40 Community Water Supplies.
2. A field survey of 12 of the 44 Communities that are adjusting the fluoride level of their public water supply.
3. A field survey of 40 small public water supplies serving the traveling public along I-70 between Topeka and Hays, Kansas.

In addition to these field studies, a complete review was made of the laboratory facilities, statutes, regulations and policies governing the State Water Supply Program activities. The number and quality of personnel assigned to these responsibilities were also evaluated.

We would like to thank Mr. N. Jack Burris, Chief of the Water Quality Control Section, Kansas State Department of Health, and his staff who so earnestly cooperated in this evaluation.

INTRODUCTION

INTRODUCTION

The Community Water Supply Study[1] revealed numerous inadequacies in the nation's water supply systems. These findings indicated that many public water supplies were failing to meet bacteriological and chemical quality established by the Drinking Water Standards[5] and that operation and maintenance of many water systems were inadequately performed. There were deficiencies noted in many state water supply programs. Many had regulations that were inadequate and surveillance of public water supplies was being neglected. Water supply programs within state environmental control or health agencies are being neglected because of the induced emphasis of other environmental health programs such as waste disposal, air and water pollution control. Legal responsibilities are imposed on and financial assistance is provided to state agency programs in many environmental control program areas. On the other hand, the water supply program has no federal backup legally or financially. Each state must recognize its problems and provide the resources to alleviate them.

Dr. Edwin D. Lyman, Director of the Kansas State Health Department, recognized the importance of an effective state water supply program and utilized the technical assistance of the Environmental Protection Agency for this evaluation of the State Water Supply Program.

The evaluation of the Kansas Water Supply Program was conducted during the spring and summer of 1972. The purpose of the evaluation was to determine the effectiveness of the Kansas Water Supply Program and

recommend any needed improvements. The Guidelines used in making the evaluation were "A Guide to the Interstate Carrier Water Supply Program,[10] Manual for Evaluating Public Drinking Water Supplies,[4] and the Public Health Service Drinking Water Standards, 1962."[5]

To perform the evaluation of the Kansas Water Supply Program, the following activities and facilities were reviewed:

1. The Kansas laws, regulations and policies pertaining to the Water Supply Program.
2. The structural organization of the State program and its activities.
3. The available physical and personal resources to accomplish the program objectives.
4. A selected representative sample of the public water supplies was visited and surveyed to determine compliance.

The findings of the above reviews were analyzed and specific recommendations were developed to assist the State in improving their Water Supply Program.

Definitions of drinking water systems used in this study are as follows:

1. Public water supply system - any system which provides water for public consumption, excluding water sold in bottles or other closed containers.
2. Community water supply systems - a public system that provides water to ten or more premises not owned or controlled by the supplier of water or to forty or more resident individuals.

3. Small public water supply systems - small public water supply systems that: (a) provide water to less than ten premises not controlled by the supplier of water or less than 40 resident individuals; (b) provide water to any number of people on premise-owned or controlled by the supplier of water; or (c) provide water to the traveling public.
4. Individual water supply system - a water supply system that serves a single dwelling unit occupied by one family.

SUMMARY OF FINDINGS

SUMMARY OF FINDINGS

Authority

Statutes

The Kansas statutes give broad authority to the State Board of Health for regulating public water supplies and administrative responsibility to the State Health officer for carrying out these acts.

Regulations

Only two regulations have been initiated that pertain to public water supplies: one pertaining to collection and analysis of water for quality control; and, one for the application of permits to supply water for domestic purposes.

Policy

The Kansas State Department of Health has developed a number of policy documents relating to the design and operation of public water supplies, much of which should be incorporated in regulations.

Organization and Activities

The Public Water Supply Program is a function of the Water Quality Control Section under the Division of Environmental Health in the State Health Department. The Water Quality Control Section Chief devotes about 30% of his time to the administration of the Water Supply Program. Area engineers and/or technicians in the six area offices devote about 20% of their activities to the Water Supply Program.

Two of the three individuals in the Central Office have obtained professional registration and master degrees. The other individual has a bachelor degree and is fulfilling the Engineering in Training (EIT) requirements. Four of the ten personnel in the area offices have acquired professional registration; two of them have bachelor degrees, one has a masters degree and the other one does not have a college degree. The other six area technicians have attended various colleges and universities but have not obtained their degrees.

Engineering Surveillance

With this available manpower only 20% of the public water supplies have been surveyed annually. Small public water supplies are not routinely inspected.

Engineering and Technical Assistance

There are approximately 100 sets of plans and specifications reviewed annually requiring one man-year of effort. Many small public water supplies fail to submit plans and specifications prior to construction. An additional .5 man-year is expended for providing water supply information to various governmental agencies, institutions and private organizations.

Operator Training

There are three area schools each year but only one day is devoted to water supply in each school.

The Annual Water and Sewage Works School has 20 hours of instruction in water supply and waste treatment.

Correspondence courses are available through State and Federal programs at a nominal fee to the operator.

Due to the lack of contact with State personnel, small public water supply operators are not encouraged to attend training courses.

Status of the 40 Community Water Supply Systems

There are 632 public water supply systems in Kansas serving an estimated population of 1,780,634. Detailed sanitary surveys of 40 selected systems revealed the following:

Water Quality - Bacteriological

Eight water systems (20%) serving a population of 27,193 failed to meet the coliform limits of the DWS for one or more months during the 11 months review period.

Water Quality - Chemical and Physical

Eighteen water systems (45%) serving a total population of 134,922 failed to meet one or more of the chemical and physical standards of the DWS.

Sixteen water systems (40%) serving a total population of 120,672 failed to meet one or more recommended or mandatory standards.

Two water systems (5%) serving a total population of 14,250 failed to meet the recommended physical limits. In addition, there were two supplies serving a total population of 20,192 that failed to meet the mandatory chemical limits.

Source

Two water systems (5%) serving a population of 6,662 had inadequate quantities of water.

Two water systems (5%) serving a population of 35,743 had sources which required improvements.

Treatment

All of the supplies (100%) had facilities for disinfecting; however, 6 systems (15%) did not have a free chlorine residual in the system at the time of the survey.

Fourteen water systems (35%) need additional treatment facilities.

Distribution

Two water systems (5%) serving a total population of 17,972 need additional distribution storage facilities.

One water system serving a population of 274,448 has inadequate water pressure in some parts of the distribution system during certain times.

Quality Control

Fifteen water systems (38%) had less than adequate quality control records.

Eleven water systems (28%) did not keep quality control records.

Four systems (10%) kept only partial control records.

Twelve water systems (30%) serving 21,168 consumers did not have an ordinance against cross-connections.

Seven water systems (18%) had plumbing codes but no inspections or

enforcements were prevalent.

Only one water system surveyed was developing a program for continuous reinspection for removal of cross-connections.

Quality of Operation

Twenty-one water systems (53%) had no certified operators.

Six of the nine water systems which exhibited operation problems employed operators that were not certified.

Seven operators (88%) in charge of the eight supplies that failed to meet adequate bacteriological quality were not certified.

Four operators (67%) were not certified in the six systems which were not properly disinfected.

Ten operators (67%) were not certified in the 15 systems that had inadequate control records.

Bacteriological Surveillance

Twenty-one water systems (52%) serving 148,548 individuals exhibited inadequate bacteriological surveillance.

Five water systems (13%) did not collect any samples during some months.

Chemical Surveillance

The State performs one chemical analyses from a well or the

distribution system from each community water supply annually. In most instances this is adequate in number; however, only eight of the 20 substances routinely analyzed are listed in the Drinking Water Standards.

Engineering Surveillance

Twenty-nine water systems (73%) had not received formal inspections by State personnel during the past 12 months.

Status of Public Water Systems Adjusting Fluoride Levels

Forty-four public water systems have facilities for fluoridation. The field survey of 12 systems revealed the following:

Optimum Fluoride Level

Nine (75%) evidenced a fluoride ion content in the distribution system within the 0.8-1.2 mg/l range.

Laboratory Control

Five (42%) were not conducting daily fluoride analysis. Adequate analytical equipment was not available in five (42%) of the facilities surveyed.

Chemical Feed Equipment

Four (33%) had deficient equipment and only four (33%) of the chemical feeding arrangements were acceptable.

Chemical Storage and Handling

Five (42%) had unsatisfactory storage arrangements.

Operators Training and Interest

Three (25%) had operators that were inadequately trained in the use of test equipment.

Three (25%) were operated by personnel not completely familiar with their equipment.

Three (25%) had operators who did not favor feeding fluoride.

Surveillance

Three (25%) had not collected the required number of check samples.

Only three (25%) had been visited during the past 12 months by a representative of the State Health Department.

Status of Water Systems Serving the Traveling Public

There are estimated to be approximately 1,000 small public water supply systems in Kansas serving the public at rural schools, highway rest stops, restaurants, service stations and motels along Kansas highways. Forty of these systems that were providing water to the traveling public were studied and the following results were obtained:

Water Quality

Thirty-five (88%) of the water systems surveyed along I-70 in Kansas failed to meet the constituent limits of the U. S. Public Health Service Drinking Water Standards.

Thirty-four (85%) of the water systems surveyed failed to meet at least one recommended limit for chemical and physical quality.

Six (15%) of the water systems surveyed failed to meet at least one mandatory chemical limit.

Nine (23%) of the water systems surveyed failed to meet the bacteriological quality limit.

Sources

Generally, the sources were sufficient to provide the quantities of water needed although signs were placed at the safety rest areas being served by hand-pumped wells warning visitors to conserve water.

Treatment

Two of the water systems surveyed had facilities for chlorination although they were not in use.

Distribution

Five (13%) of the water systems surveyed had low pressure (<20 psi) in some area of the distribution system.

Bacteriological Surveillance

None of the water systems surveyed had an adequate bacteriological surveillance program except for the three systems that were being served by municipal systems. The State Highway Commission submits one sample per month for the safety rest areas under their jurisdiction, however, this is not practiced during the winter months. There was no record of any bacteriological analysis for the commercial establishments.

Chemical Surveillance

Thirty-seven (93%) of the water systems surveyed were not subject to a regular program of chemical surveillance. The safety rest areas water systems had been analyzed for chemical quality immediately following their installation. There was no record of chemical surveillance at the commercial establishments except those being served by a municipal system.

Engineering Surveillance

Only the three water systems being served from a municipal water

system, whose plans had been reviewed and approved by the State Department of Health, were subject to engineering surveillance.

RECOMMENDATIONS

RECOMMENDATIONS

The Kansas Water Supply Program should pursue the enforcement of the existing statutes pertaining to public water supplies and strive for an interrelated program with other state and local enforcement agencies to administer the statutes enacted for safeguarding public health.

A document of collected statutes, rules and regulations, and program policies relating to the Water Supply Program should be prepared for distribution to municipalities, corporations, companies and individuals supplying water for domestic purposes to the public.

Program Resources

The budget of the Water Supply Program should be increased $723,347 for the following purposes:

a. $210,829 for engineering surveillance of 502 community water supplies and 1,130 small public water supplies.

b. $140,284 for chemical surveillance of the 1,632 public water supplies.

c. $214,534 for bacteriological surveillance of the 1,632 public water supplies.

d. $7,700 for training of Water Supply Program personnel.

e. $125,000 to hire personnel to administer a training program created by adoption of mandatory certification.

f. $25,000 to hire personnel to develop and administer a well drillers licensing program.

Administrative Action

a. The State Board of Health should promote salary increases and benefits for State employment to compete with industry, institutions, other states, and federal government agencies. An active recruitment program should be initiated at State universities and colleges to provide the opportunity for qualified engineering graduates to become familiar with the program.

b. Develop rules and regulations to enforce program requirements that are assembled in the program policies. A regulation to adopt DWS would provide authority for the State Department of Health to administer a good Water Supply Program.

Program Action

a. Require monthly operating reports from public water supplies indicating daily water use, chemicals used in treatment, analytical results of routine analyses and any operational problems that may occur.

b. Provide annual inspections of all public water supplies to avoid potential health hazards that may occur in the source, distribution system, treatment facilities or operation of the facility, to assure a safe and dependable water supply.

c. Develop and maintain current water supply inventories with the

use of automatic data processing techniques for storage, analysis and retrieval of data.

d. The Water Supply Program should coordinate its activities and responsibilities with the Kansas Food Service and Lodging Board, State Department of Education, and other State and local agencies that are concerned with water supplies serving the public.

Legislative Action

a. Promote and support legislation requiring mandatory certification of operators in the water works field. This program should be under the supervision of State Health Department personnel.

b. Adopt a statute requiring the licensing of well drillers with the State Health Department having major administrative responsibilities.

c. Revise Statutes 65-162 and 65-163 to clarify that permits for additional sources of supplies, treatment facilities and treated water storage must be submitted to the State Health Department for approval prior to construction of these facilities instead of getting approval prior to use.

d. Adopt the proposed legislation for mandatory fluoridation of public water supplies, with the provisions for adequate training, monitoring and surveillance of the systems to assure the public of an optimum level of protection against tooth decay.

SCOPE OF THE EVALUATION

SCOPE OF THE EVALUATION

Water Supplies

The 1970 census indicates that Kansas has a population of 2,246,576 of which 80% are served by approximately 632 public water supplies. The 632 public water supplies includes mobile home parks, state institutions, airports, rural water districts, turnpike authority, rest homes, and 502 systems serving organized municipalities. Public water supplies in Kansas are developed in compliance with Kansas laws, regulations, and policies, and are monitored by the State Department of Health for bacteriological quality. The term "semi-public supplies" is not used in describing water supplies in Kansas. However, it is estimated that there are an additional 1,000 small public water supplies serving water to the public in restaurants, rural schools, gasoline service stations, motels, etc., that are not included in the State surveillance program.

Method of Selection

The 502 municipal water supplies were divided into six (6) population groups, as indicated in the following Table I.

TABLE I

WATER SUPPLY SYSTEMS IN KANSAS

Public Water Supplies

Municipalities

Population Group	Population	No. of Systems	Percent of Population	Systems Selected
More than 50,000	564,173	3	34.2	2
10,000 - 50,000	545,215	30	33.1	13
2,500 - 10,000	262,930	60	15.9	10
1,000 - 2,500	159,424	98	9.7	7
500 - 1,000	70,167	101	4.2	3
Less than 500	48,000	210	2.9	5
Subtotal	1,649,909	502	100.0	40
Unincorporated Communities and small public water supplies	147,352	130		
Total	1,797,261	632		0
Other small public water water supplies		1,000*		40
Individual	449,315	114,000*		0
Total	2,246,576			
No. of Systems Surveyed				80

*Estimated

Method of Selection (Continued)

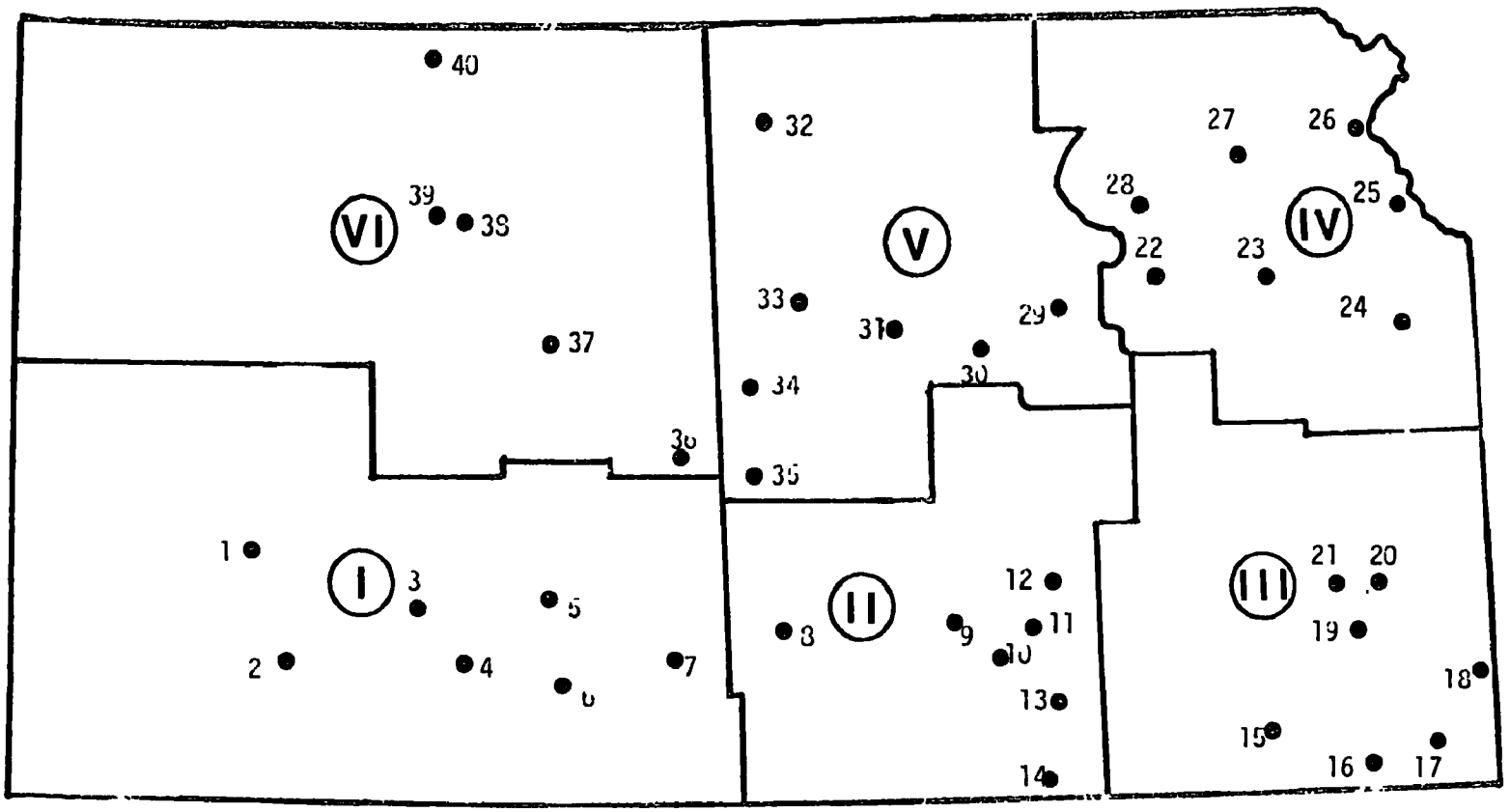
A base of forty community systems supplying water to municipalities was selected for field evaluation. These forty supplies represented less than 10% of 502 municipal systems but 47% of the population served by water supplies monitored by the State Health Department. The number of systems to be surveyed from each of the population groups was selected by considering both the population served by water supplies in these groups and by the number of systems in each group. The forty supplies to be evaluated were also distributed as equally as possible over the six areas as demonstrated in Figure I. The population, source, and the presence of fluoridation for each of the surveyed systems in each area are shown in Table II. Table I, Appendix A lists the systems, number of services, population served, average daily demand, source of supply and treatment. The geographic and population distribution of the supplies evaluated provided a reasonable basis for evaluating the effectiveness of the Kansas Water Supply Program.

Fluoridation

The adjustment of fluoride ion in public water supplies in Kansas is an accepted practice and encouraged by the Kansas State Department of Health. There are 44 public water systems in Kansas that are providing controlled fluoridation to communities serving a total population of approximately 900,000. An evaluation was made of the adequacy of this program. Twelve supplies were selected from these 44 installations for this survey; two supplies were

(Figure 1)

KANSAS STATE HEALTH DEPARTMENT AREAS AND WATER SUPPLIES SURVEYED



AREA I	AREA II	AREA III	AREA IV	AREA V	AREA VI
1. GARDEN CITY*	8. KINGMAN	15. INDEPENDENCE	22. WAMEGO	29. JUNCTION CITY	36. GREAT BEND
2. COPELAND	9. WICHITA*	16. OSWEGO	23. TOPEKA**	30. ABILENE	37. HAYS*
3. DODGE CITY	10. DOUGLASS	17. COLUMBUS	24. GARDNER	31. SALINA*	38. BOGUE
4. BUCKLIN	11. AUGUSTA	18. PITTSBURG	25. LEAVENWORTH	32. JEWELL	39. HILL CITY
5. KINSLEY	12. EL DORADO	19. CHANUTE*	26. ATCHISON	33. BEVERLY	40. NORTON
6. BUCKLIN	13. ATLANTA	20. MORAN	27. HOLTON	34. ELLSWORTH	
7. PRATT	14. ARKANSAS CITY	21. IOLA	28. WESTMORELAND	35. LYONS	

*Area Office of State Health Department **Area and Central Offices of State Health Department

WATER SUPPLY PROGRAM

TABLE II

PUBLIC WATER SUPPLIES SURVEYED

AREA 1	POPULATION	SOURCE	FLUORIDATION
Garden City	14,708	Ground	
Dodge City	14,127	Ground	
Pratt	6,736	Ground	
Kinsley	2,209	Ground	
Greenburg	1,907	Ground	
Bucklin	840	Ground	
Copeland	266	Ground	
	40,793		
AREA 2			
Wichita	274,448	Ground	
Arkansas City	13,216	Ground	Yes
El Dorado	12,308	Surface	Yes
Augusta	5,977	Surface	
Kingman	3,622	Ground	
Douglass	1,126	Ground	
Atlanta	244	Ground	
	310,941		
AREA 3			
Pittsburg	20,171	Ground	Yes
Independence	10,347	Surface	Yes
Chanute	10,341	Ground	Yes
Iola	6,493	Surface	Yes
Columbus	3,356	Ground	
Oswego	2,200	Surface	
Moran	564	Surface	
	53,472		
AREA 4			
Topeka	123,043	Surface	Yes
Leavenworth	24,951	Surface	
Atchison	12,204	Surface	Yes
Holton	3,063	Surface/Ground	
Wamego	2,507	Ground	
Gardner	1,839	Surface	Yes
Westmoreland	467	Ground	
	268,074		

TABLE II (Continued)

PUBLIC WATER SUPPLIES SURVEYED

AREA 5	POPULATION	SOURCE	FLUORIDATION
Salina	37,095	Surface/Ground	Yes
Junction City	18,820	Ground	Yes
Abilene	6,661	Ground	
Lyons	4,355	Ground	Yes
Ellsworth	2,080	Ground	Yes
Jewell	649	Surface	
Beverly	214	Ground	
	69,892		
AREA 6			
Great Bend	16,133	Ground	
Hays	15,396	Ground	Yes
Norton	3,627	Surface	
Hill City	2,071	Ground	
Bogue	275	Ground	
	38,502		
Total	780,634		

selected in each of the six areas and arrangements were made with State area engineers and technicians. The types of systems to be surveyed were selected to evaluate a variety of equipment and chemicals used in fluoridation in Kansas.

Drinking Water for the Traveling Public

During the period of the field investigation, a survey was also conducted of the water supplies available to the traveling public. This survey was part of a separate pilot study in which Kansas, Virginia and Oregon were selected to evaluate the quality of water supplies available to the traveling public. The Kansas survey included the sampling and evaluation of thirty private supplies serving restaurants and service stations and 10 highway rest stops on I-70 having water available for the public. The forty supplies included all of the water systems readily accessable to I-70 between Topeka and Hays, Kansas.

Although there are no official statistics available, it is estimated that there are approximately 1,000 systems serving nonresidents at motels, restaurants, highway rest areas, service stations, and residents at rural public schools. The survey of the forty water systems available to the traveling public provide an indication of the quality of water available from small water supply systems and the degree of protection contributed to them by the State Water Supply Program.

WATER SUPPLY PROGRAM

Authority

The Kansas Board of Health administers the Water Supply Program under Sections 65-161, 65-162, 65-163, 65-163a, 65-163b, 65-156, 65-157, 65-158, 65-170, 65-171g, 65-171h and 74-901a through f of the Kansas Statutes, Annotated.

The authority vested in the board is delegated to the Division of Environmental Health which directs the activities of the Water Supply Program through the Water Quality Control Section. The Board has adopted regulations pertaining to the supervision of water supplies which were most recently revised and compiled May 4, 1966. The institutional arrangement is shown in Figures 2, 3, and 4.

In addition to the Statutes and the Regulations, the Division of Environmental Health establishes policies and procedures for the administration of the Public Water Supply Program.

Statutes

Laws pertaining to Public Health (Appendix B) provide the State Board of Health with the authority to direct and enforce safe water quality for the residents of Kansas.

Waters Defined - Section 65-161:

Defines the "Waters of the State" to include streams and springs, and all bodies of impounded surface or ground water whether natural or artificial.

Permits Required - Section 65-162:

Establishes the authority of the Board of Health to regulate public water supplies by requiring permits for developing new water sources.

Plans, Review and Approval - Section 65-163:

This further delineates the State Board of Health's responsibility to review and approve plans and specifications for the development and the construction of facilities for treatment, storage and distribution of water for the public. This section also provides for the necessary enforcement of these requirements by establishing a penalty for noncompliance. It also provides for the State Board of Health to conduct investigations of the quality and character of public water supplies and to issue orders requiring changes in the source, treatment, storage and distribution facilities for safeguarding public health.

Cessation of Water Delivery - Section 65-163a:

Provides for the cessation of water delivery to any premise when a condition exists that may lead to contamination of a public water supply. The State Board of Health may order any such public water supplier to cease delivery of water until the danger of contamination is eliminated.

Cross-Connection Control - Section 65-163b:

Provides for the State Board of Health to restrict cross-connections between public and private water systems unless a permit is issued. Section 65-171g: Provides for protection

to water supplies by prohibiting cross-connections between water and waste sources.

Minimum Design Standards - Section 65-171h:

Provides for the board to establish and publish minimum standards for design, construction and maintenance of water systems.

Water Quality Surveillance - Section 65-156:

Provides for the State Board of Health to establish rules and regulations for the collection and evaluation of water samples from public supplies and to establish the cost of such service prior to the time that the water supply becomes operative.

Section 65-157: Provides for the analysis required in the preceeding rules and regulations to be conducted in the water and sewage laboratory of the State Board of Health.

Penalties - Section 65-158:

Provides for fines for failure to comply with regulations.

Board of Health Member - Section 65-170:

Provides for an engineer to be selected from Kansas State or Kansas University to serve on the Board of Health.

State Health Officer - Section 74-901:

Designates members of the State Board of Health, establishes the number and their qualifications. It defines the State Health officers position and responsibility in enforcing statutes assigned to the State Board of Health.

Regulations

Currently, there are two regulations governing the Water Supply Program. They were updated and compiled by the Kansas State Board of Health in 1966, see Appendix B.

Collection of Water Samples - Article 14:

Provides for the collection and analysis of water samples from public water supplies. This regulation prescribes for the number of samples to be submitted for bacteriological and chemical analyses and the fee for these analyses. The regulation calls for a prescribed fee for surface water systems and requires weekly samples. A lesser fee is set for ground water supplies and requires biweekly sampling. The number of samples to be collected is determined by the Chief Engineer of the department.

Permit Application - Article 15:

Provides for the application for permits to supply water for domestic use. This regulation outlines detailed procedure required for approval to furnish water for domestic purposes in the State of Kansas. It requires that an applicant provide the following information in application for a permit: General Plan, Detailed plans, Engineering Report, specifications, and application. Each of these items are detailed in the regulations.

Program Policies

The Kansas State Department of Health has developed a number of policy documents relating to the design and operation of Public

Water Supplies in Kansas. These policies are established for directing adequate development of public water supplies to make it possible under all conditions of operation to produce and distribute quality drinking water. A policy statement of the program includes "Public Health Service Drinking Water Standards," latest edition, see Appendix B.

The major policy documents are "Policies Governing the Design of Public Water Supply Systems; Recommendations for Public Water Well Location Construction and Disinfection; Regulations for Submission of Application for Permits to Supply Water for Domestic Purposes within the State of Kansas; Statement of Policy on Chlorination and Statement of Policies and Procedures Relating to Fluoridation of Public Water Supplies."

Water Plant Design Policy

"Policy Governing the Design of Public Water Supply Systems" is developed from Section 65-171h of the General Statute. The document outlines the procedure for the submission of plans and specifications for water supply improvements to be reviewed and approved by the State Department of Health. It establishes design policies for physical location, construction, water supply source and the selection of equipment.

Well Location Policy

"Recommendations for Public Water Well Location Construction and Disinfection" (see Appendix B) outlines the requirements

for developing ground water supplies. This document establishes policy for location, construction of wells, pumping equipment and facilities needed for a safe and dependable water supply. It includes requirements for disinfection following well construction.

Permit Required

Policy for submission of "Public Water Supply Permit Application" to supply water for domestic purposes was developed from authority outlined in Section 65-163 of the State statutes. This policy establishes the requirements for a person, companies, corporations, institutions or municipality to apply for a permit to supply water to the public. The permit is to be obtained from the State Department of Health prior to the development of a new water supply, or an addition to an existing water facility including source, storage, and treatment of ground or surface water supplies. (Refer to Appendix B for a copy of the permit application.)

Statement on Fluoridation Policy

"Statement of Policies and Procedures Relating to Fluoridation" (Appendix B) were prepared by the Kansas State Department of Health for applicants requesting permission to fluoridate public water supplies. Applicants must submit plans and specifications detailing the source of chemical, methods of storage and handling, type of equipment, point and rate of

application, mechanical controls, safety precautions and laboratory control for determining dosage and fluoride content. In addition, the applicant must have the endorsement of the local dental and medical societies, with confirmed authorization from the community for fluoridation of a public water supply. Fluoridation is permitted only with the full cooperation of the city administration, medical and health agencies. Following the installation, daily samples from the plant tap and the distribution system must be submitted to the state laboratory for comparison with local controls until satisfactory uniformity results.

Mandatory Chlorination Policy

Statement of Policy on "Chlorination of Kansas Public Water Supplies" was resolved June 1, 1956, by the Kansas State Board of Health. All municipal water supplies were ordered to provide adequate chlorination equipment at each source of its public water supply and maintain a suitable chlorine residual in the distribution system at all times. Cities that did not meet bacteriological quality of the Drinking Water Standards were required to have it installed prior to March 1, 1957, and others were required to complete the installation by January 1, 1958. Refer to Appendix B for the 1942 and 1956 Orders Pertaining To The Chlorination of Municipal Water Supplies Within The State of Kansas. A Summary of Policy Statements governing water systems in Kansas is given in Appendix B.

Program Organization and Activities

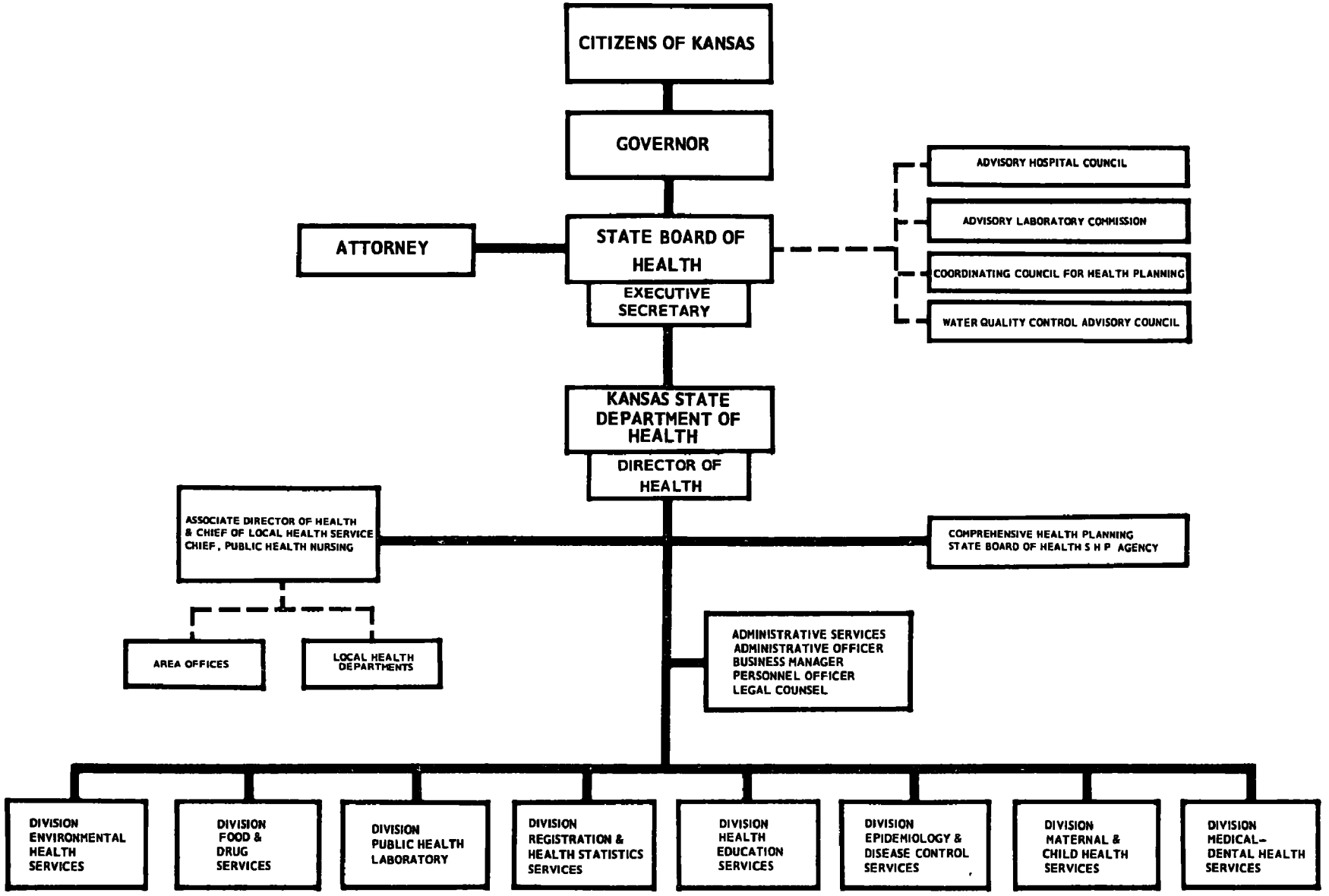
Organization

The Public Water Supply Program is a function of the Water Quality Control Section under the Division of Environmental Health in the State Department of Health. The function of the Water Quality Control Section is to develop and maintain waters of the State of such quality to adequately provide for all beneficial uses, including public water supply, agriculture, recreation and carriage of wastes. This Section is also designated to provide water quality data for the development of the State, to provide for protection of the general health and welfare of all associated with waters of the State, and to provide for delivery of safe water to the general public through public water systems. See Figures 2 and 3.

The Public Water Supply Program is one of four programs under the Water Quality Control Section as shown in Figure 4. The Water Supply Program is presently staffed with two full time positions in the State office to provide direction to field activities and program responsibilities as authorized. The Water Quality Control Section Chief devotes about 30% of his time to the administration of the Water Supply Program. The area engineers, likewise, devote about 20% of their activities to the Water Supply Program through facility inspections, technical assistance and training programs. Engineering

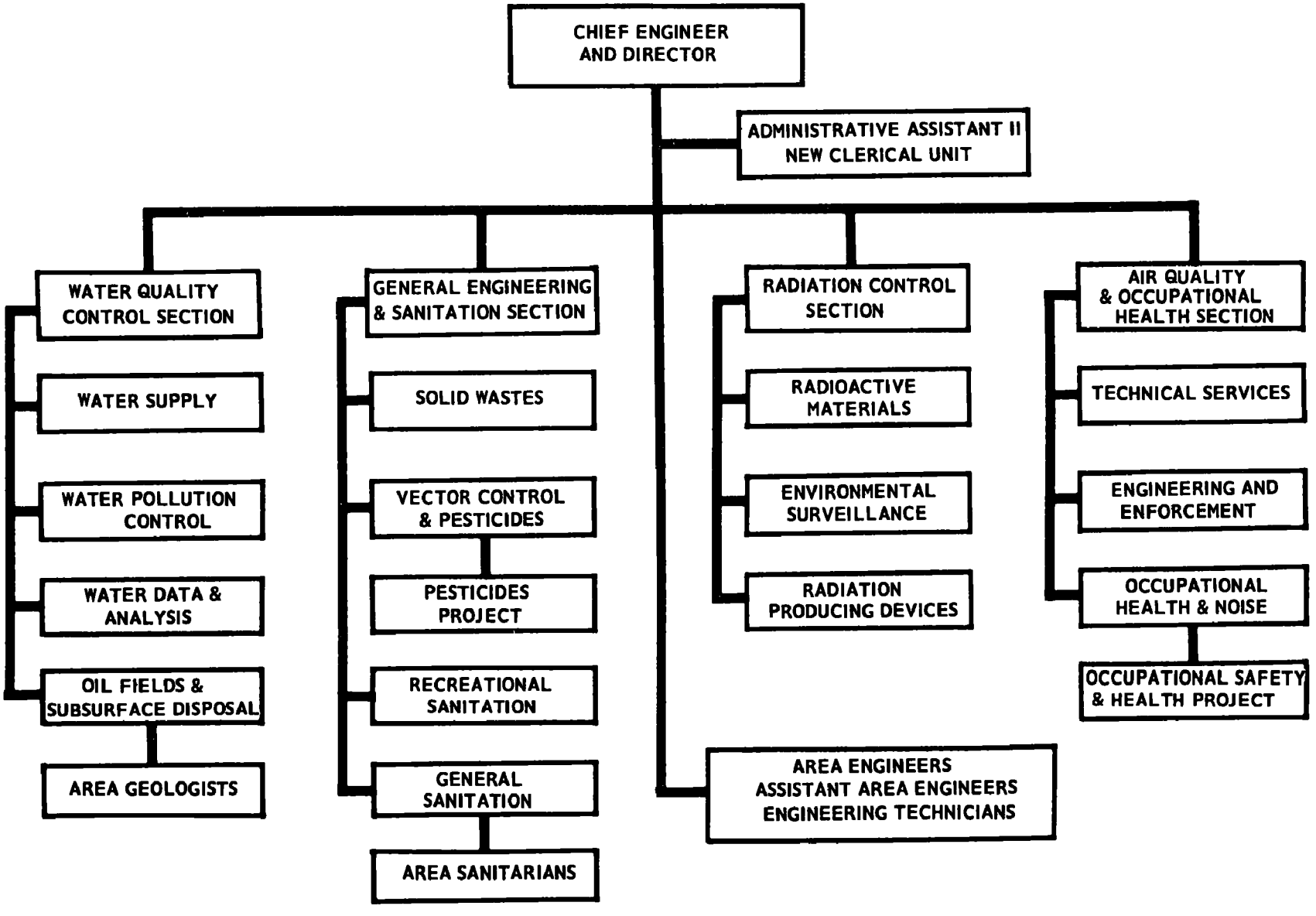
ORGANIZATIONAL CHART
KANSAS STATE DEPARTMENT OF HEALTH

(Figure 2)



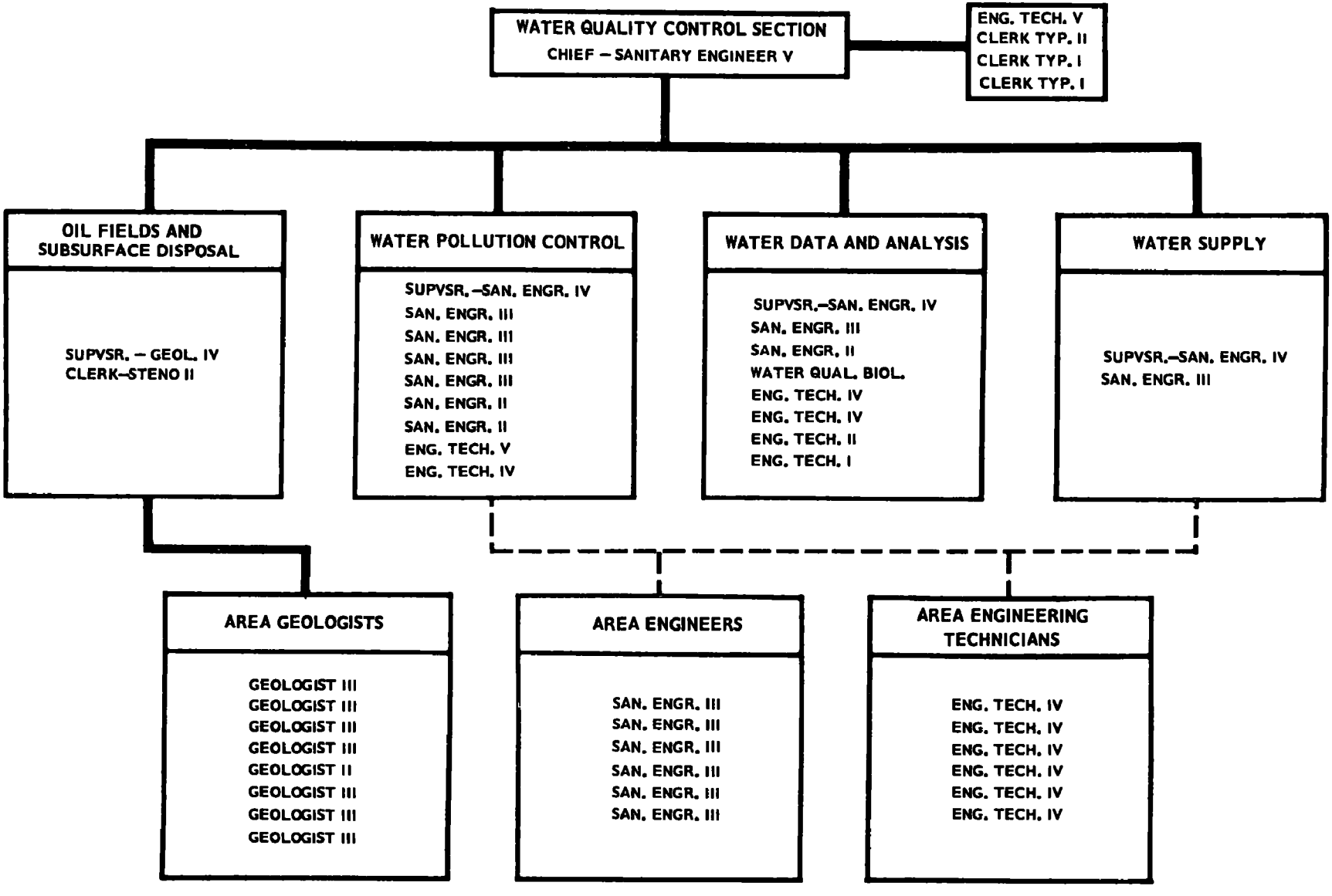
ORGANIZATIONAL CHART
DIVISION OF ENVIRONMENTAL HEALTH

(Figure 3)



ORGANIZATIONAL CHART
WATER QUALITY CONTROL SECTION

(Figure 4)



technicians are utilized to supplement the program in the six area offices. The qualifications and salary ranges of personnel who work in the Water Supply Program are shown in Figure 5 and Table III. It is estimated that 3.9 man-years of effort is presently used for Water Supply Program activities, exclusive of laboratory and support service.

Budget

In FY-73, the State has budgeted $199,855 for its Water Supply Program. This consists of $60,701 for operation of the central office, $44,469 for the field offices, and $94,685 for laboratory services. A detailed budget is shown in Table IV.

Activities

Surveillance and Monitoring

Sanitary Surveys and Inspections

The need for the Water Supply Program is based on waterborne disease prevention. The Water Supply Program provides surveillance over the 632 public water supplies in the State which serve approximately 1,790,000 Kansas citizens. Public water supplies include those water supplies serving cities; rural water districts; improvement districts; small subdivisions; trailer courts; Kansas Turnpike Authority service areas; some of the Kansas park and resources authority facilities; some airports, and all state institutions.

Inspections of the public water supplies are made by the area

PUBLIC WATER SUPPLY PROGRAM STAFF
DIVISION OF ENVIRONMENTAL HEALTH
KANSAS STATE DEPARTMENT OF HEALTH
AUGUST 22, 1972

(Figure 5)

NAME	POSITION TITLE	PERCENT OF TIME IN WATER SUPPLY	BACHELOR'S DEGREE	MASTER'S DEGREE	PROFESSIONAL REGISTRATION	PREVIOUS EXPERIENCE
N. JACK BURRIS	SAN. ENGR. V	30	KANSAS U. – 1948	MICHIGAN U. – 1952	KANSAS	NONE
LEONARD J. IMHOF	SAN. ENGR. IV	100	PITTSBURG STATE – 1943 KANSAS STATE – 1948	UNIV. CALIF. – 1958	KANSAS	F. E. DEVLIN, CONS. ENGR.
LLOYD W. ROGERS	SAN. ENGR. II (IN LIEU OF A III)	100	KANSAS STATE – 1967	NONE	E.I.T. – KANS.	FINNEY & TURNIPSEED CONS. ENGR.
L. DEAN STROWIG	SAN. ENGR. III	20	KANSAS STATE – 1950	NONE	KANSAS & TEXAS	WILSON & COMPANY CONS. ENGR.
THOMAS REEVES	SAN. ENGR. III	20	IOWA STATE – 1965	KANSAS U. – 1972	KANSAS	BLACK & VEATCH DENVER OFFICE
MAJOR C. HAGAR	SAN. ENGR. III	20	NONE	NONE	KANS. & MO.	SUPT. OF UTILITIES WATER SUPERINTENDENT CITY MANAGER
GERALD P. GRANT	ENGR. TECH. IV	20	TWO YEARS PRE-ENGINEERING AT KANSAS STATE	NONE	NONE	KANSAS STATE HIGHWAY DEPT.
JAMES L. CURRENT	ENGR. TECH. IV	20	TWO YEARS COLLEGE PRE-ENGINEERING	NONE	NONE	KANSAS STATE HIGHWAY DEPT.
WILLIAM T. TOWERY	ENGR. TECH. IV	20	126 HRS. COLLEGE NO DEGREE WASHBURN U.	NONE	NONE	KANSAS STATE HIGHWAY DEPT
RICHARD D. BUCHANAN	ENGR. TECH. IV	20	NONE	NONE	NONE	KANSAS STATE HIGHWAY DEPT.
DELBERT C. ZERR	ENGR. TECH. IV	20	54 HRS. COLLEGE FT. HAYS STATE	NONE	NONE	KANSAS STATE HIGHWAY DEPT.
JAMES E BOWMAN	ENGR TECH IV	20	92 HRS PRE-ENGINEERING WASHBURN U	NONE	NONE	KANSAS STATE HIGHWAY DEPT
JOHN H BAILEY	SAN ENGR II	20	KANSAS STATE – 1970	EXPECTED JUNE, 1973	EIT (KANSAS)	SAN ENGR U S ARMY MEDICAL CORP COOK, FLATT & STROBEL CONS ENGR

THERE ARE TWO SAN ENGR III POSITIONS BUDGETED FOR THE AREA OFFICES BUT NOT FILLED AT THIS TIME EACH OF THESE VACANT POSITIONS IS SLATED FOR 20% WATER SUPPLY ACTIVITY.

TABLE III

SALARY SCHEDULE FOR
ENGINEERING TECHNICIANS AND ENGINEERS
November 1, 1970

	SALARY RANGE
Environmental Health Director	$15,948 - $20,352
Sanitary Engineer V	$14,472 - $18,456
Sanitary Engineer IV	$13,128 - $16,740
Sanitary Engineer III	$11,328 - $14,472
Sanitary Engineer II	$ 9,780 - $12,504
Sanitary Engineer I	$ 8,448 - $10,788
Engineering Technician IV	$ 8,868 - $11,328
Engineering Technician III	$ 7,296 - $ 9,312
Engineering Technician II	$ 5,448 - $ 6,948
Engineering Technician I	$ 4,692 - $ 6,000

TABLE IV

COSTS OF THE PUBLIC WATER SUPPLY PROGRAM
Fiscal Year 1973

Item	Field Offices	Central Office
A. Personnel		
Engineering Salaries	$26,923.00	$34,749.60
OAB (Paid by State)	1,304.51	1,311.31
Retirement (Paid by State)	928.48	1,389.98
Secretarial Salaries	4,320.00	12,591.42
OAB (Paid by State)	242.35	707.64
Retirement (Paid by State)	172.80	503.66
Hospital Insurance (Paid by State)	453.04	740.12
Rent, Supplies, and Miscellaneous	780.56	3,337.50
Telephone	396.74	1,000.00
Xerox copy	-	600.00
Automobile Expenses	7,348.00	1,929.84
Travel and Subsistence	1,600.00	1,840.00
B. Laboratory Service*		
Chemistry		
a. complete analyses		18,925.00
b. partial analyses		2,500.00
Radiological		975.00
Pesticides		120.00
Bacteriological		67,154.00
IBM Cost to Bact. Lab.		5,010.52
C. Centralized State Services**	-	-
D. Totals		
Personnel		
Area Offices	44,469.48	-
Central Office		60,701.07
Laboratory Service		94,684.52
Grand Total		$199,855.07

*Does not include rent, utilities, telephone service, or fringe benefits to personnel. Information on these is not available.

**No information available.

engineers or technicians. Operation and needs of the water supplies are discussed in detailed reports which contain recommendations. These reports are submitted to the responsible officials officials of each of the surveyed supplies for corrective action. There are no special guidelines or format for preparing inspection reports. Report preparation is left entirely at the discretion of the writer; therefore, some reports contain complete water supply data while others do not.

The frequency of these surveys is not specified in the statutes, policies or regulations. However, there is an unwritten policy that surveys be made annually. The files of the State Water Supply Program indicate that this policy is not being followed. A review of the records for the last four years indicated that the State has only surveyed 20% of the total public water supplies each year. Some supplies were inspected annually while others had not been inspected for several years.

Laboratory Support

Bacteriological Examination

The Environmental Health Laboratory provides bacteriological analysis service for all water supplies in the State. The equipment, procedures and personnel of this service were evaluated on October 21-22, 1971, by the Environmental Protection Agency (EPA) Water Supply Programs Division and found in compliance with standards acceptable for bacteriological

examination of water under interstate carrier regulations, see Appendix C. All of the public water supplies in Kansas are required to meet the bacteriological sampling requirements of the DWS. However, as will be shown later, many of the towns are not following their sampling program as assigned by the Environmental Health Laboratory.

Additional water treatment plant laboratories in the cities of Salina, Topeka, Wichita, Kansas City, and Water District #1 of Johnson County, Kansas, perform routine bacteriological analyses on the majority of samples collected from their respective distribution systems. The municipal laboratories are evaluated and certified triennially by Mr. M. G. Dyck, Survey Officer of the Kansas Environmental Health Laboratory. These laboratories have currently been approved for performing coliform analyses.

The Kansas Environmental Health Laboratory utilizes the membrane filter method for coliform analysis of potable waters as described in the 13th edition of "Standard Methods for the Examination of Water and Wastewater."(6) The laboratory service provides 6.05 man-years of effort; with this employment, a maximum of 60,000 analyses can be made per year. In the fiscal year 1972, the staff ran a total of 50,889 analyses; 34,670 of these were made on 33,270 water samples from public water supplies. There were also 6,206 analyses performed on samples

from small public water supply systems and individual water supply systems. A total of $54,177 was spent in salaries, expendable supplies and equipment for bacteriological surveillance of public water supplies. The results of the coliform analyses are entered into a computer which summarizes the data and produces a printout sheet for the area office. With this information, the area staff is able to determine the public water supplies having bacteriological deficiencies. Data are given in compliance with Drinking Water Standards requirements, number of months of inadequate sampling, number of samples not collected, etc. The summary is timely since it is prepared at 4-week intervals. A total of 13 columns is shown on the report sheet. See Appendix C for one page of the computer printout and an explanation of the 13 columns.

A review of 13 four-week report sheets indicated that in any given 4-week period from 20% to 75% of the public water supplies failed to submit a sufficient number of samples to meet the DWS. The supplies which are not in compliance with the DWS sampling requirements are not being encouraged or required to improve their sampling program although they have previously paid for the number of analyses required by the DWS. About 4% of these public water supplies fail consistently each 4-week period to be in compliance with the bacteriological quality requirements.

The DWS recommend continuous sampling until the results from

at least two consecutive samples show the water to be of satisfactory quality. The review of the sampling results indicated that the procedure of resampling contaminated sources was not being followed.

Funds collected from the public water supplies for future services are greater than the budget allocation for rendering those services. Fees are placed in a general water and sewage fund which is used to finance various programs. However, if the resampling of unsatisfactory samples as prescribed in the Drinking Water Standards was followed and if the prescribed number of samples were submitted, all of the funds would be utilized.

Chemical Examination

According to the State regulations, each community water supply must submit one sample per year for chemical analysis to the State Environmental Health Laboratory. A water sample must be submitted from a new source prior to use of the source by the public. Additional samples are collected from water supplies and analyzed at the request of the department's chief engineer. There is a policy that constituent concentrations in water for public consumption must not exceed the limits specified in the Drinking Water Standards. An exception is made in the nitrate constituent which is set at 90 mg/l and recommended as 45 mg/l NO_3 in the DWS.

The State Department of Health has unofficially adopted the constituent limits in the DWS, however, a complete chemical analysis performed by the Kansas Environmental Health Laboratory consists of only eight substances in the DWS. Those eight substances are turbidity, total dissolved solids, sulfate, chloride, nitrate, iron, manganese and fluoride. Another 12 substance determinations which are included in a routine analysis are alkalinity (total carbonate and bicarbonate), pH, hardness, specific conductance, total phosphate, silica, potassium, sodium, magnesium, iron, manganese, and calcium. The Kansas Environmental Health Laboratory, upon request, performs a partial chemical analysis on water samples. This analysis consists of total hardness, alkalinity, chloride, sulfate, nitrate and fluoride determinations.

In addition to the 20 substances determined in a routine analysis, the Environmental Health Laboratory performs additional testing on samples from interstate carrier supplies. Concentrations of arsenic, cadmium, chromium, copper, lead, zinc and gross alpha and beta activity are occasionally determined. Color cyanide, carbon chloroform extract, carbon alcohol extract, barium, selenium, silver or mercury are rarely determined. Chlorinated hydrocarbon pesticide analyses are not being performed on potable water samples although the instruments and equipment to do so are available.

The water chemistry section of the Kansas Environmental Health Laboratory was evaluated June 15-16, 1972, by the Analytical Quality Control Section of EPA. The conclusions drawn from the survey indicated that the service could be broadened. Likewise, additional facilities could be utilized to improve the function of this facility and provide less deviation from the analytical methods prescribed in the 13th edition of "Standard Methods For The Examination of Water and Wastewater." It was also noted, that to carry out the recommended functions, at least one additional chemist is needed. Refer to Appendix C for Survey Report on the Kansas Environmental Health Laboratory. In the fiscal year 1972, 757 complete and 782 partial chemical analyses, as defined by Kansas, were performed on public water supply samples at a cost of $26,745.

Engineering and Technical Assistance

The Water Supply Program personnel reviewed 249 sets of plans and specifications during the 1969-70 biennium compared to 221 sets during the previous biennium. Included in this total were plans and specifications for water wells, impounding reservoirs, water supply intakes, water treatment plants, storage tanks, distribution systems, and additional treatment facilities.

The legal requirements for reviewing these plans involves

detailed work as outlined in the program policy. In the 1970 fiscal year, approximately 100 sets of plans and specifications were reviewed, requiring approximately one-man year of effort. Review of plans and specifications is a priority item and a major technical effort is directed in this area leaving less time for field investigation and supervision.

Following the review of the plans and specifications, a permit is issued for approved projects and post-construction inspections are required before additional sources of water and major improvements are used. Written reports of post-construction inspections are submitted to proper officials.

A large volume of correspondence regarding a wide variety of water supply problems is processed each year. Approximately one-half a man-year of work is expended in providing water supply information to various state and federal agencies including the Environmental Protection Agency. Information must also be supplied to the Conference of State Sanitary Engineers and the American Water Works Association. The amount of time that must be devoted to supplying this type of information is continually increasing. Special problems regarding bacteriological and chemical quality; taste and odor; iron and manganese; insecticide and herbicide contamination; corrosion control; and fluoridation occur frequently and are investigated by either the central office staff or the area engineers.

Individual and Small Public Water Supplies

In Kansas there are many individual water supplies and small public water supplies that are utilized by the traveling public. The Water Supply Program does not regulate these supplies although it has the jurisdiction to do so. The local health departments are involved in sanitation programs which offer limited service to the individual home dwellers in construction, operation and maintenance of home systems. The Kansas Food and Lodging Board has the responsibility of licensing the motels and restaurants which are available to the traveling public; however, those establishments which have small public water supplies are not required to submit plans and specifications on their water systems or samples from their systems for chemical and bacteriological analyses. Other small private water supplies such as service stations and rest areas do not obtain permits or receive any type of surveillance from the Water Supply Program. Neither a program for licensing well drillers nor a pump installation code exist to exert control over the construction of individual and small public water supplies.

Operator Certification

The State of Kansas has a voluntary certification program for water works operators. Of the total number of operators working in the 502 municipal supplies, only 239 are certified. During the field survey, the certified operators appeared to perform

substantially better than the untrained personnel. However, problems were evident in some supplies, although their operators were certified. Certification does not necessarily mean that an operator will impose the proper and correct methods and procedures during normal or unusual operational conditions, but certification shows that the operator has been exposed to and understands to some degree, the basic principles of water works operation.

The operator certification program in Kansas is sponsored jointly by the Kansas Sections of the American Water Works Association, and the State Department of Health. Representatives of the sponsoring organizations are appointed to a joint committee which administers the program. Operation certificates are of A, B, C, and D categories. The requirements of each category are based on experience, education and enough knowledge of water treatment to pass a specific examination administered by the joint committee. The difficulty of the examinations vary according to the certificate sought, with the A category being the most difficult. At present, there are 25-A, 17-B, 70-C, and 127-D certificates held by operators in Kansas. The rules and regulations of the voluntary certification plan for water works operators in Kansas are found in Appendix D.

Operator Training

Operator training is carried out by the joint committee. In 1972, three area schools and an annual water and sewage works school were held.

The three area schools were attended by 85 individuals and the annual school had 65. The area schools are 2-days in length; however, only one day is devoted to water supply. The lectures include general subjects of water supply sources, water chemistry, water purification and treatment techniques, chemical quality and bacteriology. One day is not sufficient to adequately cover all of the above subjects.

The Annual Water and Sewage Works school has 20-hours of instruction in water supply and treatment. This school is very informative; the lectures given are rather broad and general due to the variation of the enrollee's experience in water supply. The instructors at the schools are primarily personnel of the Kansas State Department of Health and some municipal employees.

Under the existing conditions, 44-hours of instruction is the maximum an operator can possibly receive if his employer is willing to pay for his travel, fees, and lodging. Most of the cities, as evidenced by the low number of certified operators, feel that this expenditure is unneeded and will maintain this position until mandatory certification is adopted.

Correspondence courses dealing with water works operation are available through State and Federal programs at a nominal fee which is usually paid personally by the operator.

In December, 1971, a training program entitled "Fluoridation

Determinations in Water" was conducted by the Environmental Protection Agency with the cooperation of the State Health Department. The three-day program consisted of laboratory and class sessions. Forty-four communities practice fluoridation in Kansas and 16 operators from 15 different supplies attended the course. The operators were instructed in standard methods of fluoride analysis, operation and maintenance of the facilities equipment, and safety in handling the fluoride equipment.

STATUS OF SUPPLIES

STATUS OF PUBLIC WATER SUPPLIES

Evaluation Criteria

The effectiveness of the Kansas Water Supply Program was based in part on the three separate surveys previously described. The bacteriological, chemical and physical quality of 40 community water supplies, and 40 small public water supplies were evaluated for compliance with DWS. These systems were also evaluated for adequacy of the water system source, treatment facilities, operation, quality control, and the engineering, chemical and bacteriological surveillance of the supply.

Bacteriological Quality

Bacteriological quality records of the 40 community water systems were reviewed at the State Health Department Laboratory. Bacteriological quality of the 40 small public water supplies was based on the results of tests performed on samples collected in the field during the survey. In addition, available bacteriological water quality data for the previous 12-month period were obtained for review from either the State Health Department or the State Highway Department files.

Chemical Quality

The chemical quality of the public water supplies surveyed was based on analytical results of treated water samples collected during the survey. If a supply had multiple sources of water, samples were collected from a point in the distribution system

representative of the composite sources. If the supply had a single source, the sample was taken where the finished water entered the distribution system. A one-gallon grab sample was collected from those supplies which had surface sources and mailed to the EPA Gulf Coast Water Supply Laboratory at Dauphin Island, Alabama, for pesticide analysis. Analyses were performed on the sample for the following chlorinated hydrocarbon pesticides: Aldrin, Lindane, Chlordane, DDD, DDE, DDT (p,p^1), Dieldrin, Endrin, Heptachlor, Heptachlor-epoxide, Methoxychlor and Toxaphene. A one-quart grab sample was collected from each of the supplies and mailed to the EPA Northeast Water Supply Laboratory at Narragansett, Rhode Island. The following physical and chemical constituents were measured: turbidity, color, total dissolved solids, chlorides, sulfates, boron, specific conductance, and pH. Another one-quart grab sample was collected and preserved with mercuric chloride and sent to Narragansett for Methylene Blue Active Substances (Foaming Agents) and Nitrate analyses. Narragansett also received a third one-quart sample preserved with sodium hydroxide for cyanide analysis. A one-quart grab sample was collected and preserved with concentrated nitric acid and mailed to the EPA Water Supply Laboratory in Cincinnati, Ohio. Analyses were performed on the sample for barium, arsenic, selenium, total chromium, silver, copper, manganese, lead, iron, cobalt, cadmium, zinc, nickel and mercury. The analytical results from the samples were compared to the recommended and mandatory limits for chemical constituents as set

forth in the 1962 Public Health Service Drinking Water Standards, see Table V. Supplies which exceeded the physical or chemical constituent limits were determined.

Bacteriological Quality

The bacteriological quality of the community water supplies was based on results of the previous 11 months of bacteriological records. These results were obtained in a tabulated computer printout form from the Kansas Environmental Health Laboratory and from two certified water treatment plant laboratories at Wichita and Topeka, Kansas. Systems which failed to meet the bacteriological requirements as prescribed in the Drinking Water Standards were determined.

Field surveys and inspections were made by EPA and State Health Department personnel. Needed information was collected and the water supply's source, treatment, operation and quality control were evaluated in accordance with the Manual For Evaluating Public Drinking Water Supplies and the Drinking Water Standards.

Source Adequacy

The adequacy of the source was determined from information provided by the water department personnel. The protection of the various sources were based on the present and possible future conditions of the well structures and watersheds.

TABLE V

Recommended Limits

Substance	Concentration in mg/l
Alkyl Benzene Sulfonate (ABS)	0.5
Arsenic (As)	0.01
Chloride (Cl)	250.
Copper (Cu)	1.
Carbon Chloroform Extract (CCE)	0.2
Cyanide (CN)	0.01
Fluoride (F)	*
Iron (Fe)	0.3
Manganese (Mn)	0.05
Nitrate[1] (No_3)	45.
Phenols	0.001
Sulfate (SO_4)	250.
Total Dissolved Solids	500.
Zinc (Zn)	5.

Mandatory Limits

Substance	Concentration in mg/l
Arsenic (As)	0.05
Barium (Ba)	1.0
Cadmium (Cd)	0.01
Chromium (Hexavalent) (Cr^{+6})	0.05
Cyanide (CN)	0.2
Fluoride (F)	*0.7-1.2
Lead (Pb)	0.05
Selenium (Se)	0.01
Silver (Ag)	0.05

*Depends on annual average of maximum daily air temperatures.

Facilities and Operation Adequacy

Facilities were considered adequate if they were suitable to treat the supply of raw water and if standby feed equipment was present. Operations were adequate if the facilities were well maintained and operated properly. If the treatment process being used showed a record which verified continual production of a water that was of good chemical, physical and bacteriological quality, the facilities were considered to be properly operated.

Distribution System

Storage was considered adequate if elevated or nonpumped storage equaled or exceeded the systems average daily demand. Pressure in the distribution system was considered adequate if it equaled or exceeded 20 psi in all parts of the system under maximum water use. Water in the distribution system was considered to be properly disinfected if a free chlorine residual was detectable through the distribution system at the time of the field visit.

Quality Control

The presence of records for disinfection, filter runs, chemical consumption, operational control tests when applicable and bacteriological results on the day of the field inspection determined the adequacy of their record keeping. The adequacy of the cross-connection control program was based on adoption of an ordinance, implementation of a program and progress toward cross-connection elimination.

Surveillance

Engineering surveillance of a supply was considered adequate if an inspection followed by a written report had been made by personnel from the Division of Environmental Health in the 12-month period previous to the field visit. Chemical surveillance was considered satisfactory if a complete chemical analysis was performed by the Kansas Environmental Health Laboratory on a distribution system sample or a well sample from the supply during the preceding 12-month period. Bacteriological surveillance was considered adequate if the actual number of bacteriological samples examined each month of the 11-month period from March 1971 to February 1972 met the minimum number specified by the Drinking Water Standards.

Findings From The Survey of 40 Community Water Supplies Serving Municipalities

Water Quality

Bacteriological Quality

Eight supplies (20%) of the systems failed to meet the mandatory coliform limit of the Drinking Water Standards one or more months during the 11-month review period. The correlation of community size on bacteriological quality and the number of noncertified operators are shown in Table VI. These supplies furnished water which was possibly unfit for consumption to 27,193 people. Five of the eight systems had well water sources and four of these were under the direction of a noncertified operator. Two other municipalities which employed noncertified operators had combined sources of well and spring water which were potentially bacteriologically hazardous to their citizens at various times. Only one system that utilized a surface supply failed to meet the standards. In all instances, the records do not indicate that any repeat sampling was initiated or carried out by any Health Department or city personnel at those locations where bad samples were previously collected.

Chemical Quality

Eighteen supplies (45%) of the systems failed to meet one or more chemical or physical constituent limits of the Drinking

TABLE VI

BACTERIOLOGICAL QUALITY AND OPERATOR CERTIFICATION EVALUATION BY COMMUNITY SIZE

Population	Number of Cities selected for survey	Number of Cities without certified operators	Number of Cities failed DWS bacteriological standards
50,000 and over	2		
10,000 - 50,000	13	3	1
2,500 - 10,000	10	6	2
1,000 - 2,500	7	5	1
500 - 1,000	3	2	1
Less than 500	5	5	3

Water Standards (DWS). At least one recommended chemical limit failed to be met by sixteen systems (40%) and two supplies (5%) failed to meet a mandatory chemical limit. Two supplies did not meet one or more of the physical constituent limits. These figures are illustrated in Figure 6. Figure 7 shows the constituent limits and the number of supplies that failed to meet them. A physical and chemical quality evaluation by community size is shown in Table VII. Fifteen of the 17 supplies which exceeded the DWS had ground water for a source of supply. Based on the chemical results of this survey, the concentrations of chemical constituents in Kansas surface water supplies are lower than in ground water supplies. Table VIII shows the relationship between the source and the systems exceeding the DWS. The turbidity and total dissolved solids standards were each exceeded one time by surface supply. Refer to Appendix E, Table I, for results of chemical and physical analyses. One of the samples from supplies with surface sources contained concentrations of the chlorinated pesticides in excess of the limits set forth in the Manual for Evaluating Public Drinking Water Supplies. Refer to Appendix E, Table II, for results of pesticide analyses.

Source

Two of the supplies surveyed did not have adequate quantities of water. The supplies sources were not adequate to satisfy the needs

Figure 6

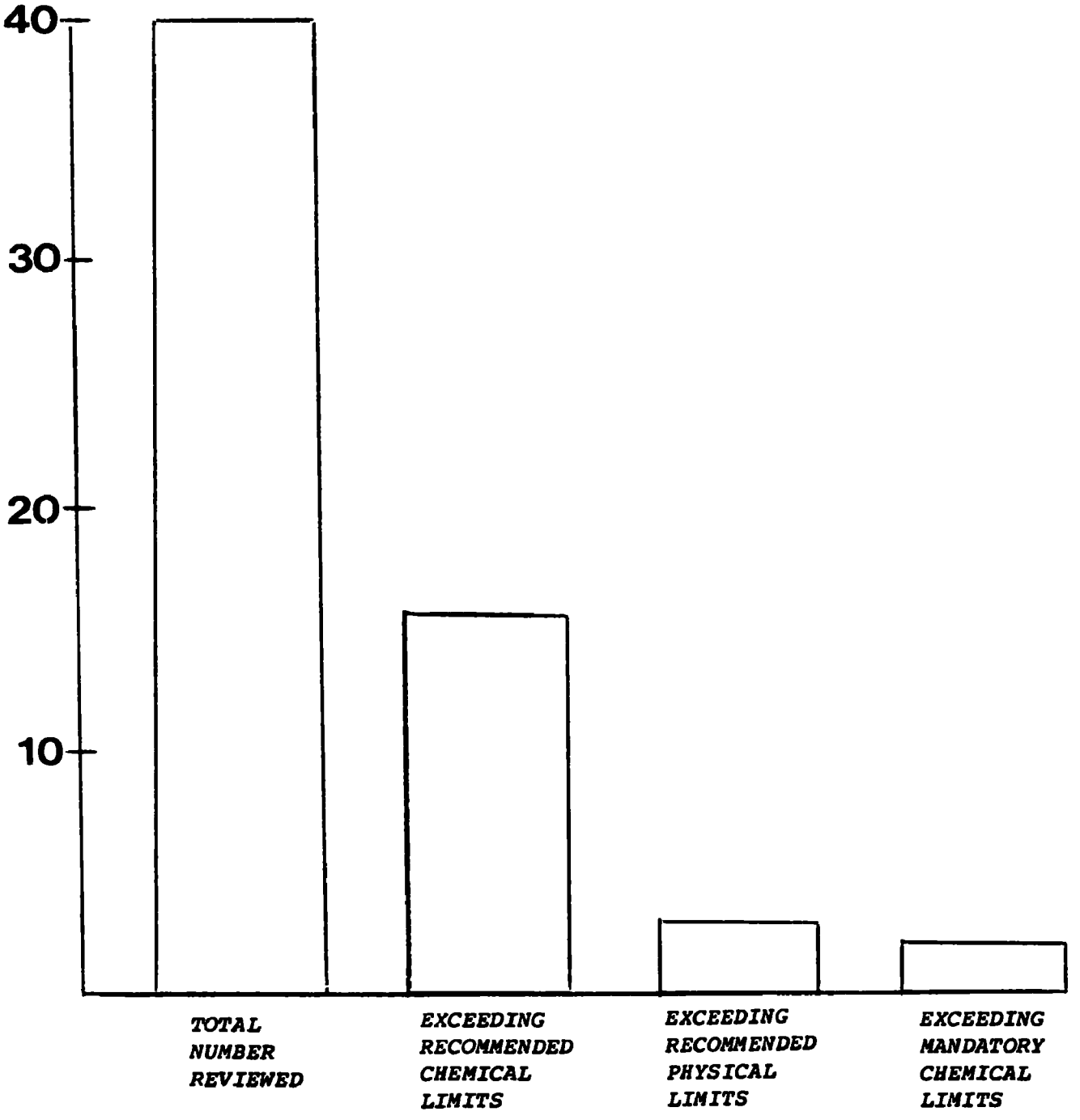

NUMBER OF SYSTEMS FAILING TO MEET
THE CHEMICAL AND PHYSICAL LIMITS IN
PHS DRINKING WATER STANDARDS
40
30
20
10
TOTAL NUMBER REVIEWED
EXCEEDING RECOMMENDED CHEMICAL LIMITS
EXCEEDING RECOMMENDED PHYSICAL LIMITS
EXCEEDING MANDATORY CHEMICAL LIMITS
Number of systems

Figure 7

NUMBER OF SYSTEMS FAILING TO MEET A CONSTITUENT LIMIT OF PHS DRINKING WATER STANDARDS

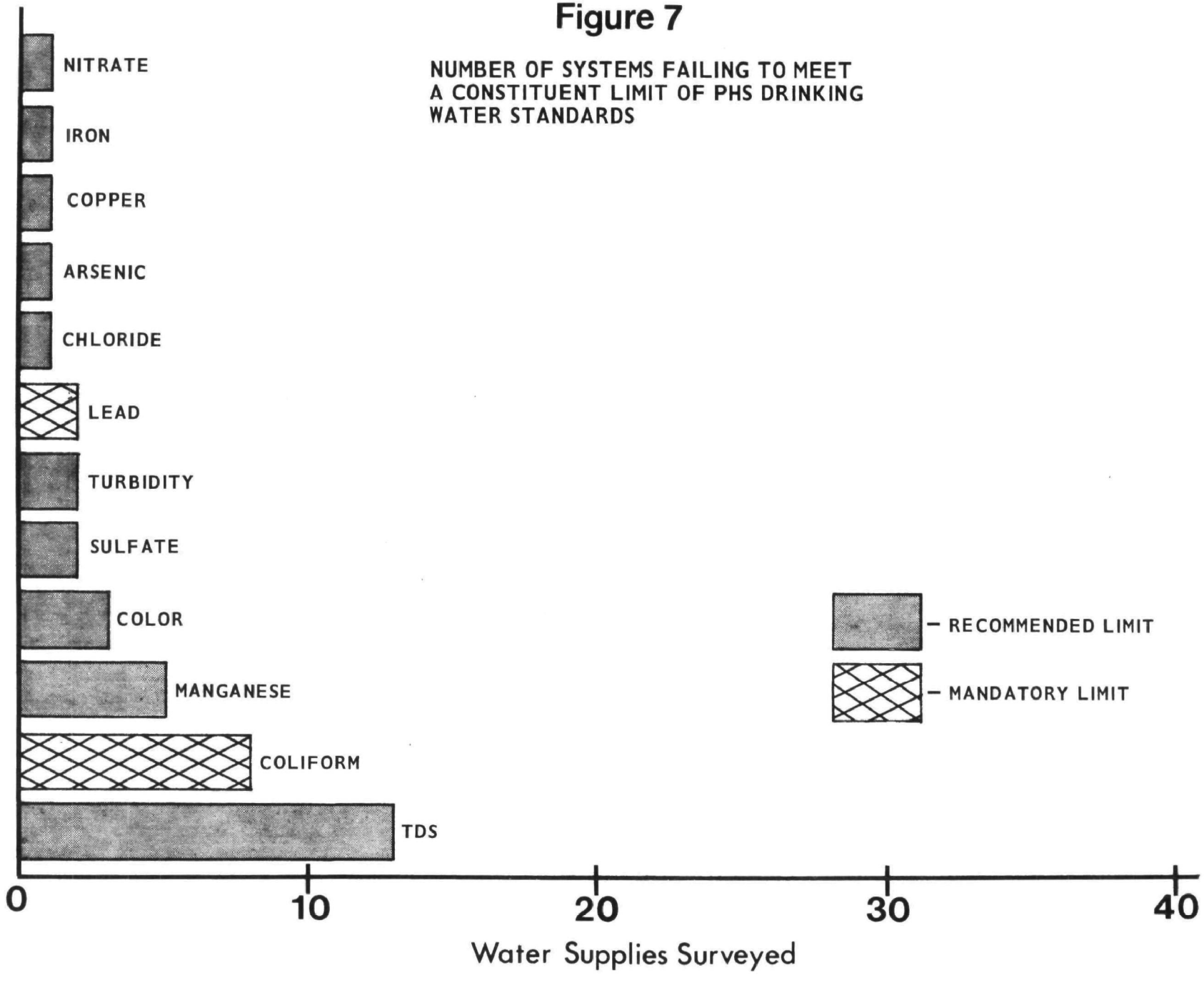


TABLE VII

PHYSICAL AND CHEMICAL QUALITY EVALUATION BY COMMUNITY SIZE

	Population Served-in Thousands					
	Over 50	10-50	2.5-10	1.0-2.5	.5-1	Less Than .5
Met Drinking Water Standards	2	7	6	5	2	2
Exceeded recommended permissible but not mandatory limit		4	4	2	1	3
Exceeded mandatory limits		2				
System totals - Number	2	13	10	7	3	5

TABLE VIII

SYSTEMS EXCEEDING LIMITS BY SOURCE

Recommended Limits

	Well	Surface	Mixed Well & Surface
TDS		1	1
MANGANESE	5		
SULFATE	2		
TURBIDITY	12	1	
COPPER	1		
NITRATE	1		
ARSENIC	1		
IRON	1		
CHLORIDES	1		
COLOR	3		

Mixed Well and Spring sources did not fail to meet any recommended physical or chemical limits.

Mandatory Limits

	Well	Surface	Mixed Well & Springs
LEAD	2		
COLIFORMS	5	1	2

Mixed Well and Surface sources did not fail to meet the mandatory limits.

of the community. The combined population served by these two supplies is 6,662 or 0.97 percent of the total population.

Four systems exhibited inadequate protection, but steps were under way to alleviate those conditions. In all supplies, the systems serve a combined population of 35,743.

Raw water quality cannot be discussed because it was not sampled and the Kansas Environmental Health Laboratory does not monitor the raw water quality of individual surface water supplies.

Treatment

The number of different sources and the various kinds of treatment the sources undergo are shown in Table II, Appendix A. Additional treatment facilities are needed in 14 (35%) of the systems surveyed. Two of the supplies are in the process of satisfying their needs. All of the supplies practiced disinfection and had at least one functional chlorinator. Of the 40 supplies surveyed, 6 (15%) did not have a free chlorine residual in the system at the time of the survey.

Distribution

Distribution storage facilities are inadequate in two systems serving a combined population of 17,972. One city is making progress toward eliminating this problem. Inadequate pressure is observed under conditions of excessive water use in some parts of the distribution system of a supply serving 274,448 consumers.

Quality Control

Eleven supplies (28%) surveyed, serving 14,126 persons failed to keep any quality control records. Four other systems kept only partial control records. All but two of the systems surveyed were reportedly checking chlorine residuals daily. One supply which did not check chlorine residuals failed to meet the Drinking Water Standards bacteriological quality requirements for two of the 11 months reviewed.

The type and frequency of tests for operational control ranged from none in two of the smaller towns to many types performed on an hourly basis in the larger systems. Atomic absorption was being used by two of the supplies for analytical work. Fluoride analyses were being performed by all supplies which made fluoride additions. All supplies that were softening ran pH, hardness and alkalinity tests. All (100%) of the systems which utilized surface sources were performing turbidity, color, and threshold odor tests.

A combined population of 21,168 was served by 12 systems that did not have an ordinance against cross-connections. Seven supplies had plumbing codes which included a section on cross-connections but no inspections or enforcement were prevalent. Only one of the cities surveyed was in the process of implementing a program of continuous reinspection for removal of cross-connections. Refer to Appendix G for information on the Source, Treatment, Distribution and Quality Control of each of the municipal water supplies surveyed.

Quality of Operation

The 40 systems surveyed provided water to a combined population of 680,656 and employed a total of 134 operators. Only 60 of the operators (45%) were certified under the voluntary certification program at the time of the survey. Twenty-one of the supplies (53%) had no certified operators. Only one supply did not have a full time employee. The smaller supplies hired one individual to take care of the water system, sewage system, streets and other problems and needs arising in the municipality. The practical experience of the water systems personnel ranged from a minimum of two years to a maximum of 30 years. The operators formal education varied from less than eight years of public schooling to acquisition of university degrees. Most of the operators have a high school or high school equivalent education. Approximately 30 percent of the supplies had sent their operators to the various area schools and the annual school sponsored by the Kansas Section of the American Water Works Association, and the State Department of Health.

Technical schools for instruction in water and sewage treatment had been attended by three of the 134 operators. No university level courses in chemistry or microbiology had been taken by personnel in 75 percent of the systems. Correspondence courses in water treatment were being taken by two of the operators.

The systems which do not have certified operators appear to have more problems in operations and in meeting the criteria in the

Drinking Water Standards. Operational problems were observed in nine of the supplies (23%) and six of these systems employed only noncertified operators. Of the eight supplies that failed to meet the bacteriological quality of Drinking Water Standards, seven employed noncertified operators. In six systems that were not disinfected properly at the time of the field survey, only two systems were controlled by certified personnel. Ten of the 15 systems operators who failed to keep completely satisfactory quality control records were not certified. The quality of operators is partially determined by salary levels and among the operators interviewed, the salary range varied from $275 to $800 per month for full time employees; $40 per month for the part time employee.

Surveillance

Bacteriological

The State has adopted into policy all the bacteriological requirements in the Drinking Water Standards. The discussion below is based on the supplies previous 11 months bacteriological records.

Twenty-one of the supplies (52%) of the water systems serving 148,548 individuals failed to meet the bacteriological standards because of inadequate sampling during one or more months.

Five water systems (13%) failed to collect any samples during some months.

A few samples from 16 supplies (40%) were discarded by the Environmental Health Laboratory because more than 48 hours had elapsed since the samples were collected. There was not evidence of a resampling policy for old samples or samples which had coliforms present.

Chemical

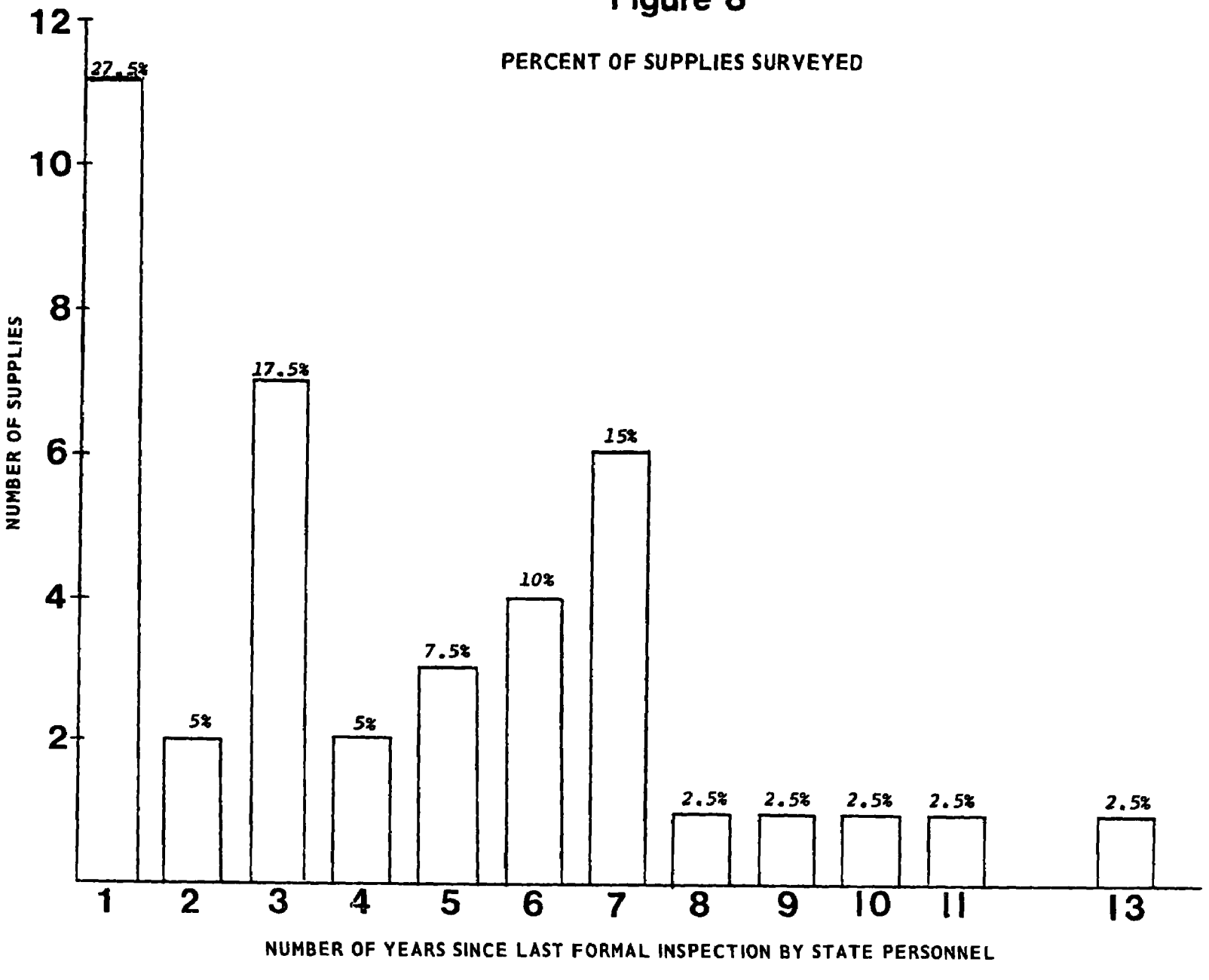
All of the supplies had a routine chemical analysis, performed yearly on a minimum of one sample from their distribution system or an individual well.

Based on the preceeding years analyses and on a limited number of constituents, about 460 public water supplies failed to meet the recommended DWS for chemical quality in one or more of the following categories: (1) total dissolved solids (2) iron and manganese (3) sulfate (4) nitrate and (5) chloride. With exception of the nitrates, while these deviations are undesirable, they reflect concentrations due to natural factors and do not constitute a health threat to the public. The State has an unwritten policy which sets the limit for nitrates in potable water at 90 mg/l unlike 45 mg/l in the DWS. An excess of nitrates in water contributes to an illness known as infant methemoglobinemia.

Engineering

Figure 8 shows the percentage and number of supplies with the length of time since the last inspection and written report by

Figure 8


PERCENT OF SUPPLIES SURVEYED
NUMBER OF SUPPLIES
12
10
8
6
4
2
27.5%
5%
17.5%
5%
7.5%
10%
15%
2.5%
2.5%
2.5%
2.5%
2.5%
1
2
3
4
5
6
7
8
9
10
11
13
NUMBER OF YEARS SINCE LAST FORMAL INSPECTION BY STATE PERSONNEL

State personnel. These data do not mean that the supplies were not visited yearly because in most cases they were but the area engineers and technicians have so many other program responsibilities that time is usually not available to make a thorough annual inspection and review all the laboratory techniques, records, etc. Without time to properly make an inspection and write a full report, there is no indication of the problems found; therefore, there are no means for the State to judge progress in correction of the problem. The inspection frequency and quality of the inspections are not in the regulations or policies, consequently, only 11 supplies (28%) have been inspected within one year of survey, two supplies (5%) inspected within two years and it has been three or more years since 27 supplies (67%) have been inspected.

Findings From The Field Survey of The 12 Selected Fluoridation Installations

Optimum Fluoride Level

In the 12 selected systems that were surveyed, it was noted that the analytical test and control of the fluoride ion level varied considerably. Only nine (75%) evidenced a fluoride ion content in the distribution system that was within the 0.8-1.2 mg/l range as required by the State of Kansas.

Laboratory Control

Five (42%) of the plant operators or laboratory personnel were not conducting fluoride analysis within $\pm$ 0.1 mg/l of the duplicate sample analysis performed by the Environmental Protection Agency Water Supply Division. Daily finished water fluoride ion analysis, required by the State Department of Health, was not conducted at five (42%) of the installations and regular raw water fluoride ion analysis was not being conducted at nine systems (75%). Adequate analytical equipment and facilities were available, and care of equipment was judged satisfactory at seven (58%) of the plants visited. Records of the fluoridation operation were acceptable at only four (33%) of the facilities surveyed.

Fluoride Chemical Feed Equipment and Facilities

Fluoride chemical feed equipment and facilities were found deficient at four (33%) of the 12 installations surveyed and only four (33%) of the feeding arrangements were acceptable, i.e.

protected against overfeeding, preferred point of chemical application, protected against backflow, and good housekeeping in the feeder area. Five (42%) of the operators reported one or more interruptions in fluoridation of one or more days duration in the past twelve months. Maintenance was found satisfactory at eleven (92%) of the facilities surveyed, however, the plant operators had been alerted to the inspection visit.

Fluoride Chemical Compound - Storage and Handling

Storage arrangements for the fluoride chemical compound fed were unsatisfactory at five (42%) of the 12 installations surveyed. Seven (58%) of the operators interviewed did not have available suitable safety equipment to handle the fluoride chemical compounds; two (17%) of the operators were permitting unsafe reuse of the chemical shipping containers or were not disposing of the empty containers satisfactorily.

Operator Training and Interest

A trained operator with a genuine interest in feeding fluorides is essential to the satisfactory operation of a fluoridation installation. Three (25%) of the facilities surveyed were operated by personnel not completely familiar with the fluoride chemical feed equipment at their plants. Three (25%) of the operators questioned were not adequately trained in the use of the fluoride ion test equipment provided and the procedures to follow in conducting a fluoride ion analyses. The operators at three (25%) of the

plants visited did not favor feeding fluoride to public water supply systems.

Surveillance

Frequent check samples of fluoride ion levels in the distribution system and regular inspection visits to the water fluoridation installation by State Water Supply surveillance personnel must be conducted to assure the facility is operating satisfactorily. The State Department of Health requires four water samples per month to be collected from the distribution system of fluoridated water supplies and submitted to the State Laboratory for fluoride ion analysis. A reivew of State Laboratory records for 1971 revealed the required number of check samples had not been received from three (25%) of the installations selected for survey. Only three (25%) of the twelve plants had been visited in the past twelve months by a representative of the State Department of Health's Water Supply surveillance agency. Inspection visits to the water supply systems surveyed averaged one visit in four years.

Figure 2, Appendix F, Operating Conditions At Selected Fluoridated Water Supply Systems, summarizes the operating conditions observed at the installations inspected during the time of the survey. Table II, Appendix F, Analysis of Samples From Fluoridated Water Supply Systems, tabulates the fluoride ion analysis of the water samples collected at each facility surveyed.

Findings From The Study of 40 Small Water Supplies Serving The Traveling Public

Water Quality

Thirty-five water systems (88%) delivered water that did not meet the constituent limits of the DWS. The systems surveyed and the constituent limits which failed to be met by each system is shown in Table III, Appendix E. Table IX lists the constituents and the number of systems failing to meet the recommended and mandatory limits of each constituent.

Bacteriological Quality

Nine water systems (23%) failed to meet the coliform limits of the DWS.

Chemical Quality

Thirty-four systems (85%) delivered water which failed to meet one or more of the recommended limits for chemical and physical quality. Six of the water systems (15%) failed to meet the chemical limits. The physical limits were exceeded by four water systems (10%). Twenty-nine systems (73%) failed to meet the total dissolved solids limit, 15 supplies (38%) failed to meet the iron limit and 10 systems (25%) failed the manganese limit. Mandatory limits for fluoride and selenium were met in 39 systems (98%) and lead was met in 36 supplies (90%).

Source Adequacy

All of the sources (100%) were capable of yielding the amounts of water needed by the traveling public.

TABLE IX

SMALL WATER SYSTEMS ALONG FEDERAL INTERSTATE HIGHWAY 70 IN KANSAS THAT FAILED TO MEET CONSTITUTENT LIMITS OF THE DRINKING WATER STANDARDS.

Recommended Limits Exceeded

	Number of Systems	Percent
Arsenic	1	3
Chloride	1	3
Color	1	3
Iron	15	38
Manganese	10	25
Nitrate	2	5
Sulfate	8	20
TDS	29	73
Turbidity	4	10
Zinc	0	0

Mandatory Limits Exceeded

	Number of Systems	Percent
Coliform Organisms	9	23
Fluoride	1	3
Lead	4	10
Selenium	1	3

Treatment

Only two systems (5%) had chlorination facilities and two other systems (5%) had softening facilities, however, none of the facilities were in operation at the time of the field visit.

Distribution

In general, the physical water system facilities used to distribute and store the drinking water were adequate, although 5 systems (13%) had low pressure (20 psi) in some area of the distribution system. This represents a potentially dangerous situation in the presence of a cross-connection between potable and nonpotable water and is especially serious at small water systems where demands are usually large and instantaneous.

Surveillance

Bacteriological

The degree of bacteriological surveillance of the water systems surveyed varied widely and generally did not meet the bacteriological surveillance criteria set forth in the Drinking Water Standards.

Three of the commercially owned water systems (8%) purchased wholesale finished water from a nearby municipal system assumed to have an adequate bacteriological sampling program. Thirty-seven water systems (98%) did not have a surveillance program which complied with the DWS. During the nine months of heaviest usage, the ten systems (25%) which were operated by the State

Highway Commission submitted one sample per month to the Kansas Environmental Health Laboratory for analysis. No records were available to show the other 27 commercially owned rest areas (68%) had ever submitted samples for analysis.

Chemical

The three systems (8%) which purchased water from the municipalities were the only ones which had samples from their supplies analyzed routinely. The ten State owned systems (25%) submitted samples to the Kansas Environmental Health Laboratory before the supplies were used by the public; however, routine analyses are not performed on samples from these systems.

Engineering

Only the municipal supplies that sold water to three (8%) of the rest stops had been inspected by the State Water Supply Program personnel. The frequency of inspection for these specific supplies was not evaluated. Engineering surveillance in previous section noted only 25% inspected annually. The other 37 supplies (98%) had never been reviewed or approved by the State Department of Health.

DISCUSSION

DISCUSSION

PROGRAM NEEDS

Legislative Authority and Implementation

Public Water Supplies

The Kansas Statutes delegate authority to the State Board of Health to supervise the development of public water supplies and to establish regulations for their surveillance. These statutes, prepared in 1907, specifically state that water supplied to the public for domestic or drinking purposes will be regulated by the State Board of Health; however, a definition of a public or other type of water supplies (i.e. public, semi-public, community, individual or bottled water) is not mentioned in the statutes. Statute 74-901, Appendix B modifies the functions of the State Board of Health, and provides for the Executive Secretary of the State Board of Health to be the Director of Health. The State Department of Health is under control of the Director of Health (State Health Officer) and he is delegated the authority and power of the State Board of Health in administrating the duties and obligations assigned by statute to the Board of Health and the State Health Department. However, the power and authority to make rules and regulations are not delegated to the Director of Health by the Board of Health. The State Water Supply Program is based primarily on the policies

developed through the Division of Environmental Health according to the Statute 65-171h revised in 1967. There are only two regulations regarding public water supplies, one pertaining to the collection and analysis of water for quality control and one for the application of permits to supply water for domestic purposes. The development of additional (Appendix B) regulations by the board of health would provide a more definite legal responsibility on public water supplies.

Small Water Supplies Serving the Public

As evidenced by the study of the water systems serving the traveling public along federal interstate highways in Kansas, the State Water Supply Program personnel have not included small public water supplies in their surveillance program. The statutes, regulations, and policies should be extended to safeguard the public in small institutions, hotels, motels, restaurants, service stations, and highway rest stops having their own water supply and serving water to the public. The State Department of Health has excluded these facilities from their inventory of public water supplies because of inadequate funds and manpower.

Individual Water Supplies

The statutes, regulations, and policies do not specifically provide for the control over water wells constructed for

individual use or small public water supplies. There is inadequate control of the well drilling operation as no agency is responsible for supervising this activity. This should be a closely related function to the Health Department as once the supply is developed and the water is provided to the public, compliance should be attained to existing statutes. Legislation should be initiated to develop a licensing of well drillers and adoption of a pump installation code with the State Health Department having major administrative and enforcement responsibilities. Permits should be issued for every well that supplies water to the public and the same requirements provided in the statute should be enforced.

Program Enforcement

Although the statutes prescribe severe penalties for failure to comply with requirements, review of the reports and records in the State Water Supply Program office revealed a number of incidents where a public water supply was in violation of State requirements and the Water Supply Program failed to take prompt corrective action.

The policy on chlorination adopted in 1942 by the Board of Health resulted in the issuing of orders for water supplies to provide this protection by January 1, 1958. One municipality refused to follow the order and held the matter in litigation for several years. During this time, the case identified as the State vs the City of

Galena, Kansas, (Appendix B) was appealed to the State Supreme Court. The legality of chlorination was upheld but precedence of the case as a safeguard for public health was obscured. Because of the slow process of judicial procedures, the City of Galena was able to furnish water to the public for 10 years without proper disinfection as ordered by the State Board of Health.

Another incident of Public Health significance was that of a landlord providing a water supply to homes which he had for rent. When his well failed, he resorted to a pond for serving his tenants. It took several weeks before the problem could be corrected in spite of the Statutes, regulations and policies.

A bowling alley that was developing its own water supply refused to follow the requirements of the State Department of Health. This called for considerable effort on the part of the Health Department to provide assurance that it was a safe supply.

Our field investigation also detected reluctance on the part of some communities to fully comply with the policies of the State Department of Health.

A reluctance has been shown by the State Department of Health in seeking legal aid to enforce the statutes. There appears to be a lack of communication between the Judicial and the Public Health workers, and the enforcement of needed protective measures for public water supplies is lax. It is the obligation of the State to

protect the health of all people, not just the majority. This lack of enforcement indicates that the State is not doing the best job possible in protecting the public health.

In view of the potential danger of a sanitary defect in a public water supply, a strict enforcement procedure should be established with the cooperation of state and local agencies having judicial powers to remedy a violation that is considered a potential health hazard.

Water Quality

Bacteriological

The State Board of Health requires chlorination of public water supplies for protection against the transmission of waterborne disease. Issuance of the Chlorination Order on October 8, 1942, resulted from an epidemic of bacillary dysentery that had occurred the previous month in Newton, Kansas. Twenty-five hundred residents and an indeterminable number of transients became ill because of a cross-connection that allowed sewage to flow into the city water mains.

During this evaluation period, 20% of the municipal systems failed to meet bacteriological quality recommended by DWS. The presence of coliform organisms is a potential danger to the supply as it indicates some form of contamination. Six of the forty systems surveyed did not have a free chlorine residual in the distribution system.

The evaluation of supplies serving the traveling public indicated a much poorer compliance to bacteriological quality for small public water supplies. Nine of the supplies (23%) of the systems surveyed failed to meet bacteriological quality standards. Only three water supplies (8%), those purchasing water from a municipal supply, had an apparent adequate bacteriological surveillance program, while 90% of the supplies failed to meet the requirements. Of these 40 systems, only two (5%) had facilities for chlorination and none of the facilities were in operation.

Maintaining a free chlorine residual in public water supplies is a major safeguard to the system. Chlorination not only protects the water supply from transmission of pathogens but provides control of nuisance organisms that contribute to taste and odor when they are allowed to develop. There were several instances during the survey of municipal systems where chlorination equipment had not been adequately maintained and, in many cases, there was no record of the amount of chlorine they were applying. The accuracy of the chlorine residual test was often of questionable reliability because of the condition of the instruments.

Chemical

Mandatory Limits

The permissible limits of chemical constituents in drinking

water are based on the fact that the substances enumerated represent hazards to the health of man.

There were two well supplies in the survey of 40 municipal water supply systems that did not meet the prescribed mandatory chemical limits. The constituent was lead, in concentration slightly greater than that prescribed in DWS.

In the survey of the 40 water supplies serving the traveling public, four supplies exceeded the mandatory limits for lead, and one supply exceeded the level for selenium. Neither one of these chemical constituents are routinely analyzed by the Kansas Water Supply Laboratory. It has been noted that only eight of the 20 consituents in DWS are being analyzed by the Kansas Environmental Health Laboratory.

Recommended Limits

The recommended limits should not be exceeded when a more suitable water supply is available. These limits are based on factors that render a supply undesirable for use because the constituents impart objectionable taste and odor to water, render it economically or esthetically inferior, or toxic to fish or plants.

Of the 40 municipal supplies surveyed, 40% failed to meet

one or more recommended chemical standards. Total dissolved solids, manganese and sulfates were the major constituents in excess. In general, these elements present an esthetic problem to the supply. From a health standpoint there is no data to indicate what level of manganese or sulfate would be harmful in a water supply. Manganese produces a brownish color in laundered goods and impairs the taste of beverages. Sulfates present a laxative problem for newcomers and casual water users. Iron, which is commonly present in the ground water sources in Kansas, only exceeded the standard in one municipal supply. The samples were taken from finished water in the distribution system or after treatment and, therefore, removal or oxidation of the iron had been accomplished by treatment or chlorination. The 40 supplies surveyed that served the traveling public indicated 15 (37%) exceeded iron standards, 10 (25%) exceeded manganese standards. These two constituents can be easily removed by conventional water treatment. There were eight supplies (20%) of the small public water supply systems surveyed that exceeded the sulfate standards. As previously noted, the cathartic effects of excessive sulfate consumption could present problems to the traveling public. The effects on infants of excessive nitrates in water is a recognized health problem. Two systems exceeded the recommended

standards for nitrates in water.

Fluoridation

Community water fluoridation is a proven public health method that provides an optimum level of fluoride ion for the prevention of tooth decay. EPA's endorsement of fluoridation is found in Appendix F.

When a community delivers water having fluoride ion adjustment, the Water Supply Program should be assured that minimum and maximum permissable concentrations of fluoride are maintained throughout the system.

Fluoridation of public water supplies is not mandatory in Kansas at the present time. Legislation is proposed in Kansas for mandatory fluoridation of every community supply over 500 population. The present policy in Kansas on fluoridation requires that the installation have full approval of the community before the State Department of Health will consider approval of fluoridation. The Water Supply Program staff must approve plans and specifications pertaining to all phases of the fluoridation process. State Health Department personnel are usually present when a community initiates fluoridation of its water supply. Normally, the area office staff provides a limited amount of individual instruction in fluoride determinations and equipment operation to the plant operators.

It was noted from the survey that 25% of the twelve supplies surveyed did not contain fluoride ion levels throughout the distribution system within the state recommended limits (0.8 to 1.2 mg/l) and that there were a number of deviations from acceptable practice in installations and analytical procedures.

Cross-Connection Control

Statute 65-163b provides requirements for cross-connection control. The statute does not allow cross-connections between a public and private supply unless a permit is obtained from the Board of Health. "Policies Governing The Design of Public Water Supply Systems in Kansas" further delineates cross-connection control and backflow prevention. The policy states that approval will be given only with adequate assurance when the following conditions exist:

1. A public water supply interconnecting private water supplies when,
    a. A 6" atmospheric gap is installed on the public supply.
    b. Under special conditions, a 4-way valve or an approved backflow preventer.
2. When interconnecting two public water supplies,
    a. A double check valve is required and surveillance is to be maintained for bacteriological quality.

The Kansas statutes and policies should provide adequate protection to public water supplies, however, there was little indication on

the part of most communities surveyed that a cross-connection control program would be initiated to minimize these hazards. There appeared to be little assurance on the part of the municipality that adequate knowledge was available as to existing cross-connection with the systems.

Bottled Water

The Water Supply Program in Kansas has no authority to regulate the bottled water industry. The Food and Drug Division of the Kansas State Department of Health has jurisdiction over the industry because bottled water is categorized as a food product. Approximately 25 bottlers are estimated to be in existence.

Personnel from the Food and Drug Division inspect the bottling establishments approximately twice a year, collect and submit samples for chemical and bacteriological analysis to the Kansas State Environmental Health Laboratory. Fifteen to twenty of the producers use either distillation or deionization methods for producing a water of low total dissolved solids content. Several companies bottle spring water to sell to the public. Occasionally, bottles of water are purchased from retailers shelves and samples from them are submitted for analysis.

The bottled water industry is also subject to the labeling provisions of the U.S. Food and Drug Act; however, there are no uniform regulations and standards applied to the plants or its products. The Kansas Food and Drug Division needs to continue

their routine inspection and shelf sampling to assure adequate registration, labelings, bacteriological quality of shelf samples, and sanitary conditions of the bottling facilities. Bottled water should adhere to the recommended bacteriological and chemical water quality requirements of the DWS, and should require surveillance by an acceptable program.

Waterborne Diseases

During the 10 year period 1961-1971, according to Craun and McCabe[7] 128 outbreaks and 46,400 cases of illness associated with drinking water occurred in the United States.

The major cause of illness with 22,000 cases was the use of untreated ground water. The detailed causes were: surface pollution near source; seepage of sewage; contamination by flood water, and others related to faulty development of the water source. Contamination of water sources with polluted water had to occur for the infections to occur. It should be possible to develop a water source and provide treatment so that the drinking water would not be a health hazard.

The second major cause of waterborne disease was inadequate control of treatment. In all, 20,000 cases of illness resulted when there were breakdowns of chlorination or inadequate chlorine fed into the system. The major cause of waterborne outbreaks in community water supplies result from the contamination of the distribution system caused by cross-connections and breaks in the lines. The

contamination is usually contained in a small part of the system and large numbers of cases of waterborne illness do not result. Infectious hepatitis is one of the most serious waterborne diseases. There were eight hepatitis outbreaks associated with community water supplies in the past 10 years and most (7) of these were caused by contamination of the distribution system.

There is no recent evidence of a major outbreak in Kansas attributed to waterborne diseases in public water supplies. However, there is potential for the transmission of any of the five listed diseases that can be waterborne, namely: Amebiasis, Infectious Hepatitis, Salmonellosis, Typhoid and Shigellosis. Typhoid fever, the classic waterborne disease of the past, has decreased and only a very few cases are reported in the United States and Kansas. During the past six years the number of cases of Typhoid reported has ranged between 350-400 for the nation and only one case was reported in Kansas during 1971. Increasing numbers of cases of amebiasis and salmonella have been reported in the United States and in Kansas during the past six years. In Kansas, an increase of 67% and 87% respectively, was noted during this period. Perhaps the greater threat to waterborne disease transmission is that of infectious hepatitis as case numbers are increasing and epidemiological evidence has verified this transmission. During the past six years the number of these cases reported in the United States has increased 81% and nearly 2.5 times in the State of Kansas. Likewise, Shigellosis is being reported at an increasing rate in the United States

and in Kansas it has increased nearly 13.5 times; evidence does not specifically point to public water supplies as the source of transmission, however, when the potential exists, every effort should be made to correct it.

Operator Training and Certification

Maximum protection to drinking water should be provided at all times. Water treatment and production personnel should have adequate training and resources to carry out their responsibilities in this program.

Many of the municipal supplies in the study obtained their water from wells and in many cases, the only treatment was chlorination. Their personnel were unaware of the necessity of keeping water production records for establishing dependable yield and projecting future water requirements. The administrative and technical personnel responsible for public water supplies must be aware of the capability of their supply and how to protect it.

The basic responsibility for operator training should reside with the utility and the operator. The State Water Supply Program should support an educational and training program for certification. Additional training courses, schools and workshops should be provided to assist operators in attaining certification. This is evidenced by the findings from the survey of the municipal supplies that the operators were not being certified.

A mandatory certification program can supply the needed personnel expertise in operations and maintenance to handle the problems associated with underground water distribution systems, complex treatment facilities, elevated storage, and pumping stations. Requirements would include formal education, actual experience in the water works field, a written examination and a required number of specialized training courses. Under a mandatory certification program, instruction of these specialized training courses would require the full time services of several individuals.

Program Resources

In the fiscal year 1973, the total cost of the Water Supply Program was approximately $200,000. This amount included some degree of engineering, chemical and bacteriological surveillance of the 632 public water supplies.

Manpower

At the present time, for engineering technical assistance, training and surveillance, a total of 4.7 man-years is budgeted for work in the Water Supply Program. Only 2.4 man-years of effort are available for routine field work and 2.3 man-years of effort are used to carry out program responsibilities in the central office.

Under the existing conditions, approximately 20% of the 632 public water supplies are receiving adequate annual engineering surveillance. The individual water supplies

or small public water supplies do not receive any type of chemical, bacteriological or engineering surveillance.

The Environmental Protection Agency has defined a public water supply system as any system that provides water for public consumption excluding water sold in closed containers. A community water supply system is a public system that either provides water to ten or more premises not owned or controlled by the supplier of water or to forty or more individuals. Small public water supplies systems serve a resident population of less than ten premises not controlled by the water supplier or less than 40 residents, including systems at schools, campgrounds, rest areas, restaurants, motels, service stations and federal installations not served by a community system. Individual water supply systems serve single dwelling units occupied by one family.

EPA has developed a rationale for estimating the cost of a state water supply program. This rationale consists of estimating the cost for the states in providing engineering, chemical and bacteriological surveillance over a public water supply.

Surveillance

Engineering

The engineering surveillance consists of sanitary surveys and

related technical assistance. To accomplish these tasks, it is estimated that 4 man-days are required per supply for plan review, meetings with governing bodies, surveys, report writing, informal on-the-job training, etc. Presently, the 4.7 man-years of effort in the Kansas Water Supply Program provide a limited amount of engineering surveillance primarily for the 502 communities (municipal supplies) with little or no engineering surveillance of the other 130 small public water supplies.

EPA feels that one person can provide surveillance over 56 community systems per year based on 225 working days, and four days a year per supply. For those small public water supply systems, EPA has assumed that $100 should be allocated for sanitary surveys and related technical assistance because this type of system requires less than one-third of the time required for surveillance of a community water supply.

Using the above criteria, the Kansas Water Supply Program needs approximately 9 man-years of effort (502 communities X $\frac{\text{4 man-days}}{\text{community}}$ X $\frac{\text{1 man-year}}{\text{225 man-days}}$) to provide the proper amount of engineering surveillance for the communities in Kansas. For the 130 small public water supplies when added with the 502 communities make up what presently constitutes the 632 public water supplies in Kansas, another 0.8 man-years of effort (130 small public supplies X $\frac{\text{1.33 man-days}}{\text{supply}}$ X $\frac{\text{1 man-year}}{\text{225 man-days}}$) are

needed for adequate engineering surveillance of these systems. In addition to the 130 small public water supplies, there are an estimated 1,000 small supplies which need to be included in the engineering, chemical and bacteriological surveillance programs. Six man-years of effort (1,000 systems X $\frac{1.33 \text{ man-days}}{\text{system}}$ X $\frac{1 \text{ man-year}}{225 \text{ man-days}}$) are needed for engineering surveillance of the additional 1,000 small public water supplies.

The Kansas Water Supply Program needs an additional 11.1 (15.8 - 4.7) man-years of effort to provide the proper amount of engineering surveillance which EPA feels is necessary for 502 communities and 1,130 small public water systems.

EPA's projected personnel costs are shown below:

Personnel Costs

$12,000	Salary
2,500	Fringe Benefits
2,000	Travel
500	Office Supplies
500	Office Space
2,500	1/3 - Secretary
$20,000	

At a cost of $20,000 for one man-year of effort, the Kansas Water Supply Program's budget needs to be increased by $222,000 to provide an adequate amount of engineering surveillance. A total of $327,170 is needed but only $105,170 is presently being spent for such surveillance. The various costs to carry on the engineering surveillance portion of the State Water Supply Program are as follows:

1973 FISCAL YEAR BUDGET

Item	Area Offices	Central Office
A. Personnel		
Engineering Salaries	$26,923.00	$34,749.60
OAB (Pd by State)	1,304.51	1,311.31
Retirement (Pd by State)	928.48	1,389.98
Secretarial Salaries	4,320.00	12,591.42
OAB (Pd by State)	242.35	707.64
Retirement (Pd by State)	172.80	503.66
Hospital Insurance (Pd by State)	453.04	740.12
Rent, Supplies, and Misc.	780.56	3,337.50
Telephone	396.74	1,000.00
Xerox Copy	-	600.00
Automobile Expenses	7,348.00	1,929.84
Travel and Subsistence	1,600.00	1,840.00
Total Cost	$44,409.48	$60,701.07
Grand Total		$105,170.55

Chemical

The Environmental Protection Agency rationale states that the water utility itself should routinely perform the chemical analysis for proper operational control (i.e. turbidity, pH, chlorine residual, etc.) as well as special analysis for contaminants that are known to be present at levels approaching the limits established in the 1962 DWS. The State should assume responsibility for sufficient sampling and analysis to insure that water of satisfactory chemical quality is delivered to the consumer by the public water supply systems. This is of particular importance due to the large number of systems without the capability to make some of the more important health related determinations.

The following tabulations indicate: (1) minimum elements of a chemical analysis considered sufficient to determine the chemical and physical quality of a drinking water (2) elements of a health-related chemical analysis (3) the minimum frequency of monitoring for each element of the chemical analysis based on the type of water source (it is assumed that 20% of the community water supplies use surface sources and the remaining 80% use groundwater sources.) (4) the estimated cost for the total chemical analysis.

Chemical Analysis	Man Days Per Sample	Source of Supply	Frequency of Analysis	Man-days Per Annum
Wet Chemistry	1.8	Surface	Annual	0.4
		Groundwater	Triennial	0.5
Trace Metals*	0.4	Surface	Annual	0.1
		Groundwater	Triennial	0.1
Pesticides* (chlorinated hydrocarbons and herbicides)	0.8	Surface	Annual	0.2
CCE*	0.6	Surface	Annual	0.1
Radiochemical*	0.6	Surface & Groundwater	Triennial	0.2
Total				1.6

$$\frac{1.6 \text{ man-days} \times (\$20{,}000/\text{year})}{\frac{225 \text{ man-days}}{\text{year}}} = \$142/\text{year}$$

*Elements of Health Related Chemical Analysis

The State Environmental Health Laboratory is currently running the wet chemistry analyses and a few trace metal analyses with the use of a Beckman visible spectrophotometer and flame photometer. The laboratory has a Perkin-Elmer 290B atomic absorption spectrophotometer, which unfortunately is a single beam instrument lacking the sensitivity and stability required to analyze for metals such as lead and chromium at a level required by the DWS without some sort of concentration step. While this instrument is sensitive enough for most other metals, another instrument such as the Perkin-Elmer 403 should be purchased so the laboratory can determine other heavy metals (i.e. arsenic, selenium, etc.) in quantities that are found in the DWS. In addition to Perkin-Elmer 403 instrument and accessories at an estimated cost of $10,000, another $3,000 is needed for purchasing a Coleman Mercury Analyzer, a Hach Model 2100A for turbidity measurements and a mini-sampler and extractors for the determination of carbon chloroform and carbon alcohol extracts (CCE and CAE.)

The State Environmental Health Laboratory has gas chromatographs and radiological equipment for measuring pesticides and radioactivity; however, these substances are not determined unless specifically requested by the Water Supply Program Chief. The Water Supply Program has to pay a fee to the Environmental Health Laboratory for any additional analyses which are performed that are not included in their routine

complete analysis.

Following is a list of the expenditures by the Kansas Water Supply Program for chemical, radiological and pesticide analyses of water samples collected from public water supplies during the fiscal year 1973.

Laboratory Service

Chemistry	
a. complete analyses	18,925.00
b. partial analyses	2,500.00
Radiological	975.00
Pesticides	120.00
Total	$22,520.00

For the 632 public water supplies, a total of $22,520 was spent, thus, in 1973 the average cost per system for a limited amount of chemical surveillance was approximately $35.

Based on the rationale developed by EPA and considering that the State Environmental Health Laboratory will have to perform wet chemistry and trace metal analyses, and using EPA's figure of $142 per year for chemical surveillance, the Water Supply Program needs $71,284 (502 communities X $\frac{\$142.00}{\text{Community}}$) for proper surveillance of the community water supplies. The estimated 1,130 small public water supplies, which primarily have wells as water sources, should submit samples every five years for

wet chemistry, trace metal and radiochemical analyses.

Another $56,000 ($\frac{2.8 \text{ man-days}}{\text{supply}}$ X $\frac{\$20,000}{\text{man-year}}$ X 226 supplies X $\frac{1 \text{ man-year}}{225 \text{ man-days}}$) is required for adequate chemical surveillance of the small public water supplies in Kansas. A total of $127,284 is necessary for the proper amount of chemical surveillance for all the public water supplies in Kansas and this sum is $104,764 more than what was spent in the fiscal year 1973.

Bacteriological

EPA feels that three procedures are possible for getting samples properly analyzed by qualified laboratories: (1) State receives all samples from utilities and performs analysis. (2) Utility performs all tests in State approved laboratories. (3) State performs a minimum number of analysis and utilities take additional samples to meet Drinking Water Standards. The State makes periodic surveys of water supply laboratories and compares their results with State laboratory results. Bacteriological monitoring is considered to be an operational procedure to be performed at the expense of the water utility, however, the State is responsible to assure itself that the analyses are properly performed. EPA feels that: (1) Procedure Number 3 provides the best approach. (2) $5.00 per sample would be adequate for postage and analytical costs. (3) State should examine 5% of the distribution samples required by the

Drinking Water Standards or two samples, whichever is the greater. On this basis, the State would examine two samples from each system serving fewer than 35,000 people and 5% of the required number for all larger systems.

Procedure number one is favored for use in Kansas because the State wants the responsibility of performing the majority of the bacteriological testing for the utilities.

In addition to saving the State money for laboratory certification and saving the utilities expenditures for qualified personnel, laboratory equipment, reagents, etc., procedure number one makes certain that testing procedures are uniform, analyses are properly performed, and results are interpreted and reported correctly; thus, assuring the best and most responsible evaluation of a supply's bacteriological water quality.

Although procedure number one is primarily being used in Kansas, procedure number three is being followed to some extent. There are five of the 502 municipal supplies that have State approved laboratories and perform their own bacteriological analyses. The utilities collect and run enough samples to be in compliance with the DWS. As a check on the utilities testing results, the State requires that four of the utilities samples be collected in duplicate and mailed weekly to the Kansas Environmental Health Laboratory for analysis.

For bacteriological surveillance of the 632 public water supplies in the fiscal year 1973, Kansas spent $67,154 for analyses and $5,010 for IBM costs. The cost per sample for postal service and analytical work averaged $2.16 but this figure does not include rent, utilities, telephone service, or fringe benefits to personnel, so the $5.00 per sample that EPA has projected may be a realistic figure.

The $72,164 which is spent for bacteriological surveillance of the 632 public water supplies in Kansas needs to be increased by $94,534 to pay for the actual $5.00 per sample cost.

The other estimated 1,000 small public water supplies which are presently not under any type of bacteriological surveillance should submit a minimum of two samples per month; thus, resulting in an additional 24,000 samples per year for the Kansas Environmental Health to analyze at an annual cost of $120,000. In summary, the bacteriological surveillance portion of the Kansas Water Supply Program needs to be increased from $72,164 to $289,698 annually.

The amount of money which the 632 public water supplies have been paying has exceeded the actual costs of the analytical work and the IBM costs because 20 to 75 percent of the public water supplies fail to submit the number of samples for which they are charged.

The State Environmental Health Laboratory sends a printout sheet listing the supplies which are, and are not, in compliance with the bacteriological monitoring or quality requirements of the DWS to the area and central offices. The Water Supply Program personnel do not reprimand the supplies for their failures or help remedy their problems.

Summary of Resources

The chart below shows the existing resources and additional resources needed to improve and extend the engineering, chemical and bacteriological surveillance of all the public water supplies in Kansas.

Surveillance	Existing Resources	Additional Resources Needed
1. Engineering	$105,170	$222,000
2. Bacteriological	72,164	217,534
3. Chemical	22,520	104,764
Total	$199,854	$544,298

An increase in the budget of $544,298 is needed for engineering (sanitary surveys and technical assistance) bacteriological, and chemical surveillance of 1,632 public water supplies in Kansas.

Training

State Staff

EPA has assumed that each professional should receive an average of five days training per year. The cost is estimated at $100 per day or $500 per year based on $60 per day (the rate

EPA charges for courses) and $40 per day (travel and per diem costs.)

Presently, the staff of 15 people that make up the 4.7 man-years of effort and carry out the Water Supply Program are allowed on an average, less than one day per person, or less than two days of training per year for each man-year of effort.

In 1972, only one man from the Water Supply Program staff attended an EPA five-day course entitled "Operation and Control of Water Systems Supplied From Wells." The $60 per day fee for this course and many other EPA courses is waived for state employees which results in a cost only for per diem.

All of the Water Supply Program personnel would have benefited from this course, especially those that were new in the water supply program. Some of the other personnel attended conferences sponsored by organizations such as the American Water Works Association and the Conference of State Sanitary Engineers. Based on the 15.8 man-years of effort needed to carry out the engineering surveillance of the estimated 1,632 public water supplies in Kansas, $7,900 (15.8 X $500) needs to be allotted for these individuals to receive five days of training per man-year of effort. It is hoped that if the Water Supply Program expands to its needed capacity, the personnel involved in the program will be able to devote 100 percent of their efforts to the program.

Water Plant Operators

EPA assumes that one operator per system should receive five days training every five years or one day of training each year at an annual cost of $60. For 598 of the 632 public water supplies (i.e. municipalities and rural water districts) $35,880 would be the cost to provide training based on EPA rates.

This type of rationale is not the best approach to take when considering Kansas. Assuming that mandatory certification will be required, the state would need $125,000 (based on the amount spent for operator training in Texas) for personnel to manage and administer the training program created by mandatory certification. After this program is initiated, the tuition paid by the utilities or the operators would defray the State cost of the program in future years.

Upon the request of the community, the individual courses included in the training program would be taught in the field over a two-week period with between 10 and 20 individuals attending class two or three hours a day.

Three-day short schools should be held in each of the six areas. With the training courses set up under the time periods specified, the operators in the supplies would have an opportunity to attend needed courses as their job permits them to do so. Most of the operators would rather attend a 3-day short school, but their responsibilities in their water systems usually force them to obtain

their needed hours of training over a two-week period.

For 20 hours of training in courses such as basic water treatment, ground water treatment, advanced water treatment, surface water treatment, water distribution, water works mathematics, bacteriological and chemical examination of water, etc., the supplies would pay a reasonable fee ($30-$40) per student to the State.

The three-day short schools should offer the previously mentioned courses plus additional lectures, by experts from private companies or municipalities, on special topics of interest such as chlorinator and water meter repair, cross-connection control, reverse osmosis, use of activated carbon filters, etc.

The training program should obtain all of its operational funds from tuition. If the cost of training is prohibitive to the supplies ($60/day), they will allow only one person per year to obtain training to become and remain certified. The other approach of $30 to $40 for 20 hours of training would allow the systems to send five people instead of one as indicated by EPA rationale.

Well Driller Licensing

If a pump installation code and a program for licensing well drillers is adopted, $25,000 will be needed for hiring personnel to develop and administer these activities.

Summary of Manpower Needs

The chart on the next page shows the existing and proposed program activities with existing and recommended additional resources needed.

SUMMARY OF EXISTING AND NEEDED RESOURCES

Activity		Existing Resources	Additional Resources Needed
A. Surveillance			
1. Engineering (Sanitary Surveys, Related Technical Assistance and Operator Training)			
a. Community (502)		$105,171	$ 74,829
b. Small Supplies (1130)		Negligible	136,000
	Total	$105,171	$210,829
2. Chemical			
a. Community (502)		*	71,284
b. Small Supplies (1130)		*	56,000
c. Additional Analytical Laboratory Equipment		*	13,000
	Total	$ 22,520	$140,284
3. Bacteriological			
a. Community (502)		*	94,534
b. Small (1130)		*	120,000
	Total	$ 72,164	$214,534
B. Training			
1. State Personnel		$ 200 Est.	$ 7,700
2. Supply Personnel		See Surv.	
a. Created by Adoption of Mandatory Certification			
(i) Personnel to administer training program and instruct courses			$125,000
	Total	$ 200	$135,700
C. Licensing of Well Drillers			25,000
	Grand Total	$200,055	$723,347

* Not determined individually; total amount spent was deducted from amount needed for community surveillance.

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REFERENCES

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APPENDICES

APPENDIX A

PUBLIC WATER SUPPLIES STUDIED

APPENDIX A

TABLE I

PUBLIC WATER SYSTEMS STUDIED

NO	NAME OF SYSTEM	NO. OF SERVICES	POPULATION SERVED	AVERAGE DAILY DEMAND (MGD)	SOURCE	TREATMENT
1	ABILENE	2732	6,661	1.50	7 Wells	D
2	ARKANSAS CITY	5421	13,216	2.50	8 Wells	D-Fl-P
3	ATCHISON	3991	12,204	2.35	Mo. River	G-S-F-D-Fl
4	ATLANTA	105	244	.02	2 Wells & Springs	D
5	AUGUSTA	2195	5,977	.68	Augusta City Lake	S-C-F-D
6	BEVERLY	110	214	.03	Wells	D
7	BOGUE	90	271	.03	Wells	D
8	BUCKLIN	450	840	.12	Wells	D
9	CHANUTE	4350	10,341	1.62	Neosho River	C-S-F-D-L-Fl-La
10	COLUMBUS	1500	3,356	.39	2 Wells	D-A-S
11	COPELAND	150	266	.015	Wells	D
12	DODGE CITY	4800	14,127	3.70	Wells	D
13	DOUGLASS	615	1,126	Not Metered	7 Wells	D
14	EL DORADO	4500	12,308	1.40	Reservoir	C-S-F-D-Fl
15	ELLSWORTH	1000	2,080	.40	Wells	La-L-C-S-F-D-Fl

APPENDIX A

(Continued)

TABLE I

PUBLIC WATER SYSTEMS STUDIED

NO	NAME OF SYSTEM	NO. OF SERVICES	POPULATION SERVED	AVERAGE DAILY DEMAND (MGD)	SOURCE	TREATMENT
16	GARDEN CITY	4658	14,708	2.00	Wells	D
17	GARDNER	748	1,839	.20	Reservoir	C-S-F-D-Fl
18	GREAT BEND	5287	16,133	2.45	Wells	D
19	GREENSBURG	837	1,907	.45	4 Wells	D
20	HAYS	5000	15,396	1.8	18 Wells	A-C-S-F-D-L-La-Fl-P
21	HILL CITY	625	2,071	.50	Wells	P-D
22	HOLTON	1200	3,063	.50	Wells	C-S-F-D
23	INDEPENDENCE	4500	10,347	2.00	Verdigras River Reservoir	Fl-C-S-F-D-L-La
24	IOLA	2694	6,493	1.20	Neosho River	D-C-S-F-L-La-Fl
25	JEWELL	285	649	.04	Reservoir	C-S-F-D
26	JUNCTION CITY	9000	18,820	2.50	Wells	C-S-F-D-Fl
27	KINGMAN	1482	3,622	.60	Springs & Wells	D
28	KINSLEY	955	2,209	.40	Wells	D
29	LEAVENWORTH	8000	24,951	2.35	Mo. River	S-C-F-D
30	LYONS	1852	4,355	1.2	Wells	D-Fl

APPENDIX A

(Continued)

TABLE I

PUBLIC WATER SYSTEMS STUDIED

NO	NAME OF SYSTEM	NO. OF SERVICES	POPULATION SERVED	AVERAGE DAILY DEMAND (MGD)	SOURCE	TREATMENT
31	MORAN	255	564	.04	Surface	C-S-F-D
32	NORTON	1380	3,627	1.05	Reservoir	C-S-F-D
33	OSWEGO	920	2,200	.36	Neosho River	C-S-F-D
34	PITTSBURG	7580	20,171	2.04	Wells	A-D-C-S-F-L-La-Fl-P
35	PRATT	2853	6,736	1.07	11 Wells	D
36	SALINA	13295	37,095	5.05	15 Wells & River	S-C-F-D-Fl
37	TOPEKA	41000	123,043	18.0	Kansas River	A-C-S-F-D-L-La-Fl-P
38	WAMEGO	983	2,507	.38	Wells	D-P
39	WESTMORELAND	233	467	.04	Wells	D
40	WICHITA	85302	274,448	.35	55 Wells & Cheney Reservoir	A-C-S-F-D-L-La-P

A - Aeration
C - Coagulation
S - Sedimentation
F - Filtration
D - Disinfection
L - Lime
La - Soda Ash
Fl - Fluoride
P - Phosphate

APPENDIX A

TABLE II

TYPES OF TREATMENT PRACTICED

Type of Source	D	D CL	D P	D FL P	D A S	D & CL L & FL SA	D CL FL	D FL	D & L & FL A & CL & P	D & L A & SA CL & P	Number of Systems Sampled of this Type
Surface		6				2	3			2	13
Well	12	1	2	1	1	1	1	1	2		23
Mixed Well & Surface							1			1	2
Mixed Well & Spring	2										2

A - Aeration
C - Coagulation
S - Sedimentation
F - Filtration
D - Disinfection

L - Lime
SA - Soda Ash
FL - Fluoridation
P - Phosphate Addition

CL - Clarification (includes coagulation, sedimentation and filtration)

APPENDIX B

LAWS, REGULATIONS AND POLICIES

PERTAINING TO

PUBLIC WATER SUPPLIES

ANALYSIS OF WATER

65-156. Regulations and fees. That the state board of health shall make rules and regulations for the collection of samples and analysis of water, either natural or treated, furnished by municipalities, corporations, companies or individuals to the public, and shall fix the fees for any services rendered under said rules and regulations to cover the cost of the services, which fees shall be approved by the state board of regents before they become operative. [L. 1915, ch. 327, § 1; April 10; R. S. 1923, 65-156.]

Edited, 1949: "Board of regents" inserted in lieu of "board of administration."

65-157. Same; analysis in state laboratory; disposition of fees. The analysis of all waters required in the rules and regulations shall be made at the water and sewage laboratory of the state board of health in the university of Kansas, and the fees collected under the provisions of this act shall be turned into the state treasury for the benefit of said laboratory of the university of Kansas. [L. 1915, ch. 327, § 2; April 10; R. S. 1923, 65-157.]

65-158. Same; penalty for failing to comply with regulations. That every corporation, railway, common carrier, company or individual that shall fail to comply with the rules and regulations prescribed by the state board of health under this act shall be deemed guilty of a misdemeanor and upon conviction shall be fined not less than $50 nor more than $500. [L. 1915, ch. 327, § 3; April 10, R. S. 1923, 65-158.]

65-161. Term "waters of the state" defined. That the term "waters of the state," wherever used in this act, shall include all streams and springs, and all bodies of surface and of impounded ground water, whether natural or artificial, within the boundaries of the state. [L. 1907, ch. 382, § 1; March 20; R. S. 1923, 65-161.]

Research and Practice Aids:

Waters and Water Courses⇐182.
Hatcher's Digest, Health § 7.
C. J. S. Waters § 226 et seq.

CASE ANNOTATIONS

1. Health authorities may invoke remedy of injunction to prevent anticipated health menace. Dougan v. Shawnee County Comm'rs, 141 K. 554, 560, 43 P. 2d 223.

65-162. Plans of waterworks to be filed. Every municipal corporation, private corporation, company and individual supplying or authorized to supply water to the public, within the state, shall, within sixty days after the passage of this act, file with the state board of health a certified copy of the plans and surveys of the waterworks, with a description of the source from which the supply of water is derived, and no additional source of supply shall thereafter be used without a written permit from the state board of health, as hereinafter provided. [L. 1907, ch. 382, § 2, March 20; R. S. 1923, 65-162.]

65-163. Water permits, application; complaints, investigations, supervision and change of water supply by state board; penalties; appeals. That no person, company, corporation, institution or municipality shall supply water for domestic purposes to the public within the state from or by means of any waterworks that shall have been constructed or extended, either in whole or in part, subsequent to the passage of this act, without a written permit from the state board of health for the supplying of such water, except this provision shall not apply to extension of water pipes for distribution of water. The application for such shall be accompanied by a certified copy of the maps, plans and specifications for the construction of such waterworks or extension, and of a description of the source from which it is proposed to derive the supply and of the manner of storage, purification or treatment proposed for the supply previous to its delivery to consumers, together with such other data and information as may be required by the state board of health; and no other or additional source of supply shall subsequently be used for any such waterworks, nor any change in the manner of storage, purification or treatment of the supply be made, without an additional permit to be obtained in a similar manner from the state board of health.

Whenever application shall be made to the state board of health for a permit under the provisions of this section, it shall be the duty of the state board of health to examine the application without delay, and, as soon as possible thereafter, to issue the said permit if in its judgment the proposed supply appears to be not prejudicial to the public health, or to make an order stating the conditions under which the said permit will be granted. If the said person, company, corporation, institution or municipality shall consider the terms of such order to be illegal or unjust or un-

reasonable, it may, within thirty days after the making of such order, appeal therefrom to the district court of the county in which the proposed waterworks, or extension thereof, is to be located; and the said court shall hear the said appeal without delay, and shall render a decision approving, setting aside or modifying the said order, or fixing the terms upon which said permit shall be granted, and stating the reasons therefor.

The supplying of water for domestic purposes to the public within the state from or by means of any waterworks that shall have been constructed or extended, either in whole or in part, subsequent to the passage of this act, without a permit to do so obtained from the state board of health as hereinbefore provided, shall be deemed a misdemeanor, and shall be punishable by a fine of not less than twenty-five dollars nor more than fifty dollars for each offense. The supplying of water in each day contrary to the provisions of this act shall be considered to constitute a separate offense. Whenever complaint shall be made to the state board of health by the mayor of any city of the state, or by a county health officer, or by a local board of health, touching the sanitary quality of any water supplied to the public for domestic or drinking purposes within the county within which the said city or health officer or local board of health is located, it shall be the duty of the state board of health to investigate the character of the water supply concerning which the complaint is made. Also, whenever the state board of health shall have reason to believe that the sanitary quality of any water supplied to the public within the state for domestic or drinking purposes is such as to be prejudicial to the public health, it may upon its own motion investigate the character of such water supply.

Whenever an investigation of any water supply shall be undertaken, under either of the foregoing provisions, it shall be the duty of the person, company, corporation, institution or municipality having in charge the water supply under investigation to furnish, on demand, to the state board of health such information relative to the source or sources from which the said supply of water is derived and to the manner of storage, purification or treatment of the water before its delivery to consumers as may be necessary or desirable for the determination of its sanitary quality. And the state board of health is hereby given authority to make an order requiring such changes in the source or sources of the said water supply, or in the manner of storage, purification or treatment of the said supply before delivery to consumers, or in both, as may in its judgment be necessary to safeguard the public health. It shall be the duty of the person, company, corporation, institution or municipality having in charge the water supply investigated, or the works for the development or distribution of the supply, to fully comply with the said order of the state board of health.

If any such person, company, corporation, institution or municipality shall consider the requirements of the said order to be illegal or unjust or unreasonable, it may, within thirty days after the making of the said order, appeal therefrom to the district court of the county in which the said waterworks are located, and the said court shall hear the case without delay, and shall render a decision approving, setting aside or modifying the said order, or fixing the terms upon which said permit shall be granted, and stating the reasons therefor. [L. 1907, ch. 382, § 3; L. 1909, ch. 226, § 1; R. S. 1923, 65-163; L. 1943, ch. 219, § 1; June 28.]

Cross References to Related Sections:

Election for change of water supply, see 65-171.

Research and Practice Aids:

Waters and Water Courses⇐190, 196.
C. J. S. Waters §§ 228, 232, 269

65-163a. Cessation of water delivery to avoid contamination of public water supply; appeal to district court; penalty. Any person, company, corporation, institution or municipality may refuse to deliver water through pipes and mains to any premises whereon any condition exists which might lead to the contamination of the public water supply and may continue to refuse such delivery of water to any such premises until such condition is remedied: *Provided, however,* The state board of health may order any such person, company, corporation, institution or municipality to cease the delivery of any water through pipes and mains to any premises whereon any condition exists which might lead to the contamination of the public water supply and any such person, company, corporation, institution or municipality so ordered by the state board of health shall immediately cease delivery of water until the danger of contamination is eliminated

If any person, company, corporation, institu-

tion or municipality shall consider the terms of such order by the state board of health to be illegal or unjust or unreasonable, it may, within thirty days after the making of such order, appeal therefrom to the district court of the county in which the premises involved is located, and the said court shall hear the said appeal without delay, and shall render a decision approving, setting aside or modifying the said order, and stating the reasons therefor.

The supplying of any water contrary to the order of the state board of health or contrary to the decision of the said district court, if appealed as aforesaid, shall be a misdemeanor, and any person, company, corporation, institution, or municipality convicted thereof shall be punished by a fine of not less than twenty-five dollars nor more than fifty dollars for each offense. The supplying of water in each day contrary to the provisions of this act shall be considered to constitute a separate offense. [L. 1943, ch. 219, § 2; June 28.]

Research and Practice Aids:
Waters and Water Courses⇐196.
C. J. S. Waters §§ 232, 269.

65-163b. Cross-connection water permits. No person shall establish or maintain any cross-connection between any public and any private water system except upon a permit to be issued by the state board of health. [L. 1943, ch. 219, § 3; June 28.]

65-170. Engineer of state board of health; duties in carrying out the provisions of 65-161 to 65-170. That for the purpose of carrying out the provisions of this act a member of the faculty of the school of engineering of the university of Kansas or agricultural university, to be named by the state board of health, is hereby made the engineer of the state board of health. It shall be the duty of the engineer to investigate and report upon all matters relating to water supply and sewerage and the pollution of the waters of the state that may come before the state board of health for investigation or action, and to make such recommendations in relation thereto as he may deem wise and proper, and to make such special investigations in relation to methods of sewage disposal and to public water supply and the purification of water as may be necessary in order to make proper recommendations in regard thereto, or as may be required by the state board of health. He shall make a report to the board at each annual meeting covering the work of his office for the past year. His actual and necessary expenses incurred while in the discharge of his duties as engineer of the state board of health shall be allowed and paid when audited and approved by the secretary of the said board.

That in carrying out the provisions of this act the secretary or the engineer of the state board of health, or both, may act for the state board of health in case the said board be not in session, and their decisions shall have the same force and effect as though made by the state board of health, when confirmed by the governor and attorney general. That suits under the provisions of this act shall be brought in the name of the state of Kansas by the attorney general of the state in any court of competent jurisdiction, and the penalties and fines recoverable under the provisions of this act shall be paid into the school fund of the state. That whenever appeal to any district court shall be made from any order or decision of the state board of health under the provisions of this act the court or judge thereof may, on application, upon good cause shown, stay said order or decision until the final determination of said appeal. [L. 1907, ch. 382, § 11; L. 1909, ch. 226, § 5; May 29; R. S. 1923, 65-170.]

Research and Practice Aids:
Health⇐7(3), Waters and Water Courses⇐70.
C. J. S. Health § 9 et seq.; Waters § 45.

65-171. Election for change of water supply, when. That nothing in this act shall permit the board of health to change the supply of water for any municipal water plant where the cost of such change would exceed one thousand dollars without first submitting the same to the qualified electors at a general or special election. [L. 1909, ch. 226, § 6; May 29, R. S. 1923, 65-171.]

Cross References to Related Sections:
Change of water supply, see 65-163.

Law Review References:
Mentioned in article on municipal power and fluoridation, Newell A George, 1 K. L. R. 156, 161 (1953).

65-171g. Protection of water and air from sewage contamination. Water supply shall be protected against contamination from sewage by the prohibition of any connection between sewage and water systems which provide the possibility of water contamination by means of back syphonage or direct connection. Air in enclosed spaces shall be protected against contamination from toxic, ex-

plosive, or disagreeable gases or vapors from a sewage system by providing leak-tight and substantial waste and ventilation connections, and liquid sealed traps on all plumbing fixtures discharging into any type of sewage disposal systems. [L. 1951, ch. 363, § 1; June 30.]

65-171h. Minimum standards for sanitary water and sewage systems. The state board of health in pursuance of its general power of supervision over the interests of the health and life of the citizens of this state, and the sanitary conditions under which they live and in order to protect the quality of the waters of the state for beneficial uses, is hereby authorized and empowered to develop, assemble, compile, approve and publish minimum standards of design, construction, and maintenance of sanitary water and sewage systems, and shall publish and make available such approved minimum standards to municipalities, communities and citizens of this state, and shall from time to time make recommendations to the appropriate committees of the legislature, for any legislation that may be required to adequately protect air in enclosed spaces, and water supply from contamination. [K. S. A. 65-171h; L. 1967, ch. 333, § 5; April 28.]

Article 9.—STATE BOARD OF HEALTH

Cross References to Related Sections:

Public health, see ch. 65.
General powers and activities, see ch. 65, art 1.
Control of ionizing radiation, see 48-1606 et seq.
Uniform vital statistics act, see ch. 65, art. 24.

74-901. Members; qualifications; appointment; terms; vacancies; powers and duties; rules and regulations; oath; officers; legal and accounting counsel; offices. The state board of health shall consist of eleven (11) members, five (5) of whom shall be licensed in the state of Kansas to practice medicine, one (1) of whom shall be licensed in the state of Kansas to practice pharmacy, one (1) of whom shall be licensed in the state of Kansas to practice dentistry, and one (1) of whom shall be licensed in the state of Kansas to practice veterinary medicine, one (1) of whom shall be a hospital administrator, one (1) of whom shall be a licensed administrator of a skilled nursing home and one (1) of whom shall be a sanitary engineer. The members of said state board of health shall be appointed by the governor by and with the advice and consent of the senate and in making such appointments, the governor shall as far as practicable make his appointments so that the members of said board will be residents of the different parts of the state.

The members of said board shall hold their respective offices for a term of three (3) years and until their successors are appointed and qualified except that the members of the first board shall hold their offices for terms as follows: Three (3) for a term of one (1) year, three (3) for two (2) years and four (4) for three (3) years, and the governor in making the appointments shall designate the term for which each is to serve and except the licensed administrator of a skilled nursing home first appointed shall hold his office for a term of two (2) years; and annually thereafter the governor shall in like manner appoint successors of like character and qualifications to fill the vacancies occurring in said board by reason of the expiration of the terms of service as herein provided.

All the powers, duties, authority and jurisdiction now conferred or imposed by law upon the state board of health are hereby transferred to, imposed and conferred upon the state board of health created by this act. All valid rules and regulations of the state board of health existing on the date this act takes effect and on file in the office of revisor of statutes as provided by law shall constitute and be the rules and regulations of the state board of health created by this act and shall continue in force and effect until revoked, suspended or amended by the state board of health created by this act. In no case shall any member appointed under the provisions of this act serve for more than two (2) terms in succession. Upon the appointment of the persons provided for in this act, the secretary of state shall issue to each of them a certificate of his appointment, and they shall each take and subscribe to the oath prescribed by law for state officers, which shall be filed with the secretary of state; and thereupon said board shall immediately organize by electing one member of the board president. The president of said board shall have no vote in any matter other than the election of officers unless there is a tie vote, when he shall have the deciding vote. The board shall also elect a secretary and said secretary shall be the executive secretary of said board, but not a member thereof. The secretary shall take and file a like oath to that prescribed for the members of said board.

The board may elect one of its own number secretary, but in such case such election shall create a vacancy in the board, which shall be filled by the governor. It shall be the duty of the governor to fill all vacancies which may occur in the board, and all appointments, whether original or to fill vacancies made during the recess of the legislature, shall be submitted by the governor to the senate at its first session after such appointment is made, for its action; but all lawful actions of the members of the board made before confirmation or rejection shall be valid. The board may employ and fix the compensation of legal and accounting counsel. The executive council shall provide the state board of health with a suitable office at the city of Topeka for the transaction of its business. [L. 1885, ch. 129, § 1; L. 1903, ch. 357, § 1; R. S. 1923, 74-901; L. 1951, ch. 435, § 1; L. 1967, ch. 434, § 25; L. 1970, ch. 265, § 6; March 26.]

Research and Practice Aids:

Health⇐3.
Hatcher's Digest, Health § 1.
C. J. S. Health §§ 4, 7.

CASE ANNOTATIONS

Annotation to L. 1885, ch. 129, § 1:

1. Board of health; power restricted concerning vaccination of pupils. Osborn v. Russell, 64 K. 507, 509, 510, 511, 68 P. 60.

Annotation to L. 1903, ch. 357, § 1:

2. Recess appointees may hold office for full term subject to consideration or rejection by senate. State, *ex rel.*, v. Mattassarin, 114 K. 244, 250, 217 P. 930.

Annotation to R. S. 1923, 74-901:

3. Cited in holding appointment to state board of regents valid. Driscoll v. Hershberger, 172 K. 145, 153, 238 P. 2d 493.

74-901a. Organizational lines of authority and administration; definitions. As used in this act: (*a*) The term "state board of health" means the ten (10) member board established by section 74-901 of the General Statutes Supplement of 1961 and its executive secretary as established therein. (*b*) The term "state department of health" means the state board of health established by section 74-901 of the General Statutes Supplement of 1961, except for the ten (10) member board and its executive secretary as defined in (*a*). [L. 1963, ch. 397, § 1; June 30.]

Research and Practice Aids:

Health⇐2.
C. J. S. Health § 4 et seq.

Law Review and Bar Journal References:

Mentioned in survey of "Constitutional and Administrative Law," Glenn E. Opie, 12 K. L. R. 143, 167 (1963).

74-901b. Same; director of health; rules and regulations of board. The executive secretary of the state board of health shall be the director of health. On and after the effective date of this act any reference in the laws of this state or in the regulations of the state board of health to the state health officer shall be deemed to refer to the director of health. The state department of health shall be under the supervision and control of the director of health, subject to the orders, rules and regulations of the state board of health. [L. 1963, ch. 397, § 2; L. 1967, ch. 414, § 1, July 1.]

Source or prior law: 75-3153.

Research and Practice Aids:

Health⇐7.
C. J. S. Health § 6 et seq.

74-901c. Same; exercise of powers by state health officer. The powers and authorities of the state board of health shall be exercised by and through the state health officer and the duties and obligations of the state board of health shall be performed by the state health officer or at his direction, except as specifically otherwise provided in this act. Whenever under any provision of law any action is to be taken or approved upon order of the state board of health, such order shall be issued and signed by the state health officer under the authority hereby conferred. The state health officer shall administer and direct all of the affairs, work and activities of all of the administrative subdivisions of the state department of health.

Except as otherwise specifically provided by law and subject to the provisions of the Kansas civil service act and acts amendatory thereof and supplemental thereto, the state health officer is hereby authorized to appoint and prescribe the dues of such employees as may be necessary to carry out the powers, authorities, duties and obligations heretofore or hereafter imposed or conferred upon the state board of health and the state health department. Involuntary terminations of employment shall be ordered by the state health officer upon instruction of the state board of health. [L. 1963, ch. 397, § 3, June 30.]

Source or prior law: 75-3153.

Research and Practice Aids:

Health⇐7(3).
C. J. S. Health § 9 et seq.

74-901d. Same; rule powers not delegated. The power and authority to make and prescribe rules and regulations conferred by law on the state board of health shall not be delegated by such board to the state health officer or any other person or persons. [L.

Research and Practice Aids:

Health⇐20.
C. J. S. Health §§ 2, 9 et seq.

74-901e. Same; hearings by board. The power and authority to conduct hearings shall be in the state board of health, in cases in which hearings are to be conducted by hearing officers, such hearing officers shall be appointed by the state board of health; the power and authority to appoint hearing officers shall not be delegated by the state board of health to the state health officer or to any other person or persons. [L. 1963, ch. 397, § 5; June 30.]

Research and Practice Aids:

Health⇐6.
C. J. S. Health § 9 et seq.

74-901f. Same; act supplemental. This act shall be supplemental to and a part of section 74-901 of the General Statutes Supplement of 1961. [L. 1963, ch. 397, § 6; June 30.]

74-902. Rules and order of business; seal; meetings; compensation of members and secretary; expenses. The state board of health shall make, adopt and publish such rules and

Article 14. COLLECTION AND ANALYSIS OF SAMPLES OF WATER FROM PUBLIC WATER SUPPLIES

28-14-1. SUBMISSION OF SAMPLES.

All municipalities, corporations, companies, water districts or individuals supplying water to the public shall collect and submit samples of water to the Environmental Health Laboratory of the state department of health for analysis. All samples shall be collected in accordance with directions furnished by the chief engineer of the department. (Authorized by K.S.A. 65-156; compiled January 1, 1966)

28-14-2. GROUND WATER SUPPLIES.

a. Samples of water shall be collected bi-weekly and submitted for bacteriological analysis. (Authorized by K.S.A. 65-156; compiled January 1, 1966)

b. A sample of water shall be collected annually and submitted for chemical analysis. (Authorized by K.S.A. 65-156; compiled January 1, 1966)

c. Additional samples shall be collected and submitted for bacteriological and/or chemical analysis when deemed necessary by the chief engineer of the department. (Authorized by K.S.A. 65-156; compiled January 1, 1966)

d. Ground water supplies subjected to any type of chemical treatment and/or subject to contamination may, at the discretion of the chief engineer of the department, be classified with surface water supplies and be made subject to the regulations applying to surface water supplies. (Authorized by K.S.A. 65-156; compiled January 1, 1966)

e. Fees for services rendered under these regulations have been fixed upon the population served, and are as follows:

Population Served	Annual Fees
0 - 300	35.00
301 - 500	60.00
501 - 1,000	80.00
1,001 - 1,500	100.00
1,501 - 2,500	120.00
2,501 - 4,000	170.00
4,001 - 5,500	180.00
5,501 - 7,000	200.00
7,001 - 9,000	230.00
9,001 -13,000	275.00
13,001 -25,000 and over	325.00

(Authorized by K.S.A. 65-156; compiled January 1, 1966)

f. Fees shall be payable in advance July first of each year to Environmental Health, State Department of Health, 535 Kansas Avenue, Topeka, Kansas. (Authorized by K.S.A. 65-156; compiled January 1, 1966)

28-14-3. SURFACE WATER SUPPLIES

a. Samples of water shall be collected weekly and submitted for bacteriological analysis. (Authorized by K.S.A. 65-156; compiled January 1, 1966)

b. A sample of water shall be collected annually and submitted for chemical analysis. (Authorized by K.S.A. 65-156; compiled January 1, 1966)

c. Additional samples shall be collected and submitted for bacteriological and/or chemical analysis when deemed necessary by the chief engineer of the department. (Authorized by K.S.A. 65-156; compiled January 1, 1966)

d. Fees for services rendered under these regulations have been fixed upon the population served, and are as follows:

Population Served	Annual Fee
0 - 1,500	135.00
1,501 - 2,500	200.00
2,501 - 4,000	230.00
4,001 - 5,500	275.00
5,501 - 7,000	300.00
7,001 - 9,000	325.00
9,001 - 13,000	400.00
13,001 - 25,000	500.00
25,001 - 75,000	675.00
Over 75,000	800.00

(Authorized by K.S.A. 65-156; compiled January 1, 1966)

Article 15. APPLICATION FOR PERMITS TO SUPPLY WATER FOR DOMESTIC PURPOSES

28-15-1. INFORMATION REQUIRED.

The information required by the state department of health in considering an application for a permit to furnish water for domestic purposes in the state of Kansas consists of the following:

a. General Plans
b. Detail plans
c. Engineer's report
d. Specifications
e. Application

(Authorized by K. S. A. 65-162 and K. S. A. 65-163; compiled Jan. 1, 1966)

28-15-2. GENERAL PLAN

The plan for a complete water supply and water purification system shall consist of the following parts: A general map of the city or district showing all existing or proposed streets and alleys; elevations of street intersections; location of all pipes, valves, hydrants, reservoirs, tanks, pumps, intakes, purification plants, etc., with sizes. Also high and low water elevations, if near a stream; in case wells are used, show location of houses, septic tanks, cesspools, swamps, stream, barnyard, sewers, etc., near enough to afford a contaminating influence. Also, fire protection district must be shown. This map shall be drawn to a scale of not less than 300 feet to one inch, nor greater than 100 feet to one inch. (Authorized by K. S. A. 65-162 and 65-163; compiled Jan. 1, 1966)

28-15-3. DETAIL PLANS.

Detail plans showing the construction of each special unit of the plant, such as blow-offs, siphons, intakes, conduits, reservoirs, wells, collecting galleries, standpipes, etc. Profiles of long conduits or pipe lines, plotted to a convenient scale, must be shown. (Authorized by K. S. A. 65-162 and 65-163; compiled Jan. 1, 1966)

28-15-4. DETAIL PLANS OF PURIFICATION PLANTS.

Detail plans of purification plants must show the arrangement, size and construction of sedimentation basins, mixing chambers, baffles, inlets and

outlets, special arrangements for feeding chemicals, blow-offs or cleanouts, elevation of each unit, etc. If filters are contemplated, complete plans of layout and detail, showing coagulating devices, disinfection devices, devices for measuring and reading loss-of-head, rate of filtration, apparatus for collecting water, apparatus for washing, arrangement of beds, of pipe gallery, sand and gravel, of pumps, etc., and any other special appurtenances. Filter company's plans must accompany the plans also; and working drawings must be submitted during construction, if any change is made from the original design. A general layout plan must also accompany the plans showing various units of the process, with reserve areas for future extensions.

Each drawing shall have a title, consisting of the name of the water supply for which the plans are intended, the names of the engineers, designing and consulting, date, scale, and such other references as are necessary for a complete understanding of the plan. (Authorized by K. S. A. 65-162 and 65-163; compiled January 1, 1966)

28-15-5. ENGINEER'S REPORT.

A report written by the engineer responsible for the plans shall be presented, with plans for complete system or for purification plants, and shall give all data upon which the design is based, or which are required for a complete understanding of the plant. (Authorized by K. S. A. 65-162 and 65-163; compiled Jan. 1, 1966)

28-15-6. SOURCE OF SUPPLY.

a. SURFACE SUPPLY. Nature and extent of watershed, with special reference to its sanitary condition, shall be fully discussed, together with proposed methods and regulations for the prevention of accidental or other pollution. A small scale map of the watershed, showing buildings, roads, barnyards, feedlots, etc., if impounded supply; or showing same within distance of five miles of intake, and all cities on the watershed, if a river supply, should be included. Storage capacity, average depth, width, rate of flow, nature and area of reservoir, character of water, etc., should also be discussed.

b. GROUND SUPPLY. If the water supply is to be taken from wells or infiltration galleries, describe the number, depth, size and construction of same, method of pumping, capacity of pumps, screens used, ground through which well is driven, and probable capacity of wells. Description of tests or wells should be included. If collection galleries are to be used, explain their construction.

The report should also include a description of area to which water is to be supplied or which may be supplied for domestic use and fire protection; quantity of water to be supplied daily, population to be served, portion of system to be built at once, depth of pipe in ground, and description of future units for pumping or power. (Authorized by K. S. A. 65-162 and 65-163; compiled January 1, 1966)

28-15-7. SPECIFICATIONS.

Specifications for the whole construction must accompany all plans for new sources of supply, new or improved treatment plants, and treated water storage tanks. It is desired that estimates of cost be included but this is not required. (Authorized by K. S. A. 65-162 and 65-163; compiled January 1, 1966)

28-15-8. APPLICATION.

An application on the form furnished by the department, signed by the proper official, and acknowledged before a notary, must be filed. (Authorized by K. S. A. 65-162 and 65-163; compiled January 1, 1966

28-15-9. SUBMISSION OF INFORMATION.

All the information included in the foregoing must be submitted to the chief engineer for the state board of health at least two weeks prior to the time action is desired. Action will not necessarily be taken in that time, however. (Authorized by K. S. A. 65-162 and 65-163; compiled January 1, 1966)

28-15-10. DEVIATION FROM PLANS.

There shall be no deviation from plans submitted to and approved by the department unless amended plans showing proposed changes have been submitted to and approved by the department. Copies of plans, specifications, engineer's report and application must be approved by and filed with the department before the contract is let. (Authorized by K. S. A. 65-162 and 65-163; compiled January 1, 1966)

SUMMARY OF POLICY STATEMENTS

Policies are aimed at securing water works facilities which will make it possible under all conditions of operation to produce and distribute a finished product which will comply with the Drinking Water Standards of the U.S. Public Health Service for bacteriological and chemical quality.

Special attention was given to protection of the water supply as finally prepared to be distributed against contamination by sewage, insects, animals, birds, and waters that are, or at times may be, unsafe for domestic use.

Designer was asked to consider the simplicity of operation as one of the most important features. Certain inherent differences between large and small plants must be recognized. The most potent factors influencing the design of small plants were recognized as financial limitations in initial construction costs and operating funds.

Approval of plans and plant site does not imply a guarantee against litigation which may result from the construction or operation of the plant.

Plans should be re-submitted for review if the contract is not let within two years from the date of approval of the origional plans.

Installation of meters on low service and high service pump discharge lines is strongly recommended.

The plant should be safe from flooding and high ground water. Top of basins, filters, and clear wells to be a minimum of five feet above previous high water of record, with ten feet desirable where feasible.

Plant should be adequate to provide for the needs of a reasonable period in future...future development should not be restricted.

Engineer shall submit calculations to show the probable yield of proposed source of supply in periods of minimum rainfall as compared to the estimated maximum demands for water expected during design period.

Bacteriological quality of water source will determine the degree of treatment required as provided in the policy statements... waters containing more than 20,000 coliform bacteria per 100 milliliters are considered unsuitable...unless special methods of treatment are employed.

In public water supplies in which the nitrate content of water is known to be in excess of the listed concentration, the public should be warned of the potential dangers of using the water for infant feeding.

Underground waters containing not more than 50 coliform bacteria (M.P.N.) per 100 ml and meeting in other respects the Drinking Water Standards will require only simple continuous chlorination treatment.

Waters containing not more than 5,000 coliform bacteria (M.P.N.) per 100 ml and meeting the Standards must be treated by mixing, flocculation, settling, rapid sand filtration and continuous post-chlorination with 30 minutes or more contact with the treated water before use. For waters in this class, pre-chlorination with at least 30 minutes contact at pH under 7.5 is strongly recommended.

Waters containing more than 20,000 coliform bacteria per 100 ml are considered undesirable as a source of supply.....in absence of adequate supply.....special methods of teatment may be considered with prior approval.

Treated water should contain no impurity which will cause offense to the sense of sight, taste, or smell.

The total detention time required in solids contact basins is equal to the sum of the individual detention times specified for mixing, flocculation, and settling.

The effect of the presence of suspended solids are to be studied on the particular water to be treated.

Pilot plant studies in the treatment of a given water will be considered in establishing the basis of design for a full scale plant.

Aerators may be used as preliminary treatment in the removal of carbon dioxide, hydrogen sulfide, iron, or manganese. Adequate ventilation and cold weather operation should be considered in all aerator designs.

Sludge collection equipment shll be especially selected or designed to adequately remove heavy silt or sand.

With regard to flocculation basins, primary or secondary, large plants should use twin units in parallel. Submerged drive for mechanical flocculation equipment is not recommended...variable speed drive is to permit adjustment of mixing velocities to suit water temperature.

Special attention should be given to the design of the inlet and outlet arrangements for settling basins in order to secure uniform distribution of flow. Changes in flow should be kept to absolute minimum.

Minimum size for settling basins recommended to minimize stoppages is 8-inch diameter.

Proper arrangements should be made to dispose of plant wastes so as not to create nuisance conditions, or to adversely affect public health, livestock, or aquatic life. Sludge from lime-soda softening plants is particularly objectionable and disposal facilities will be required.

Settling basin drainage facilities should not be connected to the sanitary sewer system.

Use of gravity rapid sand filters is recommended for all public water supply systems requiring filtration.

Use of rate controllers is strongly recommended for all gravity filters and especially for multiple filter installations.

Pressure sand filters are not approved for treatment of surface waters, or for ground waters containing more than 2 mg/l of iron and manganese.

Diatomite filters are not approved for treatment of public water supplies.

Use of storage at proper elevation or special wash water pumps is recommended. Use of water from the high pressures mains for filter washing is not recommended, except for standby service.....may be approved under special conditions.

Equipment for recarbonation of lime-softened water must produce not less than 500 lbs. of carbon dioxide per million gallons of water treated at maximum design rate if magnesium hardness is to be removed.

Single stage recarbonation just ahead of filtration will be permitted only for waters having a maximum pH of 9.5 during treatment.

The use of zeolite or other ion-exchange materials is not recommended for softening waters containing more than 1 mg/l iron and manganese.

Chlorination equipment for treated waters shall have a capacity of not less than 3 mg/l at maximum flow rates.

Disinfection apparatus should be in duplicate, or be provided with sufficient spare parts to insure no interruption in the delivery of properly disinfected water.

Chlorine residual comparator is minimum where ground water supplies with only chlorination treatment is involved.

All public water supplies serving over 20,000 people should equip their laboratories for bacteriological as well as chemical tests.

The top of treated water storage reservoirs should be at least 5 feet above previous maximum flood water level, and it is recommended that the bottom of treated water storage reservoirs be placed at this elevation if possible.

No treated water storage should be situated beneath the pipe gallery.

The distribution system shall be designed, constructed and maintained to safeguard the quality of the water delivered to the system against contamination from internal or external sources during its transmission from the source to the users.

Before excavation of the trench is started, all intersecting sewer lines, house sewer connections, and other subsurface drains should be located and diligence shall be exercised by the contractor and the engineer to prevent the discharge of wastes from such lines into the trench.

Provisions should be made for the removal of all ground or surface water from trenches, and such water should be prevented from entering water mains being laid.

New or repaired pipelines should be flushed and disinfected before being placed into use.

Under special conditions the cross-connection of a private water supply to a public water supply may be permitted by use of a four-way valve or approved backflow preventer.

Approval by the Kansas State Department of Health is required for all new wells, water treatment plans, and water storage tanks. This requires submitting a permit application, plans and specifications to Environmental Health Services of the State of Kansas.

On May 25, 1956, the Kansas State Board of Health adopted the following pertaining to the chlorination of municipal water supplies within the State of Kansas:

Each municipality within the state provide adequate chlorination equipment at each and every source of its public water supply and maintain a suitable chlorine residual in the distribution system at all times and follow approved procedures in the disinfection of any and all sections of the distribution system subject to alterations, repairs, or new connections.

All municipalities which failed to meet the Drinking Water Standards for bacteriological quality for either or both of the past two years, as shown by the tests and records of the Water and Sewage Laboratory, shall initiate the above specified chlorination practices on or before March 1, 1957.

All municipalities within the state, including all those with no chlorination facilities and all those with chlorination equipment at part but not all of the water supply wells or other water sources, shall initiate the above specified chlorination practices on or before January 1, 1958.

Any city governing body or water company officials failing to comply with this order within the specified time limit will be asked to appear before the State Board of Health to show cause why they shouldn't have their permit to supply water to the public revoked.

The March 1, 1957 deadline affected about 20 cities.

The January 1, 1958 deadline affected about 75 cities.

The State Department of Health will approve the fluoridation of public water supplies under the following conditions:

Application has been made to the State Department of Health for permission to fluoridate the water supply by the city water district or water company.

Plans and specifications covering the following items have been submitted to and approved by the State Department of Health:

1. Chemical to be used as a source of fluoride.
2. Methods of storing and handling the chemical.
3. Feeding equipment.
4. Point of application.
5. Rate of flow at point of application and flow characteristics.

6. Automatic controls.
7. Safety precautions.
8. Laboratory controls and equipment to be used for determination of dosage and fluoride content of water.

Written statements from local dental and medical societies approving fluoridation of the water be submitted to the State Department of Health..where this does not exist, written endorsements by two-thirds of the practicing physicians and dentists.

Copy of city ordinance or equivalent document of a water district board authorizing fluoridation and providing funds for their cost be submitted to the Department.

No fluoridation project should be undertaken without the full cooperation and approval of the city administration, the water department, the local dental and medical societies, the local health department as well as the State Health Department.

Department will consider the qualifications of waterworks operators to perform the control and maintenance operations required.

Operating capacities of all pumping equipment which can or does affect the rate of flow of water past the point of application of the fluoride should be accurately determined by test prior to the design and installation of fluoride feeding equipment.

Special precautions should be taken to protect operators against possible injury from gases and dusts.

Suitable laboratory space and equipment should be provided for the determination of the fluoride contents of the water in accordance with the latest edition of Standard Methods for the Examination of Water and Wastewater.

After commencing fluoridation, daily samples from the plant tap and the distribution system must be submitted to the Sanitary Engineering Laboratory, together with the report of fluoride determinations made on duplicate samples collected at the same points, until the Lab is satisfied as to the uniformity of results.

KANSAS STATE DEPARTMENT OF HEALTH

DIVISION OF ENVIRONMENTAL HEALTH

TOPEKA, KANSAS

RECOMMENDATIONS FOR PUBLIC WATER WELL LOCATION, CONSTRUCTION AND DISINFECTION

I. LOCATION

A. The pump room floor shall be 2' minimum above the highest known high water level of any nearby body of surface water.

B. Flood water shall not approach closer than 50' (measured horizontally) to the well.

C. Proper drainage in the vicinity of the well shall be provided so as to prevent the accumulation of surface water within 50' of the well.

D. For hillside sites an adequate intercepting ditch shall be constructed and maintained so as to keep hillside storm water at least 50' (measured horizontally) away from the well.

E. The well shall not be located in a ravine where surface water flows may be obstructed or concentrated.

F. The distance in all horizontal directions from the well to any potential source of contamination such as a sanitary sewer line; septic tank-lateral field; cesspool; privy; feedlot; or underground storage tank for petroleum products, shall not be less than 100' in any case and shall be greater where in the opinion of the local health department or the State Department of Health local conditions indicate the need for greater protection.

II. MINIMUM DEPTH OF CASING

The watertight well casing shall extend a minimum of 20' below the ground surface.

III. CASING

A. Steel, Wrought-Iron, Cast Iron Casing

1. New materials shall be used.

2. Joints shall be threaded or welded so as to be watertight.

3. The casing shall extend not less than 12" above the top of the well house floor.

4. All steel, wrought-iron and cast iron casing shall conform within 10% to following respective weight and thickness tables.

Steel and Wrought-Iron Well Casing

Nominal Size in inches	Weight pounds per foot (threads and couplings, incl.)	Thickness in inches
1	1.68	0.133
1-1/4	2.28	.140
1-1/2	2.73	.145
2	3.68	.154
2-1/2	5.82	.203
3	7.62	.216
3-1/2	9.20	.226
4	10.89	.237
4-1/2	12.64	.247
5	14.81	.258
6	19.18	.280
8	25.00	.277
10	35.00	.307
12	45.00	.330
14 OD	57.00	.375
15 OD	61.15	.375
16 OD	65.30	.375
17 OD	73.20	.375
18 OD	81.20	.375
20 OD	90.00	.375

Threaded Cast-Iron Well Casing

Nominal Diameter (inches)	Weight pounds per foot	Wall Thickness in inches
3	12.2	0.360
4	17.0	.380
5	18.5	.380
6	27.0	.430
8	42.0	.500
10	59.0	.570
12	77.0	.620
14	102.0	.690
16	126.0	.750
18	156.0	.830
20	183.0	.880
24	248.0	1.000

B. Use of Other Materials for Casing

Confer with the State Department of Health prior to start of construction work.

IV. GROUTING OF STEEL, WROUGHT-IRON OR CAST IRON CASING. FILLING ANNULAR SPACE

A. Drilled Wells

The annular space between the casing and the drill hole shall be filled with impervious cement grout having a minimum thickness of 1-1/2" to a depth of at least 20 feet.

B. Gravel Packed Wells (Dummy casing retained)

The annular space between the dummy casing (if dummy casing is retained) and the excavation line shall be filled with impervious cement grout having a minimum thickness of 1-1/2" to a depth of at least 20'.

C. Gravel Packed Wells (Dummy casing removed)

The annular space between the permanent casing (dummy casing entirely removed) and the excavation line shall be filled with thoroughly compacted (1) cement grout or (2) concrete or (3) a 2 foot thick concrete plug set at 20' and the remainder of the annular space filled with puddled clay.

D. Grout

1. Either neat cement grout or concrete grout may be used.

a. Concrete Grout shall be an intimate mixture of cement, sand and water in the proportion of 1 bag of cement (1 cubic foot) an equal volume of dry sand, and 5 to 6 gallons of clean water.**

b. Neat Cement Grout shall be an intimate mixture of cement and water in the proportion of 1 bag of cement (1 cubic foot) to 5 to 6 gallons of clean water.

**Hydrated lime to the extent of 10% of the volume of the cement may be added to make the grout mix more fluid.

2. Seventy-two hours shall be allowed for curing of the grout.

V. WELL HOUSE FLOOR

A. The well house floor shall be constructed of reinforced, watertight concrete not less than 4 inches thick at any point.

B. The joint between the concrete motor base and floor shall be watertight.

C. The floor shall extend not less than 3 feet from the well excavation line in all directions.

D. The top of the floor slab shall not be less than 18 inches above the surrounding ground.

E. The floor slab shall rest upon thoroughly compacted earth.

F. The floor shall slope at a rate of 1/8 inch per foot toward the floor drain.

VI. CASING SEAL, DISCHARGE PIPING

A. The casing (or a pipe sleeve attached to the casing or concrete motor base so as to be watertight) shall extend at least 1 inch into the motor base so as to form an overlapping seal. (On flat motor base plates and on other base plates where radial ribs interfere, a metal skirt projecting downward may be welded to the outside edge of the base plate to form the overlapping cover for the well casing).

B. The metal motor base shall be grouted or otherwise securely sealed to the concrete base so as to be watertight.

C. The discharge tee, check valve and gate valve shall be located above the pump room floor.

VII. METERS

Meters should be provided for all wells. The meters should be located on the pump discharge line and on the pump side of the gate valve.

VIII. SAMPLING TAP

A sampling tap is needed on the discharge side of the point of chlorine application to permit measurement of the chlorine residual in the water being pumped to the distribution system. The residual chlorine must be measured at this point to permit proper adjustment of the chlorine dose. There must be adequate distance between the point of chlorine application and the sampling tap to allow for complete mixing of the chlorine with the water. Otherwise the measured chlorine residuals will be highly variable and inaccurate.

A distance of at least 10 feet should be maintained between these points. The piping layout in most well houses does not provide this much distance. Consequently, whenever chlorine is applied to the pump discharge line the discharge line should be tapped outside the well house and a 1/2 inch sampling line extended back into the well house. It is very desirable to provide a gate valve in the sampling line ahead of the tap so that the tap can be repaired or replaced without depressuring a portion of the distribution system. If the chlorine is added in the well near the pump suction the sampling tap can be located on the pump discharge line within the well house. The tap should be located between the check valve and the gate valve.

IX. DRAWDOWN GAUGE

A. An accurate drawdown gauge and an air pump shall be provided.

B. The drawdown pipe shall pass through the motor base in a manner that will provide for a watertight seal between the pipe and the motor base; i.e., a watertight packing gland or equal shall be provided around the pipe where it passes through the motor base.

X. WELL VENT

A. The vent shall be constructed of metal tubing or pipe and fitted into the motor base so as to form a watertight connection with the base.

B. The vent shall terminate in a full 180° return bend not less than 24 inches above the motor base.

C. The opening in the vent shall be screened with not less than 16 mesh brass, bronze or copper screen.

XI. AIR/VACUUM RELIEF VALVES

Air/vacuum relief valves are frequently used on well pump discharge lines and on transmission lines. These valves are potential sources of contamination of the water supply because contaminating materials can be drawn into the water supply on the vacuum relief cycle.

Air/vacuum relief valves on water transmission lines should be located in valve boxes with crushed rock bottoms to permit drainage. The valve boxes should be so located and covered as to eliminate or at least minimize the entrance of surface water. The valve vent-discharge line should extend upward from the valve and terminate in a 180° return bend. The end of the vent-discharge line should be located either two feet above the bottom of the valve box or six inches below the valve box cover. The end of the vent-discharge line should be screened with 16-mesh brass, bronze or copper screen.

The vent-discharge lines from air/vacuum relief valves on pump discharge lines should terminate in a downward position about two feet above the floor of the well house. If splashing is a problem a loose fitting "splash guard" may be used. The end of the vent-discharge line should be screened if feasible. In no case should the vent-discharge line be tightly connected to the floor drain.

XII. FLOOR DRAIN

A. The inlet to the floor drain shall be located not less than 2 feet from the well excavation line.

B. A floor drain with a perforated or screened cover shall be provided.

C. The drain pipe shall be constructed of not less than 4-inch cast iron pipe and the cast iron pipe shall be carried to the ground surface at least 35 feet from the well OR at least 4 feet from the well house wall at which point the cast iron pipe may be connected to other suitable 4-inch pipe so that the drainage will be carried to the ground surface at least 35 feet from the well. For low capacity wells, 2-inch drain lines will be approved.

D. The drain pipe shall be laid on a grade of not less than 1/8" per feet and shall discharge onto the surface of the ground. (The drain shall not be connected to any storm drain, sanitary sewer or any other closed conduit.) The discharge end of the drain line should be covered with a coarse screen to prevent the entrance of small animals.

XIII. WELL HOUSE

A. The well house shall be provided with a doorway and a door at least 2'3" x 6'8" which opens outward and extends to the floor. The door shall be equipped with a lock.

B. Well houses located on hill slopes shall have not less than 50% of the floor area above ground level and the door located on that part of the floor above ground level.

C. The well house walls and ceiling shall be insulated.

D. Where necessary additional protection against freezing shall be provided by installing a thermostatically controlled electric heater or other suitable type of heating unit.

XIV. DISINFECTION

A. Gravel for gravel-packed wells shall be disinfected by immersing the gravel in a chlorine solution containing not less than 200 mg/l (milligrams per liter) of available chlorine. (A satisfactory solution may be made by mixing 1/4 pound of high test calcium hypochlorite (70% available chlorine) with 100 gallons of water.) A less satisfactory but acceptable method of disinfecting the gravel is to treat the gravel with a strong chlorine solution (200. mg/l) as it is placed in the tremie tube.

B. Completed wells shall be disinfected by adding sufficient hypochlorite solution to them to produce a concentration of not less than 100 milligrams per liter of available chlorine when mixed with the water in the well. (Corresponds to about 1.5 lbs of high test calcium hypochlorite per 1,000 gallons of water in the well.) (Just prior to settling the pump the casing and pump column should be washed down with a 200 mg/l available chlorine solution.)

XV. PERMITS FOR NEW CONSTRUCTION

Approval by the Kansas State Department of Health is required for all new wells, water treatment plants, and water storage tanks. Approval can be obtained by submitting a permit application, plans, and specifications to Environmental Health Services, Kansas State Department of Health, State Office Building, Topeka, Kansas, prior to construction. If the plans and specifications are satisfactory a permit to supply water to the public will be issued.

Permit application forms can be obtained by writing to the above address.

XVI. CONCRETE

The concrete used in the construction of new ground water supply units shall meet the general requirements of strength, durability, economy, and workability applicable to it. No specific mix can be named to accomplish this end, since the mix will depend upon the strength and durability requirements and the available local materials. The proportions of cement, fine aggregate, coarse aggregate, and water should be determined following the water-cement ratio, the trial mix method, and pertinent specifications.

XVII. ABANDONED WELLS AND TEST HOLES

Before any well or test hole drilled in connection with a water supply is abandoned, it shall be plugged in such a manner as to prevent the pollution of the ground water by contaminating substances. Abandoned water wells and test holes that do not penetrate below the fresh water zone shall be filled from bottom to top with natural earth materials. Any well or test holes that penetrate a formation containing salt water shall be plugged in accordance with plugging methods approved by the Conservation Division, Kansas Corporation Commission, Wichita, Kansas.

State of Kansas

STATE DEPARTMENT OF HEALTH

Environmental Health Services

State Office Building

Topeka, Kansas

Public Water Supply

PERMIT APPLICATION

_____, 19____

To the Director of Health of the State Department of Health, Topeka, Kansas:
In conformance with the provisions of Kansas Statutes Annotated*

_____

_____
Name of Municipality, Institution, District, Company, Corporation or Person

hereby makes application to the State Department of Health for a permit, or additional permit due to change in source, storage, or treatment, to supply water for domestic purposes to the public within the State of Kansas, in accordance with the information herein contained and with the accompanying maps, plans and specifications, which are made a part of this application

******

The following questions are designed to meet the requirements of widely varying conditions Answers are desired to all applicable questions.

GENERAL

1 Is the proposed project to constitute.

(a) A complete and distinct system in itself?_____

(b) An extension of or addition to a system already built?_____

2. Type of facilities to be constructed _____

_____

3. Give population to be served_____

* Kansas Statutes Annotated 65-163 provides: "That no person, company, corporation, institution or municipality shall supply water for domestic purposes to the public within the state from or by means of any waterworks that shall have been constructed or extended, either in whole or in part, subsequent to the passage of this act, without a written permit from the state board of health for the supplying of such water, except this provision shall not apply to extension of water pipes for distribution of water. The application for such shall be accompanied by a certified copy of the maps, plans and specifications for the construction of such waterworks or extension, and of a description of the source from which it is proposed to derive the supply and of the manner of storage, purification or treatment proposed for the supply previous to its delivery to consumers, together with such other data and information as may be required by the state board of health, and no other or additional source of supply shall subsequently be used for any such waterworks, nor any change in the manner of storage, purification or treatment of the supply be made, without an additional permit to be obtained in a similar manner from the state board of health."

SOURCE OF SUPPLY—SURFACE-WATER SUPPLY

4. In case the proposed supply is to be taken from a river or creek, furnish the following information:

   (a) Name of stream_____

   (b) Drainage area above intake, in square miles_____

   (c) Approximate minimum flow of stream_____

   (d) Location of intake with reference to potential sources of pollution_____

   _____

   (e) Furnish map of general layout, together with plans of intake, suction line, dam, intake well, and all other devices to be used in taking water from the river, and specifications for their construction

   (f) Remarks_____

   _____

   _____

5. In case the supply is to be taken from an impounding reservoir, furnish information as follows:

   (a) Area of water surface when reservoir is full, in acres_____

   (b) Maximum and average depth of water in reservoir, when full:

   Maximum_____, Average_____

   (c) Approximate holding capacity of reservoir when full, in gallons_____

   (d) Name of creek tributary to reservoir, and its drainage area in acres or square miles_____

   (e) Average yearly rainfall over drainage area_____

   (f) Nature of drainage area: smooth or rough_____; sand or clay_____,

   percent of tilled land_____; percent of grass land_____;

   percent of timbered land_____.

   (g) What measures will be taken to protect the drainage and reservoir from contamination?_____

   _____

   (h) What measures are proposed for protecting the supply from excessive plant and algae growths in shallow water?_____

   _____

   _____

   _____

   (i) Furnish (1) a map of the drainage area, showing the location of all public roads and railroads; all residences, animal feedlots, and picnic or camping grounds within the limits of the area; (2) a large-scale contour map of the reservoir area; (3) plans of the dam, spillway, blow-off or drain, and intake arrangement, together with specifications for their construction.

SOURCE OF SUPPLY—GROUND-WATER SUPPLY

6. In case the proposed supply is to be taken from wells, furnish information as follows:

   (a) Number of wells available at present_____

   (b) Number of wells to be constructed_____

(c) Diameter and depth of each new well

(d) Log of the well or test holes

(e) Description of the aquifer from which the supply of water is to be obtained

(f) If wells are drilled, state type of casing and its diameter, length, thickness and weight per foot.

(g) If wells are dug, state material used for walls, and method of sinking

(h) State means employed to facilitate the entrance of water into the well from the aquifer. If a well screen is to be used, give length, type of material and size of openings

(i) Give detailed results of any preliminary tests that have been made to determine the yield of the proposed wells, or any data that might be used in estimating such yields

(j) Furnish large-scale map showing general layout of wells, together with plans and specifications for the construction of wells, well house, pumping equipment and appurtenances.

7. In case the proposed supply is to be derived from springs, furnish information as follows:

(a) Character and thickness of aquifer from which springs apparently flow

(b) Results of any measurements or tests that have been made to determine the yield of the proposed springs, or any data that might be used in estimating such yield

(c) Furnish large-scale map showing general layout of springs, and plans and specifications for the construction of whatever collecting chambers, tunnels, weirs and conduits are to be used to collect or store the water from the springs and convey it to the point of use.

8. In case the supply is to be collected from an underground source by means of infiltration galleries, collecting pipes or tunnels, or similar devices, furnish the following information

(a) Description and depth of aquifer from which supply is collected_____

(b) Character and thickness of each stratum of material encountered, from the surface of the ground down to the aquifer from which the water is to be obtained_____

(c) Give results of any tests that have been made to determine the probable yield of water from the proposed construction, or any data that might be used in estimating such yield_____

(d) Furnish large-scale map showing general layout of collecting system, together with plans and specifications for the construction of collecting pipes, tunnels, or galleries, and of whatever weirs, conduits and other devices may be employed_____

9. Are there any cesspools, septic tanks, sanitary sewers, feedlots, underground storage tanks for petroleum products or chemicals, or other sources of pollution within 600 feet of site of proposed supply?_____
If so, specify each, or show location on a map_____

10. Are there any salt or oil wells in the vicinity that would be likely to injure the supply?_____

11. Is there to be an auxiliary supply for emergency use, as in case of large fires?_____ If so, describe source of such supply, the connection of the same with the pumping plant, and the conditions under which it is to be used_____

PURIFICATION

12. State briefly the treatment processes to be used_____

13. State basis of design of treatment works as to capacity_____

14. In case of aeration, give type and location of aerator_____

15. In case of preliminary sedimentation, give type, capacity, theoretical detention, overflow rate and weir loading of basin.

16. In case of sedimentation with coagulation, furnish information as follows:

    (a) Chemicals used_____

    (b) Points of application of chemicals, and facilities for feeding, mixing and flocculating:_____

    (c) Capacity, theoretical detention, overflow rate and weir loading of basin:

17. In case of filtration furnish information as to the following.

    (a) General type of filter_____

    (b) Number and dimensions of filter units_____

    (c) Type and source of filter media_____

    (d) Depth of filter media_____

    (e) Type of underdrain_____

    (f) Quantity and source of wash water_____

    (g) Filter equipment (gauges, controllers, etc.)_____

    (h) Type and capacity of clearwell_____

18. Chlorination is required. Give information on chlorination equipment:

(a) Type and capacity of equipment_____

_____

(b) Place of application_____

_____

19. What laboratory facilities and equipment are to be provided?_____

_____

_____

20. Are daily operation records to be maintained?_____

Specify items to be recorded_____

_____

_____

_____

21. Furnish general plans of the purification plant, showing relative locations and elevations of settling basins, filters, chemical feeds, clearwell, flood protection arrangements, and other general features of the plant, indicating all pipe connections. Also, furnish detailed drawings in all cases in which these are essential to the proper understanding of the plant.

PUMPING AND DISTRIBUTION

22. Low service pumps:

(a) Type and capacity of each in gallons per minute_____

_____

(b) Suction lift in feet: ordinary_____; maximum_____

(c) Discharge head in feet_____

23. High service pumps:

(a) Type and capacity in gallons per minute_____

_____

(b) Suction lift in feet: ordinary_____, maximum_____

(c) Discharge head in feet_____

24. In regard to the pipe system for distributing the supply, furnish information as follows:

(a) Total length of each size of pipe in entire system:

1-inch	ft	4-inch	ft	10-inch	ft		ft
2-inch	ft	6-inch	ft	12-inch	ft		
3-inch	ft	8-inch	ft		ft	Total	ft

(b) Type of pipe to be used_____

(c) Is any portion of the pipe system to be carried over a stream on a bridge, or otherwise to be exposed?_____

If so, give methods to be used to prevent freezing_____

(d) Number of fire hydrants

(e) Number of flushing hydrants

25. In case an elevated tank or a standpipe is to be used, give the following information:

(a) Diameter and height, in feet

(b) Capacity, in gallons

(c) Height of top of tank or standpipe above foundation

(d) Height of top of tank or standpipe above area of major use

(e) How is tank or standpipe to be covered?

(f) Is a provision to be made to cut out the tank or standpipe in case of fire, and operate under pump pressure?

(g) If a pressure tank is to used, give size, and pressure range

26. In case a ground level or below ground level reservoir is to be used, give information as follows:

(a) Shape, dimensions, and capacity when full

(b) Height of water level, when reservoir is full, above area of major use

(c) Is a provision to be made to cut out the service reservoir in case of fire, and operate under direct pump pressure?

27. Furnish plans showing all details of the facility for which this application is made such as, source of supply, transmission main, distribution system, and water storage tanks. Also furnish specifications for all equipment included in the project and for all installation procedures where applicable.

28. Give name of person or firm responsible for engineering

29. How and by whom is the work of construction to be supervised?

30. Give name of well driller.

AUTHORITY

31. To whom should future correspondence be addressed?_____

_____

(Signed)_____

(Must be signed by the proper official)

_____

State of Kansas, County of_____, ss.

SWORN TO AND SUBSCRIBED before me, a notory public in and for said county and state, this_____day of

_____, 19____.

(SEAL)

_____

Notary Public

My commission expires_____

Statement of Policies and Procedures
of Kansas State Department of Health
Relating to Fluoridation of Public Water Supplies

A. The State Department of Health will approve the fluoridation of public water supplies under the following conditions:

1. That an application has been made to the State Department of Health for permission to fluoridate the water supply by the city water district or water company.

2. That plans and specifications covering the following items have been submitted to and approved by the State Department of Health:

   a. Chemical to be used as a source of fluoride.
   b. Methods of storing and handling the chemical.
   c. Feeding equipment.
   d. Point of application.
   e. Rate of flow at point of application and flow characteristics.
   f. Automatic controls.
   g. Safety precautions.
   h. Laboratory controls and equipment to be used for determination of dosage and fluoride content of water.

3. That written statements from local dental and medical societies approving fluoridation of the water be submitted to the State Department of Health. Where no formally organized dental or medical societies exist, written endorsements by two-thirds of the practicing physicians and dentists will be acceptable.

4. That a copy of the city ordinance or equivalent document of a water district board authorizing fluoridation of the water supply and providing funds for their cost be submitted to the State Department of Health.

B. The following general principles will be used in promotion and administration of the program by personnel of Division of Environmental Health:

1. No fluoridation project should be undertaken without the full cooperation and approval of the city administration, the water department, the local dental and medical societies, and the local health department, as well as the State Department of Health.

2. In considering applications for approval of fluoridation, the Kansas State Department of Health will consider the qualifications of water works operators to perform the control and maintenance operations required.

3. Available chemicals and recommended methods of feeding are listed below:

Name	Form	Feeder	Remarks
Sodium silicofluoride	Powder	Dry	Solubility low
Hydrofluosilicic acid	Liquid	Solution	Corrosive
Sodium fluoride	Powder	Dry or solution	

4. Feeding equipment must be accurate within 5 per cent, and facilities must be provided for accurately weighing the amount of chemical used. Solution feeders must be of the positive displacement type and must be provided with two solution tanks and an accurate means for measuring the water used in making up the solution.

5. The operating capacities of all pumping equipment which can or does affect the rate of flow of water past the point of application of the fluoride should be accurately determined by test prior to the design and installation of fluoride feeding equipment. Master meters are highly desirable and may be required.

5. On supplies where pumps operate intermittently under pressure control, the feeder should be electrically connected to the pump.

7. Where solution feeders are used, the point of application of the fluoride shall be at a point on the discharge side of the pump where it is impossible for negative pressures to develop.

8. Special precautions should be taken to protect operators against possible injury from gases and dusts. Chemicals should be stored in a separate room with positive ventilation and the room should be locked except when supplies are being placed in the room or taken from it. Each operator who handles fluoride should be provided an individual toxic dust respirator and a pair of rubber gloves. Operators should be fully instructed regarding the dangers involved in handling of fluoride.

9. Suitable laboratory space and equipment should be provided for the determination of the fluoride content of the water in accordance with the latest edition of Standard Methods of the Examination of Water and Wastewater. Where colorimetric methods are used, special lighting equipment would be provided. Operators responsible for control of fluoridation must demonstrate their ability to perform such tests to representatives of the Division of Environmental Health prior to beginning fluoridation of the supply.

10. Immediately after commencing fluoridation, daily samples from the plant tap and the distribution system must be submitted to the Environmental Health Laboratory, together with the report of fluoride determinations made on duplicate samples collected at the same points, until the laboratory is satisfied as to the uniformity of results.

Thereafter, fluoride determinations will be made on regular samples submitted to the laboratory for bacteriological analysis, and routine tests run at the plant in accordance with the following schedule:

Source	Ground Water	Surface Water
Raw	1/week	Min. 1/day
Plant tap	1/day	1/shift (min. 1/day)
Distribution system	4/week	4/week

11. Daily records should be kept of the amount of chemical fed, water pumped, and the fluoride determinations. Duplicate copies should be submitted monthly to the Division of Environmental Health, Kansas State Department of Health.

12. No fluoridation equipment shall be placed in operation until the installation has been inspected by a representative of the State Department of Health and found to be in conformance with the plans and specifications approved by the State Department of Health.

ORDER PERTAINING TO THE CHLORINATION OF

MUNICIPAL WATER SUPPLIES WITHIN THE STATE OF KANSAS

Kansas State Board of Health - October 8, 1942

WHEREAS, The recent epidemic of bacillary dysentery was caused by contamination of the municipal water supply after it had reached the distribution system; and

WHEREAS, This clearly demonstrates that the quality of the water at the source does not safeguard the health of the consumers, and

WHEREAS, Section 65-163 provides authority for the issuance of an order requiring changes in the source of supply, the manner of storage, purification or treatment of said supply before delivery to the consumers as may in the judgment of the State Board of Health be necessary to safeguard the public health: Therefore, be it

RESOLVED, The all municipalities within the state maintain a suitable chlorine residual in the distribution system and follow certain set policies in the disinfection of any and all sections of the distribution system subject to alterations, repairs, or new connections.

The following recommendations are made to expedite this order, and this order is to take effect immediately and all towns so advised are to chlorinate their water supplies continuously . . . ., and those towns which are already chlorinating continuously shall, wherever necessary, increase the chlorine dosage so as to maintain a suitable residual in the distribution system.

RECOMMENDATIONS

Section 1. Chlorinating Equipment

Where chlorinators are available at the water plant, these should be checked to determine if their capacity is adequate and a suitable supply of chlorine should be kept on hand. Cities not using chlorinators for water treatment purposes should . . . .purchase chlorinators.

Section 2. Points of Application

Where the water supply is derived from more than one source, each source should be provided with suitable chlorinating equipment so that a proper residual may be maintained throughout the system.

Kansas State Board of Health
Division of Sanitation
Lawrence, Kansas
1 June 1956

CHLORINATION OF KANSAS PUBLIC WATER SUPPLIES

Improvement of Kansas Public Water Supplies. The safety of Kansas public water supplies has shown steady improvement since 1900, especially in the past few years. In 1900 there were about 35 deaths per 100,000 persons from typhoid and paratyphoid fever. By 1925 the number of deaths from these diseases was reduced to about 7 per 100,000 persons and by 1955 the number of deaths from these causes was less than 1 per 100,000 persons. There have been corresponding decreases in the incidence of other waterborne diseases.

This marked reduction in waterborne disease has been paralleled by a rapid increase in the construction of waterworks facilities and a large part of this improvement in health can be attributed to the construction of water purification plants and particularly to the almost universal practice of disinfecting public water supplies with chlorine.

The records of the Division of Sanitation, State Board of Health, show that during the past year 393 cities in the state produced water of satisfactory bacteriological quality, and that only 37 cities failed to meet the drinking water standards. In 1955, 172 cities had perfect bacteriological records, that is, none of the samples examined in the Water and Sewage laboratory showed the presence of harmful bacteria. All of the surface water supplies in Kansas met the drinking water standards for bacteriological quality. The 37 small well water supplies which failed to meet the drinking water standards in this period serve only about 1-1/2% of the persons using city water. This is the best record which the state has ever had. As recently as 1949, 106 cities had drinking water supplies which were considered to be unsafe. Better construction of wells and purification plants, and particularly the installation of equipment for continuous chlorination of public water supplies have been responsible for the major part of this improvement. Continuous chlorination of all water pumped is practiced by 303 cities having a total population of 1,172,000 persons. Partial chlorination is provided in 64 cities serving 33,000 persons. Fifty-nine cities serving 78,000 persons have no facilities for chlorination. The present status of chlorination in the state is summarized in the following table:

Description	No. of Cities	Population Served	% Population
Continuous chlorination of all water pumped	303	1,172,000	91
Chlorination of water pumped from part (not all) of the wells	64	33,000	3
No chlorination facilities	59	78,000	6
Total	426	1,283,000	100

The importance of chlorination treatment is emphasized by the fact that 33 of the 37 public water supplies which have failed to meet the drinking water standards for bacteriological quality during either or both of the past two years do not have chlorination equipment.

Previous Action by the State Board of Health. In 1942 there was a serious epidemic in a Kansas City of bacillary dysentery caused by contamination of a municipal water supply after the water had reached the distribution system. Following this epidemic, the State Board of Health passed a resolution recommending that all municipalities maintain a suitable chlorine residual in the distribution system, and disinfect all sections of the distribution system subject to alterations, repairs, or new connections. All cities in the state have been advised of these recommendations on many occasions since that time. Much of the progress which has been made in improving the bacteriological quality of public water supplies in the state has resulted from voluntary compliance with these recommendations by city officials.

It now appears that health education methods have been utilized to the maximum possible extent and that further formal action by the State Board of Health is desirable and essential to secure chlorination of all Kansas public water supplies.

Recent Action by the State Board of Health. To extend the benefits of this process, and in the interest of the public health, the Kansas State Board of Health adopted the attached policy pertaining to the chlorination of public water supplies within the state of Kansas at its regular quarterly meeting on May 25, 1956.

Essentially the order requires that each municipality within the state provide adequate chlorination equipment at each and every source of its public water supply and maintain a suitable chlorine residual in the distribution system at all times, and follow approved procedures in the disinfection of any and all sections of the distribution system subject to alterations, repairs, or new connections. All municipalities which failed to meet the drinking water standards for bacteriological quality for either or both of the past two years, as shown by the tests and records of the Water and Sewage laboratory, shall initiate the above specified chlorination practices on or before March 1, 1957. All municipalities within the state, including all those with no chlorination facilities and all those with chlorination equipment at part but not all of the water supply wells or other water sources, shall initiate the above specified chlorination practices on or before January 1, 1958.

The cities affected by this order are listed in the attached tabulation.

1 June 1956
Kansas State Board of Health
Topeka, Kansas

At its regular quarterly meeting on May 25, 1956 the Kansas State Board of Health formally adopted the following policy:

ORDER PERTAINING TO THE CHLORINATION OF MUNICIPAL WATER SUPPLIES WITHIN THE STATE OF KANSAS

WHEREAS, Epidemics of water-borne disease in Kansas and other states have been caused by contamination of the municipal water supply after it reached the distribution system; and

WHEREAS, This clearly demonstrates that the quality of the water at the source does not fully safeguard the health of the consumers, and

WHEREAS, Continuous chlorination treatment and maintenance of suitable chlorine residuals in water in the distribution system provide substantial protection against contamination and disease, and

WHEREAS, Section 65-163 provides authority for the issuance of an order requiring changes in the source of supply, the manner of storage, purification or treatment of said supply before delivery to the consumers as may in the judgment of the State Board of Health be necessary to safeguard the public health: Therefore be it

RESOLVED, That each municipality within the state provide adequate chlorination equipment at each and every source of its public water supply and maintain a suitable chlorine residual in the distribution system at all times, and follow approved procedures in the disinfection of any and all sections of the distribution system subject to alterations, repairs, or new connections. Be it further

RESOLVED, That all municipalities which failed to meet the Drinking Water Standards for bacteriological quality for either or both of the past two years, as shown by the tests and records of the Water and Sewage Laboratory, shall initiate the above specified chlorination practices on or before March 1, 1957. Be it further

RESOLVED, That all municipalities within the state, including all those with no chlorination facilities and all those with chlorination equipment at part but not all of the water supply wells or other water sources, shall initiate the above specified chlorination practices on or before January 1, 1958. Be it further

RESOLVED, That any city governing body or water company officials failing to comply with this order within the specified time limit will be asked to appear before the State Board of Health to show cause why their permit to supply water to the public should not be revoked.

The order affects the cities tabulated below. Each of these communities has been individually notified by letter of the action expected by them under this order.

GROUP I. Cities affected by the March 1, 1957 deadline.

District 1

Belpre
Isabel

District 2

Belle Plaine
Norwich
Sylvia (P)

District 3

Peru
Hamilton (P)

District 4

Alma (P)
Havensville
Oketo
Winchester

District 5

Esbon (P)
Inman
Marquette
Narka
Palmer
Republic

District 6

Collyer
Prairie View
Ransom

GROUP II. Cities affected by January 1, 1958 deadline.

District 1

Bucklin (P)
Copeland
Cullison
Dighton (P)
Dodge City (P)
Englewood (P)
Fowler
Garden City (P)
Hardtner (P)
Haviland
Horace
Johnson
Lewis
Macksville (P)
Montezuma
Moscow
Plains
Preston
Rolla
Spearville
St. John (P)
Tribune (P)

District 2

Dexter
Elmdale (P)
Halstead
Oxford (P)
Pretty Prairie (P)

District 3

Galena
Riverton
Treece
Toronto (P)
Waverly (P)

District 4

Alta Vista (P)
Axtell (P)
Beattie (P)
Blue Rapids (P)
Effingham
Robinson (P)
Waterville

District 5

Bennington
Brookville (P)
Canton (P)
Clay Center (P)
Glasco (P)
Green (P)
Hanover
Jamestown
Leonardville
Lindsborg (P)
Miltonvale (P)
Riley (P)
Scandia (P)
Simpson
Solomon
White City

District 6

Alton
Bazine (P)
Bison (P)
Claflin
Downs
Grinnell
Hoxie
Kanorado
Lebanon
Liebenthal
McDonald
Natoma (P)
Oakley (P)
Plainville (P)
Portis
Quinter (P)
Rexford
Victoria
Winona (P)
Woodston (P)

(P) Indicates cities having part of the necessary chlorination facilities already installed.

No. 43,969

THE STATE OF KANSAS, ex rel. ROBERT C. LONDERHOLM (Substituted for William M. Ferguson), Attorney General, *Appellee*, v. THE CITY OF GALENA and MILTON MOELLER, JIM MONTE, REX SMITH, STEPHEN LANGFORD, CHARLES COLE, WILBUR J. MOODY, ROBERT SCOTT, ORIN CLIFFORD, CLAIR SHAW, members of the City Council of the City of Galena, and HOMER MCAFEE, Mayor of the City of Galena, or their successors, *Appellants*.

(401 P. 2d 662)

SYLLABUS BY THE COURT

MANDAMUS—*Order to Chlorinate Water—No Necessity for Election.* The defendant city of Galena appeals from the order of the trial court granting a peremptory writ of mandamus against the city growing out of an action wherein the State Board of Health ordered the city to chlorinate the water furnished by its municipal water plant for domestic purposes to the public. The provisions of K. S. A. 65-171, providing for an election if the order of the board requires a change in the source of water for any municipal water plant, are not here applicable because, as more fully narrated in the opinion, such order of the board is clearly authorized under the provisions of K. S. A. 65-163. *Held:* The trial court did not err in any of the particulars complained of and was, therefore, correct in its order granting the peremptory writ.

Appeal from Cherokee district court; JEROME HARMAN, judge. Opinion filed May 4, 1965. Judgment affirmed.

J. John Marshall, of Pittsburg, argued the cause and was on the brief for the appellants.

John W. Cooper and *Paul Armstrong*, special assistant attorneys general, argued the cause, and *Robert C. Londerholm*, attorney general, and *J. Richard Foth*, assistant attorney general, were with them on the brief for the appellee.

The opinion of the court was delivered by

ROBB, J.: This is an appeal by the defendant city of Galena from the trial court's order granting a peremptory writ of mandamus against it and overruling its motion for new trial.

Defendant's complaints of error are that the trial court erred (1) in overruling its motion to quash plaintiff's motion for writ of mandamus (2) in granting the peremptory writ of mandamus and (3) in overruling its motion for new trial.

On December 15, 1961, the Kansas State Board of Health (hereafter referred to as the board) in pertinent parts of its order to chlorinate directed to the defendant city of Galena found that the city's good quality of water at the source did not safeguard the

consumers' health because of danger of contamination in the distribution system; that continuous chlorination treatment and maintenance in the distribution system would provide substantial protection against contamination and disease; that on May 25, 1956, the city had been instructed by the board to chlorinate its water on or before January 1, 1958; that on June 17, 1960, the board had again formally ordered the city to chlorinate its water supply on or before September 21, 1960; that the city was reported willing to chlorinate its water supply but intended to do so only at some future indefinite date; that the city's failure to chlorinate its water supply is prejudicial to the public health and that the interests of public health require prompt installation of suitable chlorination facilities. Under the provisions of K. S. A. 65-163 the board ordered the city to purchase and install adequate facilities for chlorination of its public water supply, that such facilities were to be installed promptly and within a reasonable time thereafter, and subsequently the city should continuously maintain such facilities and process.

Upon the board's motion for issuance of an alternative writ showing the city's refusal and failure to comply with the board's order of December 15, 1961, the trial court on April 12, 1962, ordered the issuance of the writ commanding the city to comply immediately with the board's order or show cause on or before July 13, 1962, why the city should not be required to do as commanded.

On March 1, 1963, the general demurrer of the city and its motion to quash the alternative writ were overruled and the city was granted thirty days in which to answer.

The city's answer thereafter filed made certain formal admissions and then set out a general denial. It further answered that at all pertinent times mentioned the city had maintained a good and sufficiently healthful and pure water supply for all of its inhabitants and the patrons of its water department, the cost of chlorinating the water supply would exceed $2,000 which, under K. S. A. 65-171 limiting such cost to $1,000, would require the change in water supply to be passed upon by the qualified electors in the city at a general or special election; no attempt had been made by the board to cause, or attempt to cause, the issue to be so presented to the electors.

On October 22, 1963, the parties stipulated to certain facts including those stating that the city had not complied with the order of the board to chlorinate its water, dated December 15, 1961, nor

had the city appealed from the order to the district court within thirty days. It was further stipulated the cost of chlorination would exceed $2,000, the question had never been submitted to the city's electors, and that monthly and semi-monthly reports concerning the purity and fitness of the water supply for a part of 1960, and for all of 1961, 1962, and 1963 reflected that the water was pure and fit for human consumption. The analysis of the water samples had been conducted by the board.

On December 17, 1963, in its formal journal entry of judgment, the trial court adopted the agreed facts as its findings, and further found the board had legal authority to order the city to chlorinate its water supply, the city had a clear legal duty to comply therewith and that the provisions of K. S. A. 65-171 pertaining to ". . . the supply of water for any municipal water plant . . ." are not applicable concerning an order for chlorination of a public water supply. Since no reason was shown why a peremptory writ should not issue, the trial court commanded the city to provide chlorination of its public water supply within a reasonable time. The court reserved jurisdiction of the cause.

On January 22, 1964, the city's motion for new trial was overruled. Hence this appeal.

The city's contentions are based on the applicability of K. S. A. 65-171 which provides:

"That nothing in this act shall permit the board of health to *change the supply of water* for any municipal water plant where the cost of such change would exceed one thousand dollars without first submitting the same to the qualified electors at a general or special election." (Our emphasis.)

We think the above statute is unequivocal, clear, and unambiguous and would be controlling if an order of the board undertook to *change the source of supply* of water for any municipal water plant because in that event an election would have to be conducted should the cost of the change exceed $1,000. However, under the circumstances here involved, we agree with the trial court and the board that K. S. A. 65-171 has no application because nothing in the board's order requires a change in the *source of supply* of water that goes into the city's water plant. As contended by the board, we believe the order is controlled by the provisions of K. S. A. 65-163. The statute is quite long and we shall merely state that it likewise is unequivocal, clear, and unambiguous and included among its provisions are:

". . . no person, company, corporation, institution or municipality *shall supply water for domestic purposes to the public* within the state from or by means of any waterworks that shall have been constructed . . . *without a written permit from the state board of health.* . . ." (Our emphasis.)

The order of the board in this case is simply informing the city that the water which it furnishes for domestic purposes to the public must be chlorinated before it is safe for public consumption.

No mention is made of the *source of supply* of the water going *into* the waterworks or the municipal water plant. Reference is made only to the water that is furnished by such water plant when it is ready to be consumed for domestic purposes by the public.

We, therefore, conclude the trial court correctly decided that K. S. A. 65-171 has no application herein and no election is required, that the controlling statute is K. S. A. 65-163, and the order granting the peremptory writ was correct.

Judgment affirmed.

APPENDIX C

E.P.A. EVALUATION

of the

ENVIRONMENTAL HEALTH LABORATORIES

Report of a Survey of the
Kansas State Department of Health
Environmental Health Laboratory

801 Harrison Street
Topeka, Kansas 66612
October 21-22, 1971

by

Harry D. Nash, Ph. D.
Microbiologist
Water Supply Programs Division
Office of Water Programs
Environmental Protection Agency
5555 Ridge Avenue
Cincinnati, Ohio 45268

The equipment and procedures employed in the bacteriological analyses of water by this laboratory conformed with the provisions of Standard Methods for the Examination of Water and Wastewater (13th edition - 1971) and with the provisions of the Public Health Service Drinking Water Standards, except for the items marked with a cross "X" on the accompanying form EPA-103 (Rev. 3-71). Items marked with a "U" could not be determined at the time of the survey. Items marked "O" do not apply to the procedures programmed in this laboratory. Specific deviations are described with appropriate remedial action for compliance in the following recommendations:

Recommendations

Item 5 Record of Laboratory Examination

State standards define a sample as being unsatisfactory if one or more coliform colonies are observed per 100 ml of sample examined; all unsatisfactory samples are reported to the Engineering Section for review. A review of the records indicate that there is no program initiated for repeat sampling. Regulations do recommend that when a sample is reported as unsatisfactory, daily samples should be collected from the same sampling point and examined until the results obtained from at least two consecutive samples indicate that contamination is no longer present.

Laboratory Evaluation Service

Mr. Marvin Dyck is designated as the State Water Laboratory Survey Officer. All interstate carrier water supplies and those laboratories conducting bacteriological analyses are listed in Table 1.

Table 1

Interstate Carrier Water Supplies and Certified Laboratories

Name of Water Supply	Laboratory Conducting Test	Survey Officer of Lab	Date of Last Survey
Emporia Municipal	Kansas Environmental Health Lab (KEHL)	H. D. Nash	Oct 22, 1971
Leavenworth	KEHL		
Atchison	KEHL		
Lawrence	KEHL		
Pittsburg	KEHL		
Water District #1 Johnson County	KEHL		
Newton	KEHL		
Liberal	KEHL		
Wichita Municipal Airport	KEHL		
Kansas City Board of Public Utilities	Board of Public Utilities Lab.	M. G. Dyck	July 1969
Salina Municipal	Salina Water Dept. Lab	M. G. Dyck	Dec. 1969
Topeka Municipal	Topeka Water Dept. Lab	M. G. Dyck	March 1970
Wichita Municipal	Wichita Water Dept. Lab	M. G. Dyck	Nov. 1969

Remarks

It is recommended that all liquid carbohydrate media be sterilized at 121° C for 12 rather than 15 minutes. This will reduce the chance of lactose hydrolysis which may result from over heating. Since brilliant green lactose bile broth and lauryl tryptose broth are used only for verification, it is suggested that these be purchased in $\frac{1}{4}$ pound quantities rather than one pound bottles. This will reduce the chance of larger quantities of medium becoming caked or deteriorating before used.

Commendation

Mr. Marvin Dyck and the laboratory personnel are to be commended on their strict adherence to standard methods and the excellent records and reporting system which is employed at the Kansas Environmental Health Laboratory. All records were current and complete.

Personnel Approved

Mr. Marvin Dyck, Bacteriologist III; Mrs. Evelyn Lawson, Bacteriologist II; and Mr. David Gleue, Laboratory Technician I, are approved for the application of the total and fecal coliform and fecal streptococci membrane filter procedures to the bacteriological examination of potable waters and stream water quality measurements.

Conclusions

The procedures and equipment in use at the time of the survey complied in general with the provisions of Standard Methods for the Examination of Water and Wastewater (13th edition - 1971) and the Public Health Service Drinking Water Standards, and with correction of deviations listed, it is recommended that the results be accepted for the bacterial examination of waters under interstate regulations.

Harry D. Nash

ENVIRONMENTAL PROTECTION AGENCY
Water Quality Office
Water Hygiene Division
Bacteriological Survey for
Water Laboratories

Indicating conformity with the 13th edition of Standard Methods for the Examination of Water and Wastewater (1971).

Survey By	X = Deviation U = Undetermined O = Not Used	
H. D. Nash		
Laboratory Kansas State Dept. of Health Environmental Health Lab	Location 801 Harrison Topeka, Kansas 66612	Date 10/21-22/71

Sampling and Monitoring Response

1. Location and Frequency
   - Representative points on system. . . . . ____
   - Frequency of sampling adequate . . . . . ____

2. Collection Procedure
   - Faucets with aerators should not be used. . . . . ____
   - Flush tap 1 min. prior to sampling . . . . . ____
   - Pump well 1 min. to waste prior to sampling . . . . . ____
   - River, stream, lake, or reservoir sampled at least 6 inches below surface and toward current. . . . . ____
   - Minimum sample not less than 100 ml . . . . . ____
   - Ample air space in bottle for mixing. . . . . ____
   - Promptly identify sample legibly and indelibly . . . . . ____

3. Sample Bottles
   - Wide mouth, glass or plastic bottles of 8 oz. capacity. . . . . ____
   - Sample bottles capable of sterilization and rinse . . . . . ____
   - Closure:
     a. Glass stoppered bottles protected with metal foil, rubberized cloth or kraft type paper . . . . . ____
     b. Metal or plastic screw cap with leakproof liner . . . . . ____
   - Sodium thiosulfate added for dechlorination. . . . . ____
     Concentration 100 mg/l added before sterilization . . . . . ____
   - Chelation agent for stream samples (optional). . . . . ____
     Concentration 372 mg/l added before sterilization . . . . . ____

4. Transportation and Storage
   - Complete and accurate data accompanies sample . . . . . ____
   - Transit time for potable water samples should not exceed . . . . . ____
     48 hrs, preferably within 30 hrs . . . . . ____
   - Transit time for source waters, reservoirs, and natural bathing waters should not exceed 6 hrs . . . . . ____
   - All samples examined within 2 hours of arrival . . . . . ____

EPA-103 (Cin)
(Rev. 3-71)

Laboratory	Location	Date
Environmental Health Lab Kansas State Dept. of Health	801 Harrison Topeka, Kansas 66612	10/21-22/71

4. Transportation and Storage (Continued)

Sample refrigeration mandatory on stream samples, optional on potable water samples. . . . . ____

5. Record of Laboratory Examination

Results assembled and available for inspection . . . . . ____

Number of Tests per year

MPN Test - Type of sample 0

Confirmed (+)____ (-)____ (Total)____

FY - 71 Completed (+)____ (-)____ (Total)____

MF Test - Type of sample Public, semi-public & private

Direct Count (+) 2822 (-) 32,686 (Total) 35,508

Verified Count (+)____ (-)____ (Total)____

Other samples swimming pools & stream samples 6,371

Data processed rapidly through laboratory and engineering sections. . ____

Unsatisfactory sample defined as ~~3 or more positive tubes per MPN test or 5~~ or more colonies per 100 ml in MF test . . . . . ____

High priority placed on alerting operator to unsatisfactory potable water results . . . . . ____

Prompt resampling for unsatisfactory samples X

6. Laboratory Evaluation Service

State program to evaluate all laboratories which examine potable water supplies. . . . . ____

Frequency of surveys on a 2 year basis. . . . . ____

State survey officer (Name) Mr. Marvin Dyck . . . . ____

Status of laboratory evaluation service. . . . . ____

Total 5 labs known to examine water

5 approved laboratories

0 provisional laboratories

Laboratory Apparatus

7. Incubator

Manufacturer Boekel Model 1295A

Sufficient size for daily work load . . . . . ____

Maintain uniform temperature in all parts (± 0.5°C). . . . . ____

Accurate thermometer with bulb immersed in liquid on top and bottom shelves. . . . . ____

Daily record of temperature or use of recording thermometer sensitive to 0.5°C change . . . . . ____

Incubator not subject to excessive room temperature variations beyond a range of 50 - 80°F . . . . . ____

Laboratory	Location	Date
Environmental Health Lab Kansas State Dept. of Health	801 Harrison Topeka, Kansas 66612	10/21-22/71

8. Incubator Room (Optional) Manufacturer _____

Well insulated, equipped with properly distributed heating and humidifying units for optimum environmental control.	____
Shelf areas used for incubation must conform to 35°C ± 0.5° temperature requirement.	____
Accurate thermometers with bulb immersed in liquid.	____
Daily record of temperature at selected areas or use recording thermometer sensitive to 0.5°C changes	____

9. Water Bath

Manufacturer Precision Scientific Model _____

Sufficient size for fecal coliform tests	____
Maintain uniform temperature 44.5°C ± 0.2°C.	____
Accurate thermometer immersed in water bath	____
Daily record of temperature or use of recording thermometer sensitive to 0.2°C changes	____

10. Hot Air Sterilizing Oven

Manufacturer _____ Model _____

Size sufficient to prevent crowding of interior	____
Constructed to insure a stable sterilizing temperature	____
Equipped with accurate thermometer in range of 160-180°C or with recording thermometer	____

11. Autoclave

Manufacturer American Sterilizer Model _____

Size sufficient to prevent crowding of interior	____
Constructed to provide uniform temperature up to and including 121°C	____
Equipped with accurate thermometer with bulb properly located to register minimal temperature within chamber	____
Pressure gage and operational safety valve	____
Steam source from saturated steam line, ~~or from gas or~~ electrically heated steam generator	____
Reach sterilization temperature in 30 min.	____
Pressure cooker may be used only if provided with a pressure gage and thermometer with bulb 1 in. above water level	0

12. Thermometers

Accuracy checked with thermometer certified by National Bureau of Standards or one of equivalent accuracy.	____
Liquid column free of discontinuous sections and graduation marks legible	____

Laboratory	Location	Date
Kansas State Dept. of Health Environmental Health Lab	801 Harrison Topeka, Kansas 66612	10/21-22/71

13. pH Meter

Manufacturer Beckman Model Zeromatic

Electronic pH meter accurate to 0.1 pH units. . . . . ____

14. Balance

Balance with 2 g sensitivity at 150 g load used for general media preparations, Type 0 Haus . . . . . ____

Analytical balance with 1 mg sensitivity at 10 g load used for weighing quantities less than 2 g, Type _____ . . . ____

Appropriate weights of good quality for each balance . . . . . ____

15. Microscope and Lamp

Preferably binocular wide field, 10 to 15 diameters magnification for MF colony counts, Type _____ . . . . . ____

Fluorescent light source for sheen discernment. . . . . ____

16. Colony Count

Quebec colony counter, dark-field model preferred for standard plate counts . . . . . ____

17. Inoculating Equipment

Wire loop of 22 or 24 gauge chromel, nichrome, or platinum iridium, sterilized by flame . . . . . ____

Single-service transfer loops of aluminum or stainless steel, presterilized by dry heat or steam. . . . . ____

Disposable single service hardwood applicators, presterilized by dry heat only. . . . . ____

18. Membrane Filtration Units

Manufacturer Millipore Type _____

Leak proof during filtration. . . . . ____

Metal plating not worn to expose base metal . . . . . ____

19. Membrane filters

Manufacturer Millipore Type _____

Full bacterial retention, satisfactory filtration speed . . . . . ____

Stable in use, glycerin free. . . . . ____

Grid marked with non-toxic ink . . . . . ____

Presterilized or autoclaved 121°C for 10 min. . . . . ____

20. Absorbent Pads

Manufacturer Millipore Type _____

Filter paper free from growth inhibitory substances. . . . . ____

Thickness uniform to permit 1.8 - 2.2 ml medium absorption . . . . ____

Presterilized or autoclaved with membrane filters . . . . . ____

Laboratory	Location	Date
Kansas State Dept. of Health Environmental Health Lab	801 Harrison Topeka, Kansas 66612	10/21-22/71

21. Forceps

Preferably round tip without corrugations. . . . . ____
Forceps are alcohol flamed for use in MF procedure. . . . . ____

Glassware, Metal Utensils and Plastic Items

22. Media Preparation Utensils

Borosilicate glass . . . . . ____
~~Stainless steel~~ . . . . . ____
Utensils clean and free from foreign residues or dried medium . . . . . ____

23. Pipets Pyrex

Brand Richard Allen (Alpha) Type Borosilicate
Calibration error not exceeding 2.5%. . . . . ____
Tips unbroken, graduation distinctly marked . . . . . ____
Deliver accurately and quickly. . . . . ____
Mouth end plugged with cotton (optional) . . . . . ____

24. Pipet Containers

Box, ~~aluminum or~~ stainless steel . . . . . ____
Paper wrapping of good quality sulfite paper (optional) . . . . . ____

25. Petri Dishes

Brand Kimax Type
Use 100 mm x 15 mm dishes for pour plates . . . . . ____
Use 60 mm x 15 mm dishes for MF cultures . . . . . ____
Clear, flat bottom, free from bubbles and scratches. . . . . ____
Plastic dishes may be reused if sterilized in 70% ethanol for 30 min. or by ultraviolet radiation . . . . . ____

26. Petri Dish Containers

Aluminum or stainless steel cans with covers, coarsely woven wire baskets, char-resistant paper sacks or wrappings . . . . . ____

27. Culture Tubes

Size sufficient for total volume of medium and sample portions . . . . ____
Borosilicate glass or other corrosive resistant glass . . . . . ____

28. Dilution Bottles or Tubes

Borosilicate or other corrosive resistant glass . . . . . ____
Screw cap with leak-proof liner free from toxic substances on sterilization . . . . . ____
Graduation level indelibly marked on side of bottle or tube . . . . . ____

Laboratory Kansas State Dept. of Health Environmental Health Lab.	Location 801 Harrison Topeka, Kansas 66612	Date 10/21-22/71

Materials and Media Preparation

29. Cleaning Glassware

Dishwasher Manufacturer Heinicke Model Typhon

Thoroughly washed in detergent at ~~160°~~ 125°F, cycle time 3.5 - 4 min. . . ____

Rinse in clean water at 180°F, cycle time 3.5 min. . . . . ____

Final rinse in distilled water, cycle time 1.0 min. . . . . ____

Detergent brand State prison formulation

Washing procedure leaves no toxic residue has been checked. . . . . ____

Glassware free from acidity or alkalinity . . . . . ____

30. Sterilization of Materials

Dry heat sterilization (1 hr at 170°C) Freas Model 124

Glassware not in metal containers . . . . . ____

Dry heat sterilization (2 hrs at 170°C)

Glassware in metal containers. . . . . ____

Glass sample bottles . . . . . ____

Autoclaving at 121°C for 15 min . . . . . ____

Plastic sample bottles 121°C for 10-12 min. . . . . ____

Dilution water blanks Rinse water autoclaved 121°C for 30 min . . . ____
Dilution water blank autoclaved 121°C for 20 min.

31. Laboratory Water Quality

Still manufacturer Barnstead Construction Material Tin Lined

Demineralizer with Crystalab 1/year recharge frequency

Protected storage tank . . . . . ____

Supply adequate for all laboratory needs. . . . . ____

Free from traces of dissolved metals or chlorine . . . . . ____

Free from bactericidal compounds as measured by bacteriological suitability test . . . . . ____

Bacteriological quality of water measured ~~once each year~~ by suitability test or sooner if necessary . . . . . ____

32. Buffered Dilution Water

Stock phosphate buffer solution pH 7.2 . . . . . ____

Prepare fresh stock buffer when turbidity appears . . . . . ____

Stock buffer autoclaved and stored at 5 - 10°C . . . . . ____

1.25 ml stock buffer per 1 liter distilled water. . . . . ____

Dispense to give 99 ± 2 ml or 9 ± 0.2 ml after autoclaving. . . . . ____

33. pH Measurements

Calibrate pH meter against appropriate standard buffer prior to use . . ____

Standard buffer brand Beckman pH pH 7

Check the pH of each sterile medium batch or at least one batch from each new medium lot number. . . . . ____

Laboratory	Location	Date
Kansas State Dept. of Health Environmental Health Lab.	801 Harrison Topeka, Kansas 66612	10/21-22/71

33. pH Measurements (Continued)
    Maintain a pH record of each sterile medium batch, the date and lot number. . . . . ____

34. Sterilization of Media
    Carbohydrate medium sterilized 121°C for 12 min . . . . . ____
    All other media autoclaved 121°C for 15 min . . . . . ____
    Tubes packed loosely in baskets for uniform heating and cooling. . . . ____
    Timing starts when autoclave reaches 121°C . . . . . ____
    Total exposure of carbohydrate media to heat not over 45 min. . . . . ____
    Media removed and cooled as soon as possible after sterilization . . . ____

35. Storage
    Dehydrated media bottles kept tightly closed and stored at less than 30°C. . . . . ____
    Dehydrated media not used if discolored or caked . . . . . ____
    Sterile culture media stored in clean area free from contamination and excessive evaporation . . . . . ____
    Sterile batches used in less than 1 week. . . . . ____
    All media protected from sunlight . . . . . ____
    If media is stored at low temperatures, it must be incubated overnight and any tubes with air bubbles discarded . . . . . ____

Culture Media - Specifications

36. Lactose Broth
    Manufacturer _____ Lot No. _____
    Single strength composition 13 g per liter distilled water 0
    Single strength pH 6.9 ± 0.1, double strength pH 6.7 ± 0.1 . . . . . ____
    Not less than 10 ml medium per tube . . . . . ____
    Composition of medium after 10 ml sample is added must contain 0.013 g per ml dry ingredients. . . . . ____

37. Lauryl Tryptose Broth
    Manufacturer Difco Lot No. 474587
    Single strength composition 35.6 g per liter distilled water . . . . . ____
    Single strength pH 6.8 ± 0.1, double strength pH 6.7 ± 0.1 . . . . . ____
    Not less than 10 ml medium per tube . . . . . ____
    Composition of medium after 10 ml sample is added must contain 0.0356 g per ml of dry ingredients . . . . . ____

38. Brilliant Green Lactose Bile Broth
    Manufacturer Difco Lot No. 480009

EPA-103 (Cin)
(Rev. 3-71)

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38. Brilliant Green Lactose Bile Broth (Continued)
    - Correct composition, sterility and pH 7.2. . . . . ____
    - Not less than 10 ml medium per tube . . . . . ____

39. Eosin Methylene Blue Agar
    - Manufacturer Levine EMB Lot No. 476128
    - Medium contains no sucrose, Cat. No. ____
    - Correct composition, sterility and pH 7.1. . . . . ____

40. Plate Count Agar (Tryptose Glucose Yeast Agar)
    - Manufacturer ____ Lot No. ____
    - Correct composition, sterility and pH 7.0 ± 0.1 . . . . . ____
    - Free from precipitate. . . . . ____
    - Sterile medium not remelted a second time after sterilization. . . . . ____

41. EC Medium
    - Manufacturer ____ Lot No. ____
    - Correct composition, sterility and pH 6.9. 0
    - Not less than 10 ml medium per tube . . . . . ____

42. M-Endo Medium
    - Manufacturer Difco Lot No. 346928
    - Correct composition and pH 7.1 - 7.3 . . . . . ____
    - Reconstituted in distilled water containing 2% ethanol. . . . . ____
    - Heat to boiling point, promptly remove and cool . . . . . ____
    - Store in dark at 2 - 10°C . . . . . ____
    - Unused medium discarded after 96 hrs . . . . . ____

43. M-FC Broth
    - Manufacturer Difco Lot No. 632408
    - Correct composition and pH 7.4 . . . . . ____
    - Reconstituted in 100 ml distilled water containing 1 ml of a 1% rosolic acid reagent. . . . . ____
    - Stock solution of rosolic acid discarded after 2 weeks or when red color changes to muddy brown . . . . . ____
    - Heat to boiling point, promptly remove and cool . . . . . ____
    - Store in dark at 2 - 10°C . . . . . ____
    - Unused medium discarded after 96 hrs . . . . . ____

44. ____ Broth
    - Manufacturer ____ Lot No. ____
    - Correct composition and pH . . . . . ____

45. ____ Agar
    - Manufacturer ____ Lot No. ____

EPA-103 (Cin)
(Rev. 3-71)

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45. _____ Agar (Continued)

Correct composition and pH. . . . . ____

Multiple Tube Coliform Test

46. Presumptive Procedure

Lactose broth _____ lauryl tryptose broth _____

Shake sample vigorously 0

Potable water: 5 standard portions, either 10 or 100 ml. . . . . ____

Stream monitoring: multiple dilutions . . . . . ____

Incubate tubes at 35° ± 0.5°C for 24 ± 2 hr . . . . . ____

Examine for gas _____ any gas bubble positive. . . . . ____

Return negative tubes to incubator. . . . . ____

Examine for gas at 48 ± 3 hr from original incubation . . . . . ____

47. Confirmed Test

Promptly submit all presumptive tubes showing gas production before or at 24 hr and 48 hr periods to Confirmed Test 0

a. Brilliant green lactose broth

Gently shake presumptive tube or mix by rotating . . . . . ____

Transfer one loopful of positive broth or one dip of applicator from presumptive tube to brilliant green lactose broth. . . . . ____

Incubate at 35° ± 0.5°C and check at 24 hrs for gas production. . . ____

Reincubate negative tubes for additional 24 hrs and check for gas production . . . . . ____

Calculate MPN or report positive tube results. . . . . ____

b. Endo or eosin methylene blue agar plates adequate streaking to obtain discrete colonies separated by 0.5 cm. . . . . ____

Incubate at 35° ± 0.5°C for 24 ± 2 hr . . . . . ____

Typical nucleated colonies with or without sheen are coliforms . . ____

If atypical unnucleated pink colonies develop, result is doubtful and completed test must be applied. . . . . ____

If no colonies or only colorless colonies appear, the confirmed test is negative. . . . . ____

48. Completed Test

Applied to all potable water samples or a proportion each three months to establish the validity of the confirmed test in determining their sanitary quality. 0

Applied to positive confirmed tubes or to doubtful colonies on differential medium. . . . . ____

Streak positive confirmed tubes on Endo or EMB plates for colony isolation. . . . . ____

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48. Completed Test (Continued)

Choice of selected isolated colony for verification should be one typical or two atypical to lactose or lauryl tryptose broth and to agar slant for Gram stain. 0

Incubate at 35°C ± 0.5°C for 24 hrs or 48 hrs . . . . . ____

Gram negative rods without spores and gas in lactose tube with 48 hrs in positive Completed Test . . . . . ____

Membrane Filter Coliform Test

49. Application as Standard Test

Use as a standard test for determining potability of water after demonstration by parallel testing that it yields information equal to that from the multiple-tube fermentation procedure . . . . ____

50. MF Procedure

Filter funnel and receptacle sterile at start of series . . . . . ____

Rapid funnel resterilization by UV, flowing steam or boiling water acceptable. . . . . ____

Membrane filter cultures and technician eyes should not be subject to UV radiation leaks 100 ml municipal 50 ml private & swimming pools

Filtration volume not less than ~~50 ml~~ for potable water; multiple dilutions for stream pollution . . . . . ____

Rinse funnel by flushing several 20 - 30 ml portions of sterile buffered water through MF . . . . . ____

Remove filter with sterile forceps . . . . . ____

Roll filter over M-ENDO medium pad or agar so air bubbles will not form . . . . . ____

51. Incubation

In high humidity or in tight fitting culture dishes . . . . . ____

At 35°C ± 0.5°C for 22 - 24 hrs . . . . . ____

52. Counting

All colonies with a metallic yellowish green surface sheen . . . . . ____

If coliforms are found in potable samples, verify by transfers to lactose broth, then to BGB broth for evidence of gas production at 35°C within 48 hr limit. . . . . ____

Calculate direct count in coliform density per 100 ml. . . . . ____

53. Standard MF test with Enrichment

Incubate MF after filtration on pad saturated with lauryl tryptose broth for 1 1/2 - 2 hr at 35°C ± 0.5°C . . . . . ____

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53. Standard MF test with Enrichment (Continued)

Transfer MF culture to M-Endo medium for a final 20 - 22 hr incubation at 35°C ± 0.5°C. . . . . ____

Count sheen colonies, verify if necessary, and calculate direct count in coliform density per 100 ml . . . . . ____

Supplementary Bacteriological Methods

54. Standard Plate Count

Plate not more than 1 or less than 0.1 ml (sample or dilution) 0

Add 10 ml or more liquefied agar medium at a temperature between 43 - 45°C . . . . . ____

Melted medium stored for no more than 3 hr at 43 - 45°C . . . . . ____

Liquid agar and sample portion thoroughly mixed by gently rotating to spread mixture evenly . . . . . ____

Count only plates with between 30 and 300 colonies, exception being 1 ml sample with less than 30 colonies . . . . . ____

Record only two significant figures and calculate as "standard plate count at 35°C per 1 ml of sample". . . . . ____

55. Fecal Coliform Test

a. Multiple Tube Procedure

Applied as an EC broth confirmation of all positive presumptive tubes. 0

Place EC tubes in water bath within 30 min of transfers . . . . . ____

Incubate at 44.5°C ± 0.2°C for 24 hrs . . . . . ____

Gas production is positive test for fecal coliforms. . . . . ____

Calculate MPN based on combination of positive EC tubes . . . . . ____

b. Membrane Filter Procedure

Following filtration place MF over pad saturated with M-FC broth . . . . . ____

Place MF cultures in water-proof plastic bag and submerge in water bath within 30 min. . . . . ____

Incubate at 44.5°C ± 0.2°C for 24 hrs . . . . . ____

All blue colonies are fecal coliforms. . . . . ____

Calculate direct count in density per 100 ml . . . . . ____

56. Delayed-Incubation Coliform Test

After filtration, place MF over pad of M-Endo containing 3.2 ml of a 12% sodium benzoate solution per 100 ml of medium 0

Addition of 50 mg cycloheximide per 100 ml of preservative medium for fungus suppression is optional . . . . . ____

Transport culture by mail service to laboratory within 72 hours . . . . ____

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56. Delayed-Incubation Coliform Test (Continued)

Transfer MF cultures to standard M-Endo medium at laboratory. . . . . ____
Incubate at 35°C ± 0.5°C for 20 - 22 hr . . . . . ____
If at time of transfer, growth is visible, hold in refrigerator till end of work day then incubate at 35° overnight (16 - 18 hr period) . . . . . ____
Count sheen colonies, verify if necessary, and calculate direct count in coliform density per 100 ml . . . . . ____

57. Additional Test Capabilities

Fecal streptococci	KF Medium	Method	membrane filter
Pseudomonas aeruginosa		Method	
Staphylococcus		Method	
Salmonellae		Method	
Biochemical tests		Purpose	
Serological tests		Purpose	
Other		Purpose	

Laboratory Staff and Facilities

58. Personnel

Adequately trained or supervised for bacteriological examination of water . . . . . ____
Laboratory staff 3 (Total) Prep room staff 2 (Total)

59. Reference Material

Copy of the current edition of Standard Methods available in the laboratory . . . . . ____
State or federal manuals on bacteriological procedures for water available for staff use. . . . . ____

60. Physical Facilities

Bench-top area adequate for periods of peak work in processing samples. . . . . ____
Sufficient cabinet space for media and chemical storage. . . . . ____
Office space and equipment available for processing water examination reports and mailing sample bottles . . . . . ____
Facilities clean, with adequate lighting, ventilation and reasonably free from dust and drafts . . . . . ____

61. Laboratory Safety

Proper receptacles for contaminated glassware and pipettes. . . . . ____

61. Laboratory Safety (Continued)

Adequately functioning autoclaves with periodic inspection and maintenance. . . . . ____
Accessible facilities for hand washing . . . . . ____
Proper maintenance of electrical equipment to prevent fire and electrical shock . . . . . ____
Convenient gas and electric outlets. . . . . ____
First aid supplies available and not out-dated . . . . . ____

62. Remarks

COMPUTER PRINTOUT AND EXPLANATION SHEET

Column 1. Area number of the water supply.

Column 2. The code number specific for each individual public water supply.

Column 3. The name of the water supply.

Column 4. This column and column 5 relate to the coliform content requirement as stated in the Drinking Water Standards. Column 4 is answered "yes" or "no" - "yes" if the arithmetic average of all distributions sampled for the month is more than 1 per 100 ml. or "no" where the average is less than 1 ml.

Column 5. This is a count of the number of "yes's" in column 4 since the beginning of the current calendar year.

Column 6. This column and column 7 relate to the number of samples. Every public water supply of Kansas has attached to it a number of samples which, in theory, is the number of samples required of that water supply each month. (Month being interpreted as a 4 week period). If all samples expected of a supply are received, the supply would be in compliance with sample requirements and the word "no" appears in column 6. However, if samples received per 4 weeks is less than that expected, the word "yes" appears in column 6.

Column 7. This is a count of the number of "yes's" in column 4 since the beginning of the current calendar year.

Column 8. This is a count of the number of samples each month that had to be reported in paragraph C. (See this paragraph on the first page of the report.)

Column 9. This is an accumulative count of the number of samples reported as paragraph C since the first of the year.

Column 10. This is the first column of the bottle accounting set up for each account. Column 10 indicates the number of sterile empty bottles the laboratory is to send out to each account during the 4 week report period.

Column 11. This indicates the number of bottles that have been received from each water supply during the 4 week period.

Column 12. This column snows the difference between column 11 and column 12. Zero indicates the account is in balance -- bottles shipped equals bottles received. A number followed by CR in this column indicates more bottles were sent than were received. In other words, the public supply has not submitted all of the samples it should have submitted.

Column 13. This column is the accumulated difference of bottles shipped and bottles received for the year to date.

Report of a Survey of the
Division of Laboratories
Kansas State Department of Health
Environmental Health Laboratory
801 Harrison Street
Topeka, Kansas

by

Earl F. McFarren, Chief
Analytical Quality Control
Water Supply Research Laboratory

The Water Chemistry Section of the Environmental Health Laboratory at 801 Harrison Street and the Water Supply Section at 535 Kansas Ave. was visited on June 15th and 16th, 1972. The General Health Laboratory at 4000 East Tenth Street was visited on the morning of June 16, 1972. The equipment and procedures employed in the chemical analysis of water by the Environmental Health Laboratory conforms with the provisions of Standard Methods for the Examination of Water and Wastewater (13th edition) and with the provisions of the Public Health Drinking Water Standards, except for the items marked with a cross "X" (deviation from standard), or an "O" (not being done at present). Items marked with a "U" could not be determined at the time of the survey (see attached survey form).

Substances Determined

The water chemistry section routinely determines turbidity, chlorides, fluorides, nitrates, sulfates, surfactants, total dissolved solids, iron, and manganese; but only occasionally (interstate carrier supplies), arsenic, cadmium, chromium, copper, lead, zinc, or gross alpha and beta activity. In addition, they do specific conductance, silica, phosphate, calcium, magnesium, sodium, potassium, alkalinity, carbonate and bicarbonate; although none of these are in the drinking water standards. They rarely do color, cyanide, CCE, barium, selenium, silver or mercury. Thus, in summary, although they routinely analyze for 20 substances, only nine of these are required by the drinking water standards and seventeen substances are seldom, if ever, done.

Turbidity (1 c) is the only substance being determined at present by a non-standard method. The others marked with an "X" (items 3 a, c, d, e, g, 1 and 4 a and d) are correctly analyzed but marked as a deviation because they are not done routinely on all water supplies.

Laboratory Apparatus

The laboratory has a Perkin-Elmer 290 B atomic absorption spectrophotometer, which unfortunately is a single beam instrument lacking the sensitivity and stability required to analyze for metals such as lead and chromium at the level required by the drinking water standards without some sort of concentration step. While this instrument is sensitive enough for most other metals, another instrument is needed anyhow in order to carry out all of the metal analysis without continually having to change all of the attachments to the instrument such as is required for mercury, and for arsenic and selenium. It is therefore, recommended that a Perkin-Elmer 403 be purchased and that the equipment for the determination of arsenic or selenium by the high sensitivity A.A. method either be manufactured or also purchased. In the case of mercury, either an attachment for the A. A. can be obtained or a Coleman Mercury Analyzer may be purchased. Since the latter only costs about $900 and avoids tying up another A. A. just for this determination, it is probably the preferable thing to do.

It is recommended that a Hach Model 2100 A for turbidity measurements be purchased, and a mini-sampler and extractors for the determination of CCE and CAE, as soon as the equipment becomes generally available.

Samples

It is recommended that samples collected for metal analysis be preserved with nitric acid (item 32 a) and those collected for nitrate and surfactant analysis be either refrigerated until analyzed or else preserved with mercuric chloride (item 32 b).

The sample identification tag needs to be revised so that space is provided to indicate the type of sample collected (raw, finished or distribution) and so that one tag is provided for each sample (item 33 b).

Records

According to laboratory records 607 samples were analyzed last year. Since there are about 625 public supplies in the state of which 115 are surface supplies, assuming that each of the surface supplies were analyzed twice a year, and each of the estimated 1500 wells (in the 510 ground water supplies) were analyzed once every three years, they should have analyzed about 730 samples last year (item 36 c). Furthermore, the exact number of wells involved did not seem to be known, and information is needed on the analysis of the individual wells. Likewise, distribution samples need to be taken for analysis; particularly, in some of the bigger supplies.

In addition to the analysis of public supplies, about 4,000 nitrate samples were analyzed of private individual wells, and about 400 samples from private wells were analyzed for hardness, calcium, magnesium, iron, sulfate, chloride, nitrate, alkalinity, sodium and manganese for a $7.00 fee. Thus, it would appear that perhaps an undue emphasis is being placed upon the analysis of private supplies because the fee is so low; as the actual cost is in all probability more like $30 or $40.

Only about 40 supplies in the state are fluoridated but according to the laboratory records 4,876 fluoride determinations were carried out last year. Many of these were on private waters or streams, however, fluorides are run on public supplies every time a bacteriology sample is collected which is every two weeks, and a spot check of the records indicated that most of the fluoridated supplies were well controlled.

The record keeping system of the Water Supply Section (although manual) is one of the best I have encountered. Not only are the results of analysis filed by municipality or county supply, but a running log indicating when analyzed and for what is available for each supply. For example, on a single page can be found the results of analysis of Topeka's water supply for 21 substances, as far back as 1959, with results up to the present so that any changes can be readily observed and it is known when and how often the supply has been analyzed.

Laboratory

In addition to potable water analysis, the laboratory analyzes water for water pollution control, does stream surveys for the Geological Survey, some air quality determinations and radiological chemistries on milk and vegetation (in addition to water). In general, the bench, floor and hood space is adequate, but there is inadequate space for storage of chemicals and glassware (item 38b). The atomic absorption spectrophotometer also is not vented and this could present a health problem when aspirating heavy metals such as lead and cadmium.

Quality Control

The laboratory does routinely check the quality of their distilled water, but otherwise has no routine program for checking the quality of their analysis (item 42).

If this laboratory desires to be certified for analysis of those chemistries which they are now running routinely, it will be necessary for them to establish their proficiency by analyzing a reference sample which we can supply.

Staff

Because of the variety of activities being carried out at the Environmental Health Laboratory at 801 Harrison Ave., it is difficult to judge their manpower requirements, but it would appear that if additional chemistries are to be undertaken (metal analysis by A.A., CCE, etc.) an additional chemist will be needed. In fact, the laboratory already is short one chemist, since one person was transferred to the General Health Laboratory at 4000 East Tenth Street, in order to develop a capability in pesticide analysis. This program is just getting started, and no analysis of potable waters has yet been undertaken.

Conclusions

The Environmental Health Laboratory routinely analyzes potable waters for 20 substances, but only nine of these are required by the drinking water standards, and seventeen determinations are seldom (occasionally on interstate carriers), if ever, done.

The laboratory analyzed 607 samples last year; whereas, they probably should have analyzed at least 730 samples (assuming that the surface water supplies were checked at least twice a year and the ground water supplies at least once every three years). More information is needed on individual wells in the systems, and distribution samples should be collected in, at least, the larger systems.

It is recommended that a Perkin-Elmer 403 atomic absorption spectrophotometer or equivalent be purchased and accessories for running mercury, arsenic and selenium be acquired. It is also recommended that a Hach Model 2100A for turbidity measurements be purchased and a mini-sampler and associated equipment for running CCE's when available.

Hood and bench space appears to be adequate but more space is needed for storage of chemicals and glassware, and a vent is needed for the atomic absorption spectrophotometer.

Insufficient radiological chemistries are being run on potable waters and no pesticide analysis is at present being done. It is recommended that some sort of a routine surveillance program for at least checking the surface water supplies for pesticides be established.

In order to be able to carry out the recommended additional chemistries (metal analysis and CCE) at least one additional chemist will need to be hired.

The laboratory form for reporting the results of analysis of potable water needs to be revised so as to include all the metals in the drinking water standards, and the sample identification card needs revision. The card should not permit its being used to identify more than one sample and space should be provided to indicate whether the sample is a raw, finished or distribution sample.

Some sort of a laboratory analytical quality control program should be established.

Earl F. McFarren

SURVEY OF WATER CHEMISTRY LABORATORIES

ENVIRONMENTAL PROTECTION AGENCY
Office of Water Programs
Water Hygiene Division

Indicating conformity with the 13th edition of Standard Methods for the Examination of Water and Wastewater (1971).

Survey by Earl F. McFarren
Date June 15-16, 1972

X = Deviation U = Undetermined
O = Not Used

Laboratory Environmental Health Lab. Director Dr. Nicholas Duffett
Street 801 Harrison Ave. Chief Chemist Howard Stoltenberg
City Topeka State Kansas 66612 Water Supply Chief Jack Burris

Substances Determined

	Method	
1. Physical determinations		
a. color		O
b. odor	qualitatively for chlorine, hydrogen sulfide, etc.	
c. turbidity	visually, source bacteriology bottle	X
2. Miscellaneous anions, organics and solids		
a. chlorides	silver nitrate titration	
b. cyanide		O
c. carbon chloroform extract		O
d. fluorides	alizarin visual (electrode on turbid some waters)	
e. nitrates	phenoldisulfonic acid	
f. sulfates	gravimetric (turbidity on private)	
g. surfactants	methylene blue	
h. total dissolved solids	180°	
i. other	specific conductance, silica, phosphate	
3. Metals		
a. arsenic	silver diethyl dithiocarbamate	X
b. barium		O
c. cadmium	atomic absorption	X
d. chromium	diphenyl carbazide	X
e. copper	atomic absorption	X
f. iron	ortho phenanthroline	
g. lead	dithizone	X
h. manganese	persulfate	
i. selenium		O
j. silver		O
k. mercury	dithizone on streams	O
l. zinc	atomic absorption	X
m. other	calcium, magnesium, sodium, potassium, carbonate, bicarbonate, alkalinity	

4.	Radioactivity			
	a. gross beta	internal proportional counter		X
	b. radium 226	precipitation - measurement of decay rate		
	c. strontium 90			
	d. other	gross beta - internal		X
5.	Pesticides			
	a. aldrin			O
	b. chlordane			O
	c. dieldrin			O
	d. DDT			O
	e. endrin			O
	f. heptachlor			O
	g. heptachlor epoxide			O
	h. methoxychlor			O
	i. lindane			O
	j. toxaphene			O
	k. total organic phosphates plus carbamates			O
	l. chlorinated phenoxy alkyl pesticides			O
	m. other			
		Laboratory Apparatus		
		Make	Model	
6.	Color comparators			
	a. visual			
	b. filter photometer	Fisher	Electrometer II	
7.	Spectrophotometer			
	a. visible	Beckman	DB	
	b. flame	Beckman	Model B	
	c. other	P. E. Infracord		
8.	Atomic absorption spectrophotometer			
	a. air-acetylene burner	Perkin-Elmer	290 B	
	b. nitrous-oxide burner			O
	c. argon-hydrogen flame			O
	d. cold-vapor (flameless)			O
9.	Gas chromatographic equipment			
	a. electron capture	Beckman	GC-5	
	b. flame photometric			
	c. microcoulometric			
	d. other			

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		Make	Model	
10.	Other chromatographic equipment			
	a. thin-layer			
	b. Kuderna-Danish evaporator			
	c. other			
11.	Turbidimeter			
12.	Amperometer			
13.	Titrimeter			
14.	pH meter	Beckman	Zeromatic	
15.	Fluoride electrode	Beckman	Expandomatic (meter)	
16.	Arsine generator			
17.	Cyanide still			
18.	Fluoride still			
19.	Carbon-chloroform extraction equipment			
	a. high or low flow columns			
	b. carbon drying oven			
	c. extraction apparatus			
	d. manifold for solvent evaporation			
20.	Drying oven	Freas		
21.	Steam bath	Precision		
22.	Hot water bath			
23.	Muffle furnace			
24.	Distilled water still	Barnstead (2)	5 gal/hr	
25.	Water deionizer	mixed bed		
26.	Conductivity meter	Instrument Labs	RC 16 B	
27.	Balance, sensitive to 0.1 mg	Mettler		
28.	Automatic analyzer for			
	a. nitrates plus nitrites			
	b. nitrites			

	Make	Model	
28. Automatic analyzer for (Continued)			
c. chloride			
d. sulfate			
e. cyanide			
f. fluoride			
g. other			
29. Radiation Counting Equipment			
a. internal proportional counter		NMC, RC-3A	
b. alpha-scintillation counter			
c. other gamma scintillation counter			
30. Other Instruments or Equipment			
a.			
b.			
c.			
d.			

Sampling

31. Containers	
a. Non-reusable plastic containers preferred for the collection of samples for general inorganic analysis.	
b. Glass bottles with teflon lines caps preferred for collection of pesticide samples	
c. Other kind	
32. Preservatives	
a. Samples for metal analysis preserved by the addition of nitric acid to a pH of about 2.0	X
b. Nitrates and methylene blue active substances preserved by addition of mercuric chloride	X
c. Cyanide preserved by the addition of sodium hydroxide to a pH of 11.	
d. No known or required preservative for turbidity, color, pH, chloride, sulfate, fluoride, specific conductance and total dissolved solids.	
e. If no preservative is used, in general samples are analyzed within 72 hrs	

Laboratory	Location	Date
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33. Identification

a. Every bottle should be identified by attaching an appropriately inscribed tag, a label or a number corresponding to a sample identification sheet. . . . . ____

b. The minimum information required on the tag or correspondingly numbered sheet includes; name of the water supply sampled, location of sampling site, exact date and time of collection, type of sample (raw, finished, grab or composite) by whom collected, and kind of preservative if added X

34. Collection

a. Samples from wells collected after pumping for a sufficient time to assure that the sample is representative of the ground water which feeds the well. . . . . ____

b. Finished (treated) water sampled at the plant by use of a pipeline drip device or the collecting and compositing of hourly (or other interval) samples . . . . . ____

c. Distribution samples obtained at several different points in the system; usually grab samples obtained without first flushing the line, although both kinds of samples may at times be desirable . . . . . ____

Records

35. Availability

a. Assay results assembled and available for inspection . . . . . ____

b. Notation made of those water supplies which did not comply with one or more standards, and some sort of follow-up program instigated . . . . . ____

36. Number analyzed annually

a. private supplies 4,000 nitrates, 400 for ten substances ____

b. semi-public ____ ____

c. municipal 607 complete plus 789 partial X

(1) sources ____ ____

(2) finished ____ ____

(3) distribution none X

37. Frequency

a. Physical characteristics measured at least once a week and preferably every day at the treatment plant. . . . . ____

b. Chemical characteristics determined at least once every three years on ground water supplies and semi-annually on surface water supplies unless previous data has indicated a potential problem which needs to be monitored more frequently ___X___

Laboratory

38. Physical facilities

a. Bench top area adequate . . . . . ____

b. Sufficient cabinet space for chemicals and glassware . . . . . ___X___

c. Adequate hood space. . . . . ____

d. Office space available for record keeping and processing reports . . . . . ____

e. Space for storage and handling of bottles. . . . . ____

39. Glassware

a. Thoroughly washed with suitable detergent and warm water . . . ____

b. Rinsed immediately in clean tap water to remove detergent . . . ____

c. Final rinse with distilled water. . . . . ____

d. Dichromate cleaning solution used for difficult to clean glassware. . . . . ____

e. Glassware used for pesticide analysis should receive a final rinse with A. R. grade acetone or ethyl acetate . . . . . ____

40. Organization

a. Total number of laboratories examining water ___2___ . . . . ____

b. Water laboratory is a separate unit, and not part of a food, drug, or toxicological laboratory . . . . . ___X___

c. Each of the other regional laboratories have the same capabilities. . . . . ____

d. Radiation chemistry is a part of the water laboratory . . . . . ____

Quality Control

41. Laboratory water quality

a. Conductivity of water checked at regular intervals . . . . . ____

b. Use of deionized water for metal analysis . . . . . ____

Laboratory	Location	Date
Environmental Health Lab.	801 Harrison Ave. Topeka, Kansas 66612	6/15-16/72

42. Control Samples

a. A control sample of known composition (in addition to any necessary standards) is analyzed every time one or more unknown samples are analyzed. . . . . O

b. A control sample is available and used for each substance specified in the drinking water standards . . . . . O

c. A control chart has been constructed for each substance, and the precision of each determination has been calculated . . . . . O

43. Reference Samples

a. Accuracy and ability of laboratory to perform each analysis checked by requiring them to analyze an unknown reference sample(s) supplied by the surveying office or laboratory at least once a year . . . . . _____

Staff

44. Personnel

a. Total number of staff _____ . . . . . _____

b. Number with degrees in chemistry 6 (1 M.A., 5 B.A.) . . . . . _____

c. Does state operate under a merit system . . . . . _____

d. Are job descriptions written . . . . . _____

e. Does state encourage attendance at professional meetings, short courses, etc. . . . . _____

45. Salaries

a. Chief chemist $16,000 . . . . . _____

b. Assistant chemist $10,000 . . . . . _____

c. ~~Analy~~ $6,000 Technicians . . . . . _____

7

APPENDIX D

VOLUNTARY PLAN

FOR

OPERATOR CERTIFICATION

A VOLUNTARY CERTIFICATION PLAN FOR WATER WORKS OPERATORS IN KANSAS

A. OBJECTIVE

This voluntary plan for certification is presented with the following purposes in view: (1) to promote the employment of trained, experienced and efficient personnel in (a) responsible charge of public water systems, or (b) any of the functional divisions of such systems, (2) to encourage efficient and careful operation of water plants, (3) to establish standards and facilities whereby operating personnel can demonstrate competency, (4) to encourage the development of a higher professional status in the field of water works operation, and (5) to promote an educational program for improving water works operational practices.

B. GENERAL POLICY

1. This is a voluntary program for certification. The application for a certificate shall be purely optional and voluntary on the part of the operator.

2. All water works operators meeting the requirements as herein set forth are eligible to take an examination for a certificate in any one of four grades.

3. Certificate holders will be encouraged to qualify for higher grade certificates consistent with their advancement in training and experience.

4. Application for certification shall not be restricted to membership in the Kansas Section of the American Water Works Association.

C. CO-OPERATING AGENCIES

1. Kansas Section of the American Water Works Association.

2. Kansas State Board of Health, Division of Sanitation.

3. School of Engineering and Architecture, University of Kansas.

D. DEFINITIONS

1. "Certification Examining Board" means the committee appointed and functioning as described herein, and who shall be responsible for the administration of the certification program.

2. "Certificate" means a certificate of competency attesting the fact that the applicant has successfully demonstrated his ability and has fulfilled the requirements for a particular grade as herein stated.

3. The term "water works" includes the facilities for the source, collection, conditioning, purification, and distribution of water for the general public use.

4. "Water works operator" is the term applied to any person (1) who is at any time directly responsible for the operation of a water works or such parts of a water works system as would affect the quality and safety of the water, or (2) who by training and experience has the qualifications necessary for the responsible operation of a water works, though not necessarily in charge of such plants. The term operators shall include superintendents, assistant superintendents, managers, engineers, chemists, supervisors, plant operators, assistant plant operators, superintendents of distribution systems, or any persons actively engaged in the operation or supervision of water works systems or any essential part thereof.

E. CERTIFICATION EXAMINING BOARD

1. The Certification Examining Board shall consist of seven members appointed by the Division of Sanitation, Kansas State Board of Health and the officers of the Kansas Section as follows:

Representatives of the Water Works Operators: 4

Leaders in the Water Works Field: 3

2. The representatives of the Water Works operators shall be appointed by the officers of the Kansas Section for a two year period and shall consist of one operator from each of the four grades. These shall be initially appointed for one and two year periods, with succeeding appointments of two year periods for each. The initial appointees shall be representative of the various water works systems in existence in the State of Kansas.

3. The Chief Engineer of the State Board of Health shall appoint three members, one of whom shall be a representative of the State Board of Health, one shall be a consultant in the water works field, and one shall be a professor of Sanitary Engineering. These shall be initially appointed for 1, 2, and 3 year periods, with succeeding appointments of three year periods for each.

4. A chairman of the committee shall be elected annually from its membership by majority vote of the members.

5. A quorum of the committee shall consist of not less than five members.

6. The Certification Examining Committee shall have full responsibility for conducting and administering the voluntary certification program. The committee shall be empowered to adopt such rules, regulations, and qualifications not inconsistent with the provisions herein contained,

as are necessary for the conduct of this program.

7. It shall be the duty of the committee to receive all applications, to investigate, verify, and evaluate the accompanying record of each applicant as required to establish his qualifications; prepare and conduct examinations for the various grades; and make recommendations as to the grade of certificate to be issued.

8. The Certification Examining Committee shall present a written report of its activities to the Kansas Section at each annual meeting of the Section; a brief review of its activities shall be presented at each district meeting of the Kansas Section.

F. APPLICATIONS FOR CERTIFICATION

1. Applications for examinations shall be made in writing on forms prepared by the Examining Board and shall be received by the Chairman of the Examining Board.

2. The application shall state the class of certificate desired and the qualifications of the applicant.

3. The Examining Board shall determine whether or not the applicant has the necessary qualifications for the grade certificate desired. Applicants having the necessary qualifications shall be notified regarding their eligibility and the time and place of the examination. Applicants not having the necessary qualifications for the grade desired shall be so advised and shall be encouraged to re-apply for such lower grade as their qualifications permit.

4. In case an operator taking the examination fails to pass such examination, he may, after six months, file application for re-examination.

5. No limit shall be placed on the number of times that an applicant may file for re-examination for any particular grade.

6. Certificate holders wishing certification in higher grades shall re-apply to the Examining Board.

G. EXAMINATION

1. The time and place of the examination shall be determined by the Examining Committee.

2. Prior to taking an examination, or re-examination, an operator must file a formal application of his intentions with the committee.

3. Certificates issued by other States having equivalent standards, as determined by the Examining Board, may be accepted in lieu of examination.

4. Examinations shall be given at least annually.

5. Examinations shall be written; and, in addition, an oral examination and a practical demonstration may be required at the discretion of the Board.

6. A passing mark of 75 shall be required in each part of the examination.

H. CERTIFICATES

1. The State Board of Health and the Kansas Section shall issue certificates to such applicants as are approved by the Examining Board.

2. Certificates shall continue in effect for a period of five years unless revoked prior to that time.

3. A certificate may be re-newed at its expiration date by (1) a written or oral examination for both, or (2) at the discretion of the Examining Board after considering the training, experience, education, and progress made by the certificate holder during the certification period.

4. The Examining Board shall be authorized to revoke the certificate of any person, who, after a hearing before the committee, has been found guilty of (1) deceit and fraud in obtaining such a certificate, or (2) gross negligence, incompetency, or improper conduct in the discharge of his duties as an operator of a public water supply system.

5. A list of the certificate holders shall be published each year by the State Board of Health and the Kansas Section, American Water Works Association.

I. FEES FOR CERTIFICATION

1. Applications for certification shall be accompanied by the following fees, made payable to the Kansas Section:

(a) Original Certification: $3.00

(b) Advancement to a higher grade: $3.00

(c) Renewal of certificate: $1.00

2. The above fee shall be composed of two parts: (1) $1.00 for filing fee, and (2) $2.00 for certificate fee.

3. The filing fee of $1.00 shall not be returnable in the event that the applicant does not qualify or does not pass the examination for the particular grade desired. The certification fee of $2.00 shall be returnable to the applicant in this event.

4. All fees collected shall be used to defray, in part, the expense of conducting this program.

J. CLASSIFICATION OF WATER WORKS SYSTEMS AND WATER SUPPLY PROCESSES

1. The class and type of water works system operated is not used as a basic requirement in this plan, but shall receive consideration by the Examining Board in determining the qualifications of the applicant for certification.

2. A special committee shall be appointed by the Chairman of the Kansas Section and the Chief Engineer of the Kansas State Board of Health to make a careful study of the relationship of classification of water systems to that of classification of operators.

3. The Examining Board shall be authorized, upon recommendation of the above named committee, to establish experience and education qualifications upon the type system operated. In this event, the Examining Board and the Chief Engineer of the State Board of Health shall classify plants as population served, type of plant, type of water treated, and type of treatment used.

4. The initial water works operators composing the Examining Board shall be representative of the following type systems:

(a) Surface Water Supply: Systems where chemical feeding, coagulation, softening, filtration, disinfection, or any combination of these are practiced, and serving over 10,000 population.

(b) Ground Water Supply: Systems using the above treatment or any combination and serving over 10,000 population.

(c) Surface Water Supply: Systems using any one or more of the above treatments and serving less than 10,000 population.

(d) Ground Water Supply: Systems using any one or more of the above treatments and serving less than 10,000 population.

K. GRADE OF CERTIFICATE FOR WATER WORKS OPERATORS AND QUALIFICATIONS REQUIRED FOR EXAMINATIONS

1. General.

Four grades of certificates, (A, B, C, and D) are indicated in this plan.

Certain qualifications are necessary for the successful, efficient, and economical operation of water works systems. The Grade certificate issued will depend upon the relative amount of skill, training, education, experience and character demonstrated by the applicant to successfully operate a water works system or integral parts of such systems.

Any operator may voluntarily apply for an examination for a specific grade of certificate; this application shall be referred to the Examining Committee to determine that certain requirements as to training and experience (listed below under Class A, B, C, and D) have been met. The Examining Committee shall give careful consideration to the competency of each applicant and may at its discretion accept any applicant for examination when, in its judgement, the applicant has had sufficient training and experience not specifically required in any of the grades as outlined in this plan.

Natural ability and practical education are frequently as important as specialized knowledge and shall be given careful consideration.

Applicants in all classifications shall meet the following general requirements:

1. Be in satisfactory health and physically capable to operate water works systems.

2. Be able to recognize hazards which might endanger public health of a community.

3. Good moral character and integrity.

4. Submit evidence of successful experience in water works operation or management.

Class A Certificate:

1. All applicants shall meet the following requirements:

(a) Submit satisfactory evidence of responsible and/or successful operation or management of water works systems including production, treatment control, distribution, or administration.

(b) Possess the following educational and experience requirements:

1. A degree from a recognized college (1) in an appropriate branch of engineering, or (2) a BS degree in chemistry, bacteriology, sanitary science, or public health; and three years in responsible charge and/or operation of water works systems.

2. Four years college and four years of responsible charge and/or operation of water works systems.

3. Two years of college and five years of responsible charge and/or operation of water works systems.

4. High school education and seven years of responsible charge and/or operation of water works systems.

(c) Any combination of education, training, or experience, which in the opinion of the Examining Board is the equivalent of the above.

2. All applicants must satisfactorily pass examinations as given by the Examining Board.

Class C Certificate:

1. All applicants shall meet the following requirements:

(a) Submit satisfactory evidence of responsible and/or successful experience in water works operation or management.

(b) Educational and experience requirements:

1. High school education and four years experience in water works operation or three years experience in responsible charge and/or operation of water works systems.

2. Grammer school education and six years experience in water works operation.

(c) Any combination of education, training, or experience, which in the opinion of the Examining Board, is the equivalent of the above.

2. All applicants must satisfactorily pass an examination as given by the Examining Board.

Class D Certificate:

1. All applicants shall meet the following requirements:

(a) Submit satisfactory evidence of successful experience in water works operation.

(b) Educational and experience requirements:

1. High school education (two years, or more) and one year acceptable water works experience.

2. Grammer school graduate and two years acceptable water works experience.

(c) Any combination of education, training, or experience, which in the opinion of the Examining Board, is the equivalent of the above.

2. All applicants must satisfactorily pass an examination as given by the Examining Board.

APPENDIX E

ANALYTICAL RESULTS

TABLE I

SUMMATION OF CHEMICAL AND PHYSICAL TEST RESULTS

Water Supply	Turbidity (5SU)*	Color (15SU)*	Total Dissolved Solids (500)*	Chloride (250)*	Sulfate (250)*	Nitrate (45)*	Barium (1.0)*	MBAS (0.5)*	Arsenic (0.01)* (0.05)**	Selenium (0.01)**	Boron [1] (1.0)* (5.0)**	Cyanide (0.01)* (0.2)**	Specific Conductance	pH	Chromium (Total) (.05)**	Silver (0.05)**	Copper (1.0)*	Manganese (0.05)*	Lead (0.05)**	Iron (0.3)*	Cobalt	Cadmium (0.01)**	Zinc (5.0)*	Nickel	Mercury
Abilene	0 23	<5	572.0	13.9	114.0	53.1	.20	0 033	<.0005	<.0005	0.218	0.000	800	7.6	.006	.000	.009	.000	.000	.056	.000	.000	.027	000	<.0005
Arkansas City	0.57	<5	1077.5	270.0	159.0	2.1	0.10	0.057	<.005	<.005	0.123	0 000	1580	7.4	.000	.000	011	.60	.000	.018	005	.000	009	000	< 0005
Atchison	0.37	5	467 5	24.0	190 0	1.8	0.07	0 030	<.005	<.005	0.234	0.000	705	7.8	000	.000	.11	.009	.000	027	.000	.000	098	.000	< 0005
Atlanta	1 00	<5	358.5	9.0	15.5	11 1	<.05	0.035	<.005	<.005	<0.1	0.000	540	7.3	.000	.000	.005	000	.000	.036	.000	.000	.040	.000	<.0005
Augusta	4.0	8	289.0	23.5	35.5	2.3	0.1	0.039	<.005	< 005	<0.1	0.000	390	7.9	.000	.000	.005	.000	.000	.055	.000	000	.007	000	< 0005
Beverly	0.27	<5	757.0	16.0	138 0	4.5	.17	0 048	<.005	<.005	0.350	0.000	1000	7.6	.006	.000	009	.23	.000	19	.008	000	19	.013	<.0005
Bogue	0.27	<5	650.5	34.0	174.0	39.5	<.05	0.039	<.005	.006	0 185	0.000	1100	7.6	.000	.000	.84	.000	.000	.003	000	000	.12	.000	<.0005
Bucklin	0.15	<5	405 0	25.0	20.0	19 5	.24	0.025	<.005	< 005	<.1	0.000	570	7 6	.000	.000	.034	.004	.000	.022	.000	000	.028	000	<.0005
Chanute	0.67	<5	200 2	12.0	53.0	2.4	<.05	0.048	<.005	<.005	0.100	0.000	292	7.4	.000	.000	.000	.000	.000	.000	.000	000	.040	000	<.0005
Columbus	0 57	<5	603 0	38.0	76.0	1.3	12	0.031	<.005	<.005	0.595	0 000	1020	7.6	.006	.000	1.3	.003	.060	.14	.000	.004	1.25	013	<.0005
Copeland	0 11	<5	233.5	10 0	13.5	16.6	.20	0 021	<.005	<.005	<.1	0.000	350	7.7	.000	.000	.025	.004	.000	.029	.000	.000	.025	.000	<.0005
Dodge City	0 35	<5	340.5	11.5	59.0	16.6	.08	0.025	<.005	< 005	0 111	0.000	490	7.6	.000	.000	.031	.000	.057	.057	.006	.000	.034	000	<.0005
Douglass	0.17	<5	557.0	19.0	73.5	15.1	.02	0 032	<.005	< 005	0.117	0 000	736	7.3	.000	.000	.005	.000	.000	.012	.000	.000	.000	000	< 0005
El Dorado	7 9	8	214.0	8.0	43.5	2 3	< 05	0 040	< 005	< 005	<0.1	0 000	295	7.4	.000	.000	.000	.000	.000	.055	000	000	.002	.000	<.0005
Ellsworth	0 15	<5	425.5	19 0	113 0	7.1	<.05	0.033	<.005	< 005	0.168	0 000	642	7 8	006	.000	.009	.010	.000	.062	.000	000	.025	000	<.0005
Garden City	0 10	<5	261 5	5 3	44.0	8 9	.06	0 040	<.005	<.005	<0 1	0.000	380	7.7	.000	.000	.016	.000	.000	.029	.000	000	011	.000	< 0005
Gardner	0.33	<5	221.5	9 0	36 5	0 7	<.05	060	<.005	<.005	0 107	0.000	300	7.6	.000	.000	.000	000	.000	.000	.000	000	016	.000	< 0005
Great Bend	0.23	<5	1008.5	23 8	375.0	2.2	.1	0.048	< 005	<.005	0.167	0.000	1470	7.6	.000	.000	.13	.060	.000	.062	.000	.000	.072	.000	<.0005
Greensburg	11 0	15	340.5	15.0	22.8	18.6	.34	0.023	<.005	<.005	<0.1	0.000	510	7.4	.000	.000	.32	.000	.000	.043	.000	.000	.095	.000	< 0005
Hays	0.17	<5	663.5	30.0	266.0	0.6	< 05	0 039	<.005	<.005	0.169	0.000	984	8.4	.000	.000	.017	.000	.000	.090	.000	000	003	000	<.0005
Hill City	0.42	<5	622 0	28.0	209.0	<0.1	.2	0 044	.015	<.005	0.152	0.000	1100	7.5	.000	.000	031	043	.000	1.68	.012	000	.11	.000	< 0005
Holton	0.50	<5	382 5	36.0	74.0	1.7	.08	0.016	<.005	<.005	0.179	0.000	625	8.1	.000	.000	.011	.056	.000	.042	.000	.000	.10	.000	<.0005
Independence	0 34	<5	309 0	19.0	61 0	<0 1	< 05	0 035	< 005	<.005	.101	0.000	530	7 9	.006	000	.033	000	.000	.020	.000	000	036	000	< 0005
Iola	.73	<5	192.0	12.5	53.0	2 3	< 05	0 044	< 005	< 005	0.113	0.000	285	7 6	.000	000	.011	000	000	008	.000	000	.069	.000	<.0005
Jewell	0 23	<5	948 5	10.8	218.0	11 1	.20	0 044	<.005	<.005	.292	0.000	1240	7.7	.006	.005	.005	.003	040	020	008	000	.030	.013	<.0005
Junction City	0.07	<5	217.0	13.5	65.0	6 7	07	0.035	<.005	< 005	- -	0.000	334	7 6	006	.000	.009	.000	.000	.050	.000	.000	.039	.000	< 0005

* Recommended Limit ** Mandatory Limit All values are milligrams per liter unless otherwise noted 1 Not included in 1962 DWS

TABLE I (Continued)

SUMMATION OF CHEMICAL AND PHYSICAL TEST RESULTS

Water Supply	Turbidity (5SU)*	Color (15SU)*	Total Dissolved Solids (500)*	Chloride (250)*	Sulfate (250)*	Nitrate (45)*	Barium (1.0)*	MBAS (0.5)*	Arsenic (0.01)* (0.05)**	Selenium (0.01)**	Boron (1.0)* (5.0)**	Cyanide (0.01)* (0.2)**	Specific Conductance	pH	Chromium (Total) (.05)**	Silver (0.05)**	Copper (1.0)*	Manganese (0.05)*	Lead (0.05)**	Iron (0.3)*	Cobalt	Cadmium (0.01)**	Zinc (5.0)*	Nickel	Mercury
Kingman	0 17	<5	286.5	17.0	19.4	41.5	0 5	0.032	<.005	<.005	<0.1	0.000	323	7.1	000	.000	.057	.000	.000	.018	.000	.000	.000	.000	<.0005
Kinsley	0.18	<5	204.0	5.0	19.2	21.2	.30	0.026	<.005	<.005	<0.1	0.000	283	7.8	.000	.000	.034	.000	.000	.022	.000	.000	.019	.000	<.0005
Leavenworth	0.15	<5	358.0	22.9	186.0	1.4	<.05	0.018	<.005	<.005	0.189	0.000	500	7.6	.000	.000	.031	.000	.000	.027	.000	.000	.12	.000	<.0005
Lyons	0.07	<5	531.0	17.8	68.0	6 2	.13	0 040	<.005	<.005	0.174	0.000	785	7.8	.006	.000	.000	.003	.000	.009	.000	.000	.051	.000	<.0005
Moran	0 73	<5	304.6	12.0	68.5	1.3	<.05	0.044	<.005	<.005	<0.1	0.000	422	7.6	.000	.000	.000	.000	.000	.003	.000	.000	.028	.000	<.0005
Norton	0.32	<5	358 0	21.9	73.0	0.8	.2	0.012	<.005	< 005	0.179	0.000	611	7.6	.000	.000	.016	.008	.000	.018	.000	.000	.063	.000	<.0005
Oswego	0 47	<5	340 5	9.0	43.0	2.4	.12	0.039	<.005	<.005	.101	0.000	486	8.0	.000	000	.009	.000	000	.004	.000	.000	000	.006	< 0005
Pittsburg	0.32	<5	367.5	33.0	83.0	0 2	<.05	0.031	<.005	<.005	.228	0.000	605	7.8	.000	.000	.025	.000	.000	.14	.000	.000	.022	.000	<.0005
Pratt	0.32	<5	409.5	30 0	34.5	27.5	.19	0.023	<.005	<.005	0.115	0.000	635	7.5	.000	.008	.13	.000	.000	.034	.006	.000	015	.000	<.0005
Salina	0 13	<5	597 0	139.0	142.0	0 4	<.05	0 044	- -	~ -	0.118	0.000	1160	7.4	.000	006	.013	.000	.020	.039	.000	.000	.024	000	<.0005
Topeka	0.46	<5	360.9	35.5	94.0	0.7	<.05	0.053	<.005	<.005	0.144	0.000	590	7.5	.006	.000	.009	.006	.000	.020	.000	.000	.005	.000	< 0005
Wamego	0.22	<5	578.5	12.0	137.0	15.1	.1	0.035	<.005	<.005	0.250	0.000	835	7.2	.000	.000	.040	.028	.000	.084	000	.000	.080	.010	<.0005
Westmoreland	0.34	<5	436.0	7.0	59.0	2 1	.21	0.057	<.005	<.005	0.143	0.000	1500	7.8	.000	.000	.064	.065	.000	.031	000	000	.067	.006	<.0005
Wichita	0.67	<5	375.0	98.0	69.0	1.8	.07	0.039	<.005	<.005	- - -	0.000	700	7.5	.000	.000	.000	.004	.000	.16	.000	.000	.086	.000	<.0005

* Recommended Limit ** Mandatory Limit All values are milligrams per liter unless otherwise noted 1 Not included in 1962 DWS

APPENDIX E

TABLE II

RESULTS OF PESTICIDE ANALYSES

Water Supply	Pesticide / Limit	Aldrin 10	Lindane 100	Chlordane 10	DDD	DDE	DDT(p,p') 100	Dieldrin 10	Endrin 3	Heptachlor 20	Heptachlor-epoxide 20	Methoxychlor 500	Toxaphene 100
Atchison		*	*	*	*	*	*	<0.1	*	*	*	*	*
Augusta		*	*	X	*	*	*	*	*	<0.1	*	*	*
Chanute		*	*	X	*	*	<0.1	*	*	<0.1	*	*	*
Gardner		*	*	X	*	*	*	*	*	*	*	*	*
El Dorado		*	*	*	*	*	*	*	*	*	*	*	*
Independence		*	*	<0.1	*	*	*	*	*	<0.1	*	*	*
Iola		*	*	X	*	*	*	*	*	<0.1	*	*	*
Jewell		-	-	-	-	-	-	-	-	-	-	-	-
Leavenworth		*	*	*	*	*	*	<0.1	*	*	*	*	*
Moran		*	*	X	*	*	*	*	*	<0.1	*	*	*
Norton		*	*	X	*	*	*	*	*	<0.1	*	*	*
Oswego		*	*	<0.1	*	*	*	*	*	<0.1	*	*	*
Salina		-	-	-	-	-	-	-	-	-	-	-	-
Topeka		*	*	<0.1	*	*	*	*	*	<0.1	*	*	*
Wichita		*	*	*	*	*	*	*	*	*	*	*	*

Amounts in parts per billion.

* None found.

X While chlordane was detected in a very low concentration, it is not reported because of a minor laboratory contamination problem.

TABLE III

WATER SYSTEMS WHICH FAILED TO MEET THE DRINKING WATER STANDARDS

	Recommended										Mandatory			
WATER SYSTEM SURVEYED	Arsenic	Chloride	Color	Iron	Manganese	Nitrate	Sulfate	TDS	Turbidity	Zinc	Coliform	Fluoride	Lead	Selenium
Hi Quality Lo Cost #27 at Dover								x						x
Stuckey's Restaurant at Vera Road				x	x			x						
Triplett Standard At K-30											x			
Nickerson Farms at K-138								x						
Heighert Fina at K-138	x			x	x			x						
Safety Rest Area 1-5506				x	x		x	x						
Safety Rest Area 1-5507				x				x	x					
Safety Rest Area 2-1511				x				x						
Safety Rest Area 2-1512				x				x						
Safety Rest Area 2-1513				x				x	x				x	
Safety Rest Area 2-1514				x										
Safety Rest Area 2-4506			x	x	x		x	x	x					
Safety Rest Area 2-4507				x	x		x	x	x					
Safety Rest Area 3-3512				x							x		x	
Stuckey's - Texaco at Toulon Rd.						x		x						
Trapp Mobil Service at K-255								x						
Hornes - DX at Walker Rd.								x			x			
Hi Quality Lo Cost at Pioneer Rd.		x						x			x	x		

TABLE III (Con't)

WATER SYSTEM SURVEYED	Recommended										Mandatory			
	Arsenic	Chloride	Color	Iron	Manganese	Nitrate	Sulfate	TDS	Turbidity	Zinc	Coliform	Fluoride	Lead	Selenium
Vickers Service Station (Bunker Hill Water System)					x			x						
Co-op Service Station (Dorrance Water System)								x						
Luthi Fina at K-206								x			x			
D & V Texaco at K-206								x						
Hi Quality Lo Cost #30 at McDowell								x						
Triplett Standard & Fina at K-177							x	x			x		x	
Stratz Texaco & Trail House Restaurant at K-177				x										
Phillips 66 Service at K-177				x			x	x					x	
Haynes Mobil at Chapman								x						
Deep Rock Service at K-99								x			x			
Triplett Standard at K-99					x									
Lantz Conoco-Restaurant at K-232								x			x			
Olenjnczak Texaco at K-232						x		x						
Deep Rock Service at K-232					x									
Miller Mobil at K-14							x	x			x			
Nelson Mobil at Brookville				x	x		x	x						
Hi Quality Low Cost at Brookville				x	x		x	x						

Adequacy of The Water Fluoridation
Control Program in Kansas

APPENDIX F

An Evaluation of Water Fluoridation
At Selected Water Supply Systems
In the State of Kansas

FINAL DRAFT

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Environmental Protection Agency

Kansas Water Supply Program Evaluation

Adequacy of the Water Fluoridation Control Program in Kansas

Introduction

The control of the fluoride ion level in the public water supplies in Kansas to within an optimum range of 0.8-1.2 mg/l is recommended by the State Department of Health as an important public health measure for the prevention of tooth decay. The Division of Environmental Health Services of the State Department of Health is responsible for approval and surveillance of public water supplies in Kansas including all fluoridation installations. A "Statement of Policies and Procedures Relating to Fluoridation of Public Water Supplies" has been established by the Health Department for approval of fluoridation installations in Kansas and includes general principles to be used by personnel of the Environmental Health Services for the promotion and administration of the fluoridation program. There is no State law in Kansas requiring the fluoridation of public water supplies, however, pending legislation, House Bill No. 1289, would require that, "all public water supplies serving more than five hundred (500) people shall be provided fluoride adjustment by July 1, 1973 . . . ".

On April 1, 1972, forty-four public water supply systems practiced fluoridation in the State of Kansas serving a population of approximately 900,000. An estimated 140,000 of the 1.8 million population in the State

on public water systems were supplied water containing natural fluorides of 0.7 mg/1 or higher. 1/ Six communities, (Crawford RWD #2, Dighton, Lane RWD #1, Liebenthal, Melvern and Susank) were reported using one or more water sources containing natural fluorides greater than 2.0 mg/1 fluoride. 2/

Evaluation Procedure

To evaluate the adequacy of the Kansas State Department of Health's water fluoridation control program, twelve fluoridated water supply systems were selected for survey. The choice of the twelve systems representative of the forty-four fluoridation installations in Kansas was based on geographical location, population served, source of water supply (ground or surface water), and fluoride compound used in fluoridation. Two fluoridated water supply systems were chosen in each of the six Environmental Health Service Districts in the State to give representative geographical coverage. Selection based on the other parameters noted was so the sample would have the same approximate percentage of supplies meeting each parameter as occurred for all forty-four water supply systems fluoridating in the State (i.e. thirty percent of the forty-four installations were feeding fluosilicic acid as a

1/ Source - Environmental Health Services, Kansas State Department of Health

2/ Natural Fluroide Content of Community Water Supplies, 1969, U.S. Department of Health, Education & Welfare, Public Health Service.

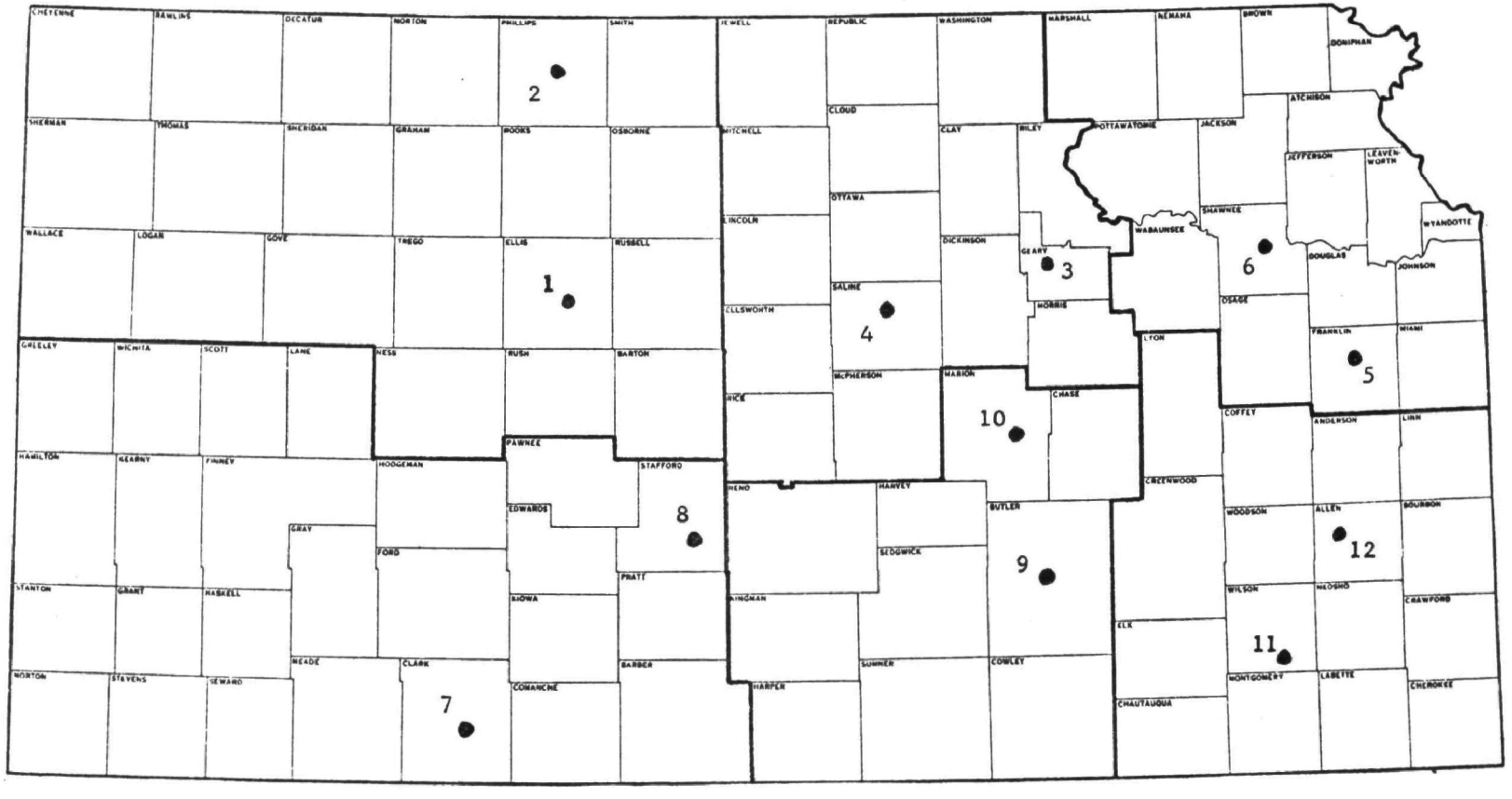
source of fluoride ion; therefore, thirty percent or four of the twelve surveyed installations were feeding fluosilicic acid). Figure 1, Fluoridated Water Supply Systems Selected For Study, locates the twelve installations visited and Table I summarizes pertinent information on each facility.

The survey of the twelve representative fluoridation installations included a field inspection visit to the facility (the State notified the operators of the visit in advance), completion of a survey form 3/, and collection of water samples for fluoride ion analysis. Each installation was examined with respect to: fluoride ion content in the distribution system; analytical control of the fluoride ion level; fluoride chemical feed equipment and facilities; fluoride chemical compound - storage and handling; operator training and interest; and, surveillance.

The actual level of fluoride ion in the distribution system is the single most important factor in evaluating the adequacy of a community water fluoridation effort and hence in evaluation of the State program responsible for approval and surveillance of the installation. However, as distribution samples collected on one particular day may not give a true picture of day-to-day operating conditions, the installations were also evaluated with respect to the following:

3/ A copy of the questionnaire used in the Kansas Fluoridation Survey is appended.

KANSAS WATER SUPPLY PROGRAM EVALUATION
Figure 1
FLUORIDATED WATER SUPPLY SYSTEMS SELECTED FOR STUDY



Northwest District

1 - Hays
2 - Phillipsburg

Southwest District

7 - Ashland
8 - Stafford

North Central District

3 - Junction City
4 - Salina

South Central District

9 - El Dorado
10 - Marion

Northeast District

5 - Ottawa
6 - Topeka

Southeast District

11 - Neodesha
12 - Iola

KANSAS WATER SUPPLY PROGRAM EVALUATION
TABLE I
FLUORIDATED WATER SUPPLY SYSTEMS SELECTED FOR STUDY

Water Supply System	Location (County)	Date of Fluoridation	Population Served	Source of Supply	Avg. Flow (MGD) 1/	Fluoride Compound	Type of Feeder	Analysis Method	Test Equipment
Northwest District									
Hays *	Ellis	8/52	15,396	10-Wells	1.80	VS	V-1	S	T-3
Phillipsburg	Phillips	4/61	3,750	22-Wells	0.85	VA	P-1	SS	T-1
North Central District									
Junction City *	Geary	1/52	18,820	8-Wells	1.90	VS	V-2	SS	T-1
Salina *	Saline	8/69	37,095	Smoky River & 15-Wells	5.5	VS	V-3	E	T-4
Northeast District									
Ottawa	Franklin	9/46	11,150	Marais Des Cygnes R.	1.57	VT	G	SS	T-1
Topeka	Shawnee	8/57	123,043	Kansas River	17.0	VS	G-1	E	T-5
Southwest District									
Ashland	Clark	9/65	1,400	3-Wells	0.30			SS	T-1
Well #1						VA	P-3		
Well #4						VA	P-3		
Well #5						VA	P-3		
Stafford	Stafford	7/62	1,835	3-Wells	0.6 W			SS	T-1
Well #1					1.0 S	VA	P-4		
Well #4						VA	P-4		
South Central District									
El Dorado	Butler	9/52	12,308	Blue Stem Lake	1.2 W 1.8 S	VS	V-2	SS	T-1
Marion	Marion	12/58	2,225	Mud Creek	0.23 W 0.50 S	VT	V-3	SS	T-1
Southeast District									
Neodesha	Wilson	7/69	4,150	Fall River	0.59	VS	PS-1	SS	T-2
Iola	Allen	12/52	6,493	Neosho River	0.09 W 1.4 S	VA	P-2	SS	T-1

* Representative Attended Fluoride Determinations in Water Training Course

1/ W-Winter; S-Summer

Fluoride Compound
- VA - Fluosilicic Acid
- VS - Sodium Silicofluoride
- VT - Sodium Fluoride

Analysis Method
- E - Electrode
- S - Spadns
- SS - Scott-Sanchis

Test Equipment
- T-1 Color Comparator - Hellige Aqua Tester
- T-2 Color Comparator - Taylor Water Analyzer
- T-3 Photometer - Hach DR
- T-4 Specific Ion Meter - Orion #401, Orion Electrodes
- T-5 Expanded Scale pH Meter - Beckman Expandomatic, Orion Electrodes

Type of Feeder
- V-1 Volumetric - W&T A-690 Screw Type
- V-2 Volumetric - W&T A-378 Roll Type
- V-3 Volumetric - BIF 50-A Rotating Disk
- G Gravity - Constant Head
- G-1 Gravimetric - BIF D-LIW Loss-in-Weight
- P-1 Diaphram Pump - W&T A-747 Metering Pump
- P-2 Diaphram Pump - W&T A-417 Type HEMP
- P-3 Diaphram Pump - Precision S-801 Metering Pump
- P-4 Diaphram Pump - Precision S-811 Metering Pump
- PS-1 Diaphram Pump - W&T A-747, W&T Saturator

I. Analytical Control of the Fluoride Ion Level

A. Were the fluoride ion analyses conducted at the water plant accurate within $\pm$ 0.1 mg/l of the value determined by the EPA Water Supply Division?

B. Were finished water samples analyzed daily or more frequently for fluoride ion content?

C. Were raw water samples analyzed regularly for fluoride ion content?

D. Were laboratory equipment and facilities at the water plant adequate to conduct fluoride ion analysis according to one of the three standard methods?

E. Was laboratory equipment clean and given responsible care?

F. Were complete records kept of the fluoridation operation?

II. Fluoride Chemical Feed Equipment and Facilities

A. Were the fluoride feed equipment and facilities adequate to control the fluoride ion level in the finished water?

B. Was positive protection provided against overfeeding? Was equipment location and point of fluoride chemical application at the best practical site? Was backflow protection provided? Was the feed equipment site uncluttered?

C. Was the fluoride chemical feed installation operated continuously for the past twelve months without an interruption of more than one day?

D. Were the fluoride chemical feed equipment and facilities maintained satisfactorily?

III. Fluoride Chemical Compound - Storage and Handling

A. Was the fluoride chemical compound stored in a safe, protected and orderly manner?

B. Was safety equipment available and were safe procedures followed in handling the fluoride chemical compound?

C. Were fluoride chemical shipping containers disposed of satisfactorily or re-used only for fluoride chemical storage?

IV. Operator Training and Interest

A. Was the treatment plant operator well-trained to operate the fluoride chemical feed equipment and facilities?

B. Was the individual conducting the fluoride ion analyses knowledgeable of his test equipment and standard procedures for analysis?

C. Was the water plant official interviewed in favor of fluoridation and was he interested in adding fluorides to public water supply systems?

V. Surveillance

A. Were check samples for fluoride ion analysis submitted to the state as required?

B. Had the water fluoridation installation surveyed been inspected in the past twelve months by a representative of the state water supply program surveillance agency?

Summary of Findings

Data collected on the water supply systems fluoridating in the State of Kansas indicated nine (75 percent) of the twelve installations selected for investigation evidenced a fluoride ion content in the distribution system at the time of the survey within the 0.8 - 1.2 mg/l range recommended by the State Department of Health. Three (25 percent) of the facilities were underfeeding, i.e. the fluoride ion level in the samples collected from the distribution system were less than 0.8 mg/l. Water samples collected from one system (Ashland) were both below and above the recommended fluoride ion level. Table II, Analysis of Samples From Fluoridated Water Supply Systems, tabulates the fluoride ion analysis of the water samples collected at each facility surveyed 4/.

The operating conditions observed during the time of the survey of the twelve fluoridation installations inspected are summarized as follows:

I. Analytical Control of the Fluoride Ion Level

Practices to analytically test and control the fluoride ion level in the distribution systems varied considerably. Only seven (58 percent) of the plant operators or laboratory personnel conducted fluoride analysis within $\pm$ 0.1 mg/l of the duplicate sample analysis performed by the EPA, Water Supply Division. Daily finished water fluoride ion analysis, required by the State Department of Health,

4/ Water samples were analyzed for fluoride ion content by the Water Supply Division, Environmental Protection Agency, Washington, D. C. using the Electrode Method.

KANSAS WATER SUPPLY PROGRAM EVALUATION
TABLE II
ANALYSIS OF SAMPLES FROM SELECTED FLUORIDATED WATER SUPPLY SYSTEMS

Water Supply System	Date of Sample	Raw Water	Check Sample (Operator)	Check Sample (EPA)	(Fluoride, mg/l) Distribution System	
Northwest District						
Hays *	4/13	0.55	1.12	0.59	0.61	0.63
Phillipsburg	4/13	0.39	0.6	0.37	0.86	0.87
North Central District						
Junction City *	4/11	0.36	1.4	1.00	0.79	0.84
						0.93
Salina *	4/12	0.37	0.89	0.92	0.90	0.90
					0.92	0.93
Northeast District						
Ottawa	4/10	0.22	1.1	1.02	1.00	1.02
Topeka	4/11	0.33	1.10	1.02	0.79	0.83
					0.84	0.85
Southwest District						
Ashland	5/16		1.2	1.27 **	1.32	
Well #1		0.46			1.43	
Well #4		0.39			0.56	
Well #5		0.56				
Stafford	5/16		1.2	1.17	1.10	1.15
Well #1		0.40			1.17	
Well #4		0.37			1.13	
South Central District						
El Dorado	5/17	0.18	1.1	0.97	0.97	1.00
Marion	5/17	0.80	1.0	1.07	0.97	1.07
Southeast District						
Neodesha	5/18	0.26	1.6	0.75	0.75	0.75
Iola	5/18	0.21	1.1	1.02	1.01	1.01

* Representative Attended Fluoride Determinations in Water Training Course

** Check Sample Collected June 12 - 16.

was conducted at only seven (58 percent) of the installations and regular raw water fluoride ion analysis was being conducted at only three (25 percent). Adequate analytical equipment and facilities were available, and care of equipment was judged satisfactory at seven (58 percent) of the plants visited. Records of the fluoridation operation were acceptable at only four (33 percent) of the facilities surveyed.

II. Fluoride Chemical Feed Equipment and Facilities

Fluoride chemical feed equipment and facilities were found deficient at four (33 percent) of the twelve installations surveyed and only four (33 percent) of the feeding arrangements were acceptable, i.e. protected against overfeeding, preferred point of chemical application, protected against backflow, and good housekeeping in the feeder area. Five (42 percent) of the operators reported one or more interruptions in fluoridation of one or more days duration in the past twelve months. Maintenance was found satisfactory at eleven (92 percent) of the facilities surveyed, however, the plant operators had been alerted to the inspection visit.

III. Fluoride Chemical Compound - Storage and Handling

Storage arrangements for the fluoride chemical compound fed were unsatisfactory at five (42 percent) of the twelve installations surveyed. Seven (58 percent) of the operators interviewed did not have available suitable safety equipment to handle the fluoride

chemical compounds; and two (17 percent) of the operators were permitting unsafe reuse of the chemical shipping containers or were not disposing of the empty containers satisfactorily.

IV. Operator Training and Interest

A trained operator with a genuine interest in feeding fluorides is essential to the satisfactory operation of a fluoridation installation. Three (25 percent) of the facilities surveyed were operated by personnel not completely familar with the fluoride chemical feed equipment at their plants. Three (25 percent) of the operators questioned were not adequately trained in the use of the fluoride ion test equipment provided and the procedures to follow in conducting a fluoride ion analyses. The operators at three (25 percent) of the plants visited did not favor feeding fluoride to public water supply systems.

V. Surveillance

Frequent check samples of fluoride ion levels in the distribution system and regular inspection visiits to the water fluoridation installation by State water supply surveillance personnel must be conducted to assure the facility is operating satisfactorily. The State Department of Health requires four water samples per month to be collected from the distribution system of fluoridated water supplies and submitted to the State Laboratory for fluoride ion analysis. A review of State Laboratory records for 1971 revealed the required number of check samples had not been received from three (25 percent) of the installations selected for survey. Only

three (25 percent) of the twelve plants had been visited in the past twelve months by a representative of the State Department of Health's water supply surveillance agency. Inspection visits to the water supply systems surveyed averaged one visit in four years.

Figure 2, Operating Conditions At Selected Fluoridated Water Supply Systems, summarizes the operating conditions observed at the installations inspected during the time of the survey. Conditions varied at each facility and Table III, Adequacy of Fluoridation At Selected Fluoridated Water Supply Systems, summarizes the adequacy of the operating conditions at each facility during the time of the survey.

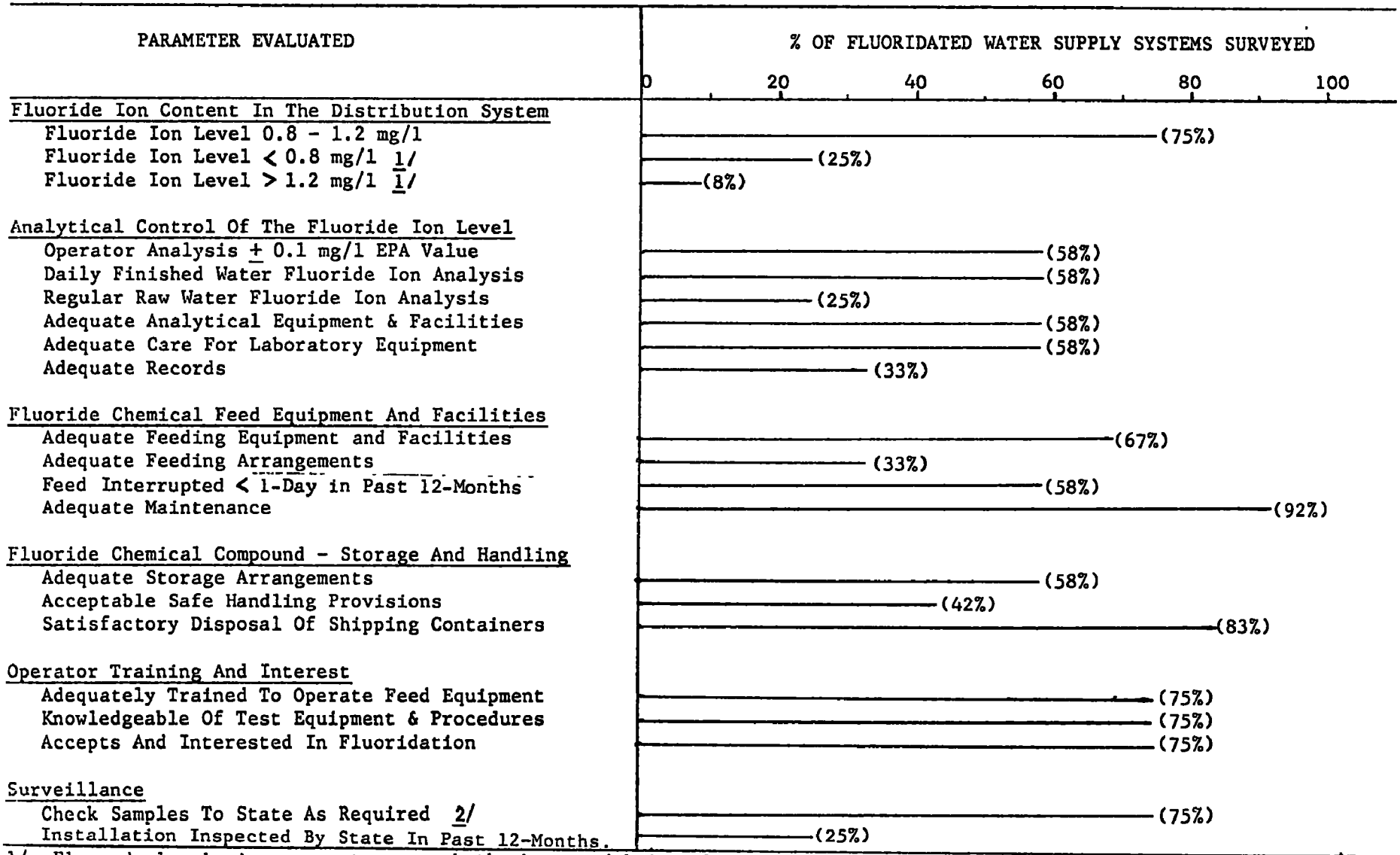
Conclusions and Recommendations

1. Forty-four public water supply systems in Kansas were fluoridating April 1, 1972, serving approximately 900,000 of an estimated 1.8 million population in the State using public water supply systems. An additional 140,000 population were using public water supplies containing natural fluorides of 0.7 mg/l or higher. Therefore, only 58% of the population served by public water supply systems are being supplied or an attempt is being made to supply them with water containing dentally significant concentrations of fluorides.

Recommendation

The Kansas State Department of Health should more actively promote fluoridation in Kansas. A concentrated effort should be made to provide the benefits of fluoridated water to the population (42%) served by public water supplies which are not fluoridated or do

KANSAS WATER SUPPLY PROGRAM EVALUATION
FIGURE 2
OPERATING CONDITIONS AT SELECTED FLUORIDATED WATER SUPPLY SYSTEMS



1/ Fluoride levels in one system were both above and below the recommended limit
2/ Per 1971 State Department of Health Records - 4 Per Month

KANSAS WATER SUPPLY PROGRAM EVALUATION
TABLE III
ADEQUACY OF FLUORIDATION AT SELECTED WATER SUPPLY SYSTEMS

PARAMETER EVALUATED	Hays *	Phillipsburg	Junction City *	Salina *	Ottawa	Topeka	Ashland	Stafford	El Dorado	Marion	Neodesha	Iola
Fluoride Ion Content In The Distribution System												
Fluoride Ion Level 0.8 - 1.2 mg/l		X	X	X	X	X		X	X	X		X
Fluoride Ion Level < 0.8 mg/l	X						X				X	
Fluoride Ion Level > 1.2 mg/l							X					
Analytical Control Of The Fluoride Ion Level												
Operator Analysis ± 0.1 mg/l EPA Value				X	X	X	X	X		X		X
Daily Finished Water Fluoride Ion Analysis	X		X	X		X			X		X	X
Regular Raw Water Fluoride Ion Analysis				X		X						X
Adequate Analytical Equipment & Facilities	X		X	X	X	X			X	X		
Adequate Care For Laboratory Equipment	X		X	X		X			X		X	X
Adequate Records				X		X			X			X
Fluoride Chemical Feed Equipment And Facilities												
Adequate Feeding Equipment and Facilities	X	X		X		X	X	X	X			X
Adequate Feeding Arrangements				X		X			X			X
Feed Interrupted < 1-Day in Past 12-Months	X			X	X		X	X		X	X	
Adequate Maintenance	X	X		X	X	X	X	X	X	X	X	X
Fluoride Chemical Compound - Storage And Handling												
Adequate Storage Arrangements		X	X			X	X	X		X		X
Acceptable Safe Handling Provisions	X								X	X	X	X
Satisfactory Disposal Of Shipping Containers	X	X	X	X	X	X	X	X	X		X	
Operator Training And Interest												
Adequately Trained To Operate Feed Equipment	X	X		X	X	X	X	X			X	X
Knowledgeable Of Test Equipment & Procedures	X		X	X	X	X	X	X			X	X
Accepts And Interested In Fluoridation		X	X	X	X	X	X			X	X	X
Surveillance												
Check Samples To State As Required 1/	X	X	X	X	X	X				X	X	X
Installation Inspected By State In Past 12-Months.			/				X	X	X			

X - Satisfactory or Applicable for System Surveyed
* - Representative Attended Fluoride Determinations in Water Training Course
1/ - Per 1971 State Department of Health Records - 4 per Month

not contain dentally significant concentrations of natural fluorides. Where no community water supply system exists school water supply fluoridation in that community should be considered.

2. Six public water supply systems in Kansas were reported using one or more water sources containing natural fluorides greater than 2.0 mg/1.

Recommendations

When the natural fluoride ion level in a public water supply exceeds two times the optimum the following should be considered so the finished water will have a fluoride ion level within the limits required by the State: blending of water containing high levels of fluoride ion with a low natural fluoride water, development of an alternate source of water, or defluoridation of the water source.

3. Nine (75 percent) of the twelve fluoridated water supply systems surveyed evidenced a fluoride ion content in the distribution system within the limits required by the State Department of Health and only seven (58 percent) of the plant operators or laboratory personnel conducted fluoride ion analysis within $\pm$ 0.1 mg/1 of the sample results analyzed by the EPA, Water Supply Division. Daily finished water fluoride ion analysis was conducted at seven (58

percent) of the installations and the source of raw water was analyzed on a regular basis at only three (25 percent) of the facilities surveyed. Records of the fluoridation operation were acceptable at only four (33 percent) of the plants.

Recommendation

The Kansas State Department of Health should require the operators at all fluoridation installations to conduct fluoride ion analysis according to Standard Methods to within $\pm$ 0.1 mg/l of the value reported on the State check sample. Daily finished water fluoride ion analysis, regular raw water fluoride ion analysis, adequate laboratory equipment and care of equipment, and complete records on the fluoridation operation should be enforced at all fluoridation installations.

4. Fluoride chemical feed equipment and facilities to control the distribution system fluoride ion level to within the required range were satisfactory at eight (67 percent) of the installations surveyed. Feeding arrangements were judged adequate at only four (33 percent) of the plants visited. Five (42 percent) of the installations had one or more interruptions in the fluoridation operation of one or more days duration in the past twelve months.

Recommendation

The Kansas State Department of Health should provide design assistance to all communities installing fluoridation equipment, thoroughly review all proposed installations before the operation is approved,

and assist the operator as needed during the "start-up" period. All interruptions in the fluoridation operations should be required to be reported to the Division of Environmental Health Services of the State Department of Health. A preventative maintenance program should be established for each facility and closely followed for the installation to receive continued approval for operation.

5. Fluoride chemical storage arrangements and safety precautions for handling the compounds were judged inadequate at five (42 percent) of the installations surveyed. Seven (58 percent) of the operators did not have available suitable safety equipment to handle the fluoride chemical compounds and two (17 percent) of the operators were not disposing of the empty containers in a satisfactory manner.

   Recommendation

   The Kansas State Department of Health should instruct all water plant operators feeding fluorides on safe handling and storage practices for fluoride chemical compounds and enforce their regulations for handling and storing fluoride chemical compounds.

6. A trained operator with a genuine interest in feeding fluorides is essential to the satisfactory operation of a fluoridation installation. Training deficiencies were noted in the operators knowledge of his fluoride feed equipment and his acquaintance with the equipment and procedures used in conducting fluoride ion analysis. Three (25 percent) of the operators interviewed did not favor feeding fluorides to public water supply systems.

Recommendation

The Kansas State Department of Health should provide training in fluoride feed equipment operation and maintenance and fluoride determinations in water for the operators of all fluoridated water supply systems. The benefits of water fluoridation and the importance of maintaining an optimum level of fluoride ion in the distribution system at all times should be stressed. Satisfactory completion of the course should be a mandatory requirement of the plant operator for approval of his installation to feed fluorides.

7. Surveillance of each water fluoridation installation must be on a regular, continual basis to assure the facility is operating satisfactory. Three (25 percent) of the operators interviewed were not submitting the required number of check samples to the State laboratory for fluoride ion analysis. Nine (75 percent) of the installations had not been visited by a representative of the Division of Environmental Health Services in the past twelve months.

Recommendation

The Kansas State Department of Health should enforce their "Statement of Policies and Procedures Relating to Fluoridation of Public Water Supplies" requiring check samples to be collected from the distribution systems of fluoridated water supplies and sent to the State Department of Health Laboratory for fluoride ion analysis. All interruptions in the fluoridation operations should be investigated

by the Division of Environmental Health Services and all plants employing new operating personnel placed in charge of the fluoridation operation should be visited immediately to assure the new operator has been adequately trained. One additional full time engineer with the necessary travel funds and laboratory support is estimated to be needed for an adequate fluoridation surveillance program in Kansas.

DATE: _____

KANSAS FLUORIDATION SURVEY

Water System:

Population Served: Average Flow:

Date Fluoridation Started:

Source of Supply:

Treatment:

Fluoride Analysis:
Raw Water: Finished Water:

Fluoridation Equipment -

Manufacturer:

Type:

Model:

Location:

Point of application:

Condition of equipment:

Operational problems:

Overfeeding safeguards:

Planned Improvements:

Remarks:

Fluoride Compound -

Chemical: Cost:

Source:

Form of shipment

Storage facilities:

Quantity used:

Safety provisions:

Remarks:

Control of Fluoridation -

Frequency of sampling:
Raw water: Finished water:

Sampling point:

Test method:

Test instrument:

Records:

Interruptions:

Remarks:

Operator Qualifications -

Experience: Classification:

Training:

Interest:

Remarks:

Surveillance -

Check samples:

Last visit by State:

Availability of technical assistance:

Remarks:

Comments -

Population Using Controlled and Natural Fluoridation in Public Water Supplies in Kansas

Population using public water supplies		1,785,000 *
Population using public water supplies with Controlled Fluoridation (69 communities)		886,380
Percent of population using public water supplies with Controlled Fluoridation		49.7%
Population using public water supplies with Natural Fluoridation (85 communities)		136,315
Population using public water supplies with Natural and Controlled Fluoridation		
	(controlled) -	886,380
	(natural) -	136,315
	Total --	1,022,695
Percent of population using public water supplies with Natural and Controlled Fluoridation		57.3%
Total Population of Kansas		2,249,071 **
Percent of Population using Natural and Controlled Fluoridation		45.5%

* Source - Environmental Health Services, Kansas State Dept. of Health
** Source - Kansas State Board of Agriculture, April 1970

January 1971

SOME REASONS FOR STATE LAWS FOR FLUORIDATION

1. The dental problem is of such magnitude it cannot be solved by local action alone.

2. Dental manpower shortages affect availability and quality of dental care for all.

3. Costs of tax-supported dental care programs are increasing.

4. Public health measures should be consistently available to all persons without regard to education or income.

5. Community and water system jurisdictional boundaries frequently do not coincide.

6. Standardized surveillance and training of water treatment personnel can be exercised.

7. Denial of immediate benefits has long range effects.

    a. Generations of children cannot recover the lost benefits.
    b. Adults denied fluoridation in childhood are deprived of its life time benefits.
    c. Overall health of aged is influenced by dental health.

8. Local action can be expensive and unstable.

    a. Repeated referenda.
    b. Delaying court actions on points already answered.
    c. Reversal of Council action.
    d. Political football.
    e. Emotionalism vs. scientific facts.
    f. Abandonment of equipment.
    g. Vehicle for attack on representative government.
    h. Confusion over who has authority to fluoridate.
    i. Failure of implementing authority to act on decision by appropriate authority.

Session of 1971

HOUSE BILL No. 1289

By Messrs. Niles, Steichen, Speer, Brauchi and Hougland

2-10

AN ACT concerning public health; providing for the fluoride adjustment of certain public water supplies and for the adoption of regulations by the state board of health for administration and enforcement of the act.

Be it enacted by the Legislature of the State of Kansas:

Section 1. All public water supplies serving more than five hundred (500) people shall be provided fluoride adjustment by July 1, 1973, in accordance with rules and regulations adopted by the state board of health. Rules and regulations shall be adopted by the state board of health for the administration and enforcement of this section and said regulations shall incorporate recognized scientific public health practices.

Sec. 2. This act shall take effect and be in force from and after its publication in the statute book.

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service

National Institutes of Health

Refer: PPB-51
February 1973

ENVIRONMENTAL PROTECTION AGENCY SUPPORTS FLUORIDATION

Opponents of fluoridation frequently allege that fluoridation is pollution and may have detrimental environmental effects. In response to such allegations the U.S. Environmental Protection Agency has issued the following statement:

> Since the safety and efficacy of water fluoridation have been well established, the Environmental Protection Agency endorses the principles of such practice.
>
> The Environmental Protection Agency does not consider the adjustment of the fluoride content of drinking water for purposes of dental decay reduction to be a form of pollution. By definition, water pollution is the addition of a substance to water which makes such water unfit for its intended use. Since adjusting the natural fluoride content of drinking water to a level which is optimal for the reduction of dental decay does in no way make the water unfit for drinking, water fluoridation cannot be considered to be pollution.
>
> At the concentrations used in water fluoridation, the fluoride ion has no detrimental effects on the environment. Fluoride is a natural constituent of fresh water, soil, sea water and most living organisms, often at higher concentrations than are used in water fluoridation. A recent study on the environmental impact of fluorides, conducted by the National Research Council under contract to the Environmental Protection Agency, has confirmed that the only hazard to our environment from fluorides is from industrial discharges.

Division of Dental Health
Preventive Practices Branch
9000 Rockville Pike
Bethesda, Maryland 20014

APPENDIX G

FACILITY RATINGS

APPENDIX G

TABLE I

FACILITIES - PUBLIC WATER SYSTEMS

SYSTEM NO.	SOURCE			TREATMENT		DISTRIBUTION			QUALITY CONTROL		
	QUALITY	QUANTITY	PROTECTION	FACILITIES	OPERATION	STORAGE	PRESSURE	Cl_2 RESIDUAL	RECORDS	X-CONN.	CONTROL
1	OK	OK	OK	X	X	OK	OK	X	OK	X	X
2	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	X
3	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	X
4	OK	OK	OK	X	OK	OK	OK	OK	X	X	X
5	OK	X	OK	X	X	OK	OK	OK	OK	OK	X
6	OK	OK	OK	OK	OK	OK	OK	OK	X	X	X
7	OK	OK	OK	OK	X	OK	OK	OK	X	X	X
8	OK	OK	OK	OK	X	OK	OK	X	X	X	X
9	OK	OK	OK	X	OK	OK	OK	OK	OK	OK	X
10	OK	OK	OK	X	OK	OK	OK	X	P	OK	X
11	OK	OK	OK	OK	OK	OK	OK	OK	OK	X	X
12	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	X
13	OK	OK	OK	X	OK	OK	OK	OK	X	OK	X
14	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	X

APPENDIX G

TABLE I (Continued)

FACILITIES - PUBLIC WATER SYSTEMS

SYSTEM NO.	SOURCE			TREATMENT		DISTRIBUTION			QUALITY CONTROL		
	QUALITY	QUANTITY	PROTECTION	FACILITIES	OPERATION	STORAGE	PRESSURE	Cl_2 RESIDUAL	RECORDS	X-CONN.	CONTROL
15	OK	OK	OK	OK	OK	OK	OK	OK	OK	X	X
16	OK	OK	P	OK	OK	OK	OK	OK	OK	OK	P
17	OK	OK	P	OK	OK	P	OK	OK	OK	P	X
18	OK	OK	P	P	OK	X	OK	OK	OK	P	X
19	OK	OK	OK	OK	OK	OK	OK	OK	OK	X	X
20	OK	OK	OK	OK	OK	OK	OK	OK	OK	P	X
21	OK	OK	OK	X	X	OK	OK	X	X	P	X
22	OK	OK	P	P	P	OK	OK	OK	OK	P	X
23	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	X
24	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	X
25	OK	P	OK	P	P	OK	OK	OK	P	X	X
26	OK	OK	OK	OK	OK	OK	OK	OK	OK	P	X
27	OK	OK	OK	OK	OK	OK	OK	OK	X	OK	X
28	OK	OK	OK	OK	OK	OK	OK	OK	OK	X	X

APPENDIX G

TABLE I (Continued)

FACILITIES - PUBLIC WATER SYSTEMS

SYSTEM NO.	SOURCE			TREATMENT		DISTRIBUTION			QUALITY CONTROL		
	QUALITY	QUANTITY	PROTECTION	FACILITIES	OPERATION	STORAGE	PRESSURE	Cl_2 RESIDUAL	RECORDS	X-CONN.	CONTROL
29	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	X
30	OK	OK	OK	OK	OK	OK	OK	OK	P	OK	X
31	OK	OK	OK	X	OK	OK	OK	OK	X	OK	X
32	OK	OK	OK	OK	OK	OK	OK	OK	P	X	X
33	OK	OK	OK	X	OK	OK	OK	OK	X	X	X
34	OK	OK	OK	X	OK	OK	OK	OK	OK	OK	X
35	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	X
36	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	X
37	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	X
38	OK	OK	OK	X	X	OK	OK	X	X	OK	X
39	OK	OK	OK	OK	P	OK	OK	X	X	P	X
40	OK	OK	OK	X	OK	OK	X	OK	OK	OK	X

OK - Adequate

X - Inadequate

P - Partially