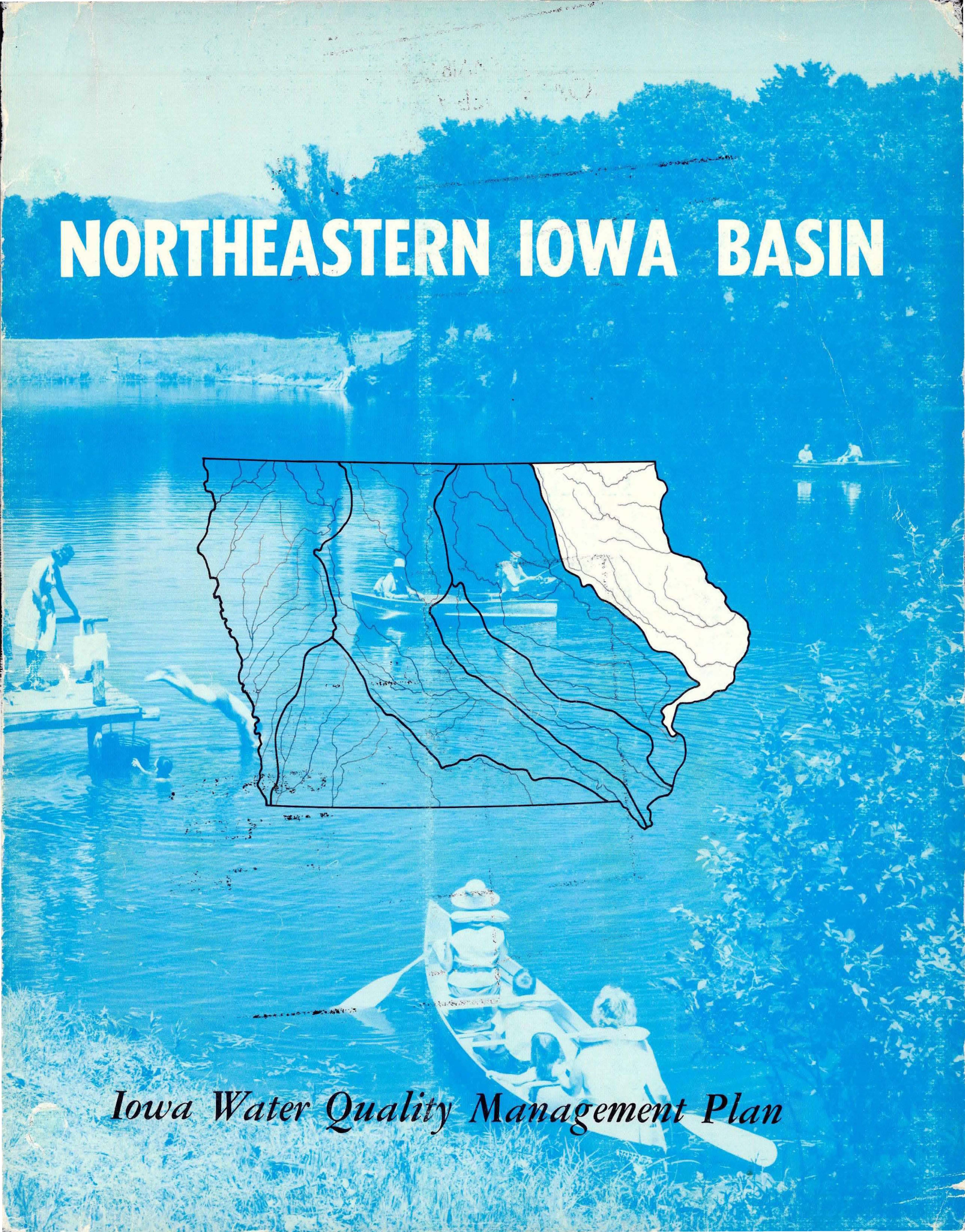
NORTHEASTERN IOWA BASIN



Iowa Water Quality Management Plan

WATER QUALITY MANAGEMENT PLAN

NORTHEASTERN IOWA BASIN

July, 1976

PLANNING AND ANALYSIS SECTION
WATER QUALITY MANAGEMENT DIVISION
IOWA DEPARTMENT OF ENVIRONMENTAL QUALITY

SCOPE

This basin plan addresses the Northeastern Iowa Basin. The basin includes the Iowa portion of the Upper Iowa and Wapsipinicon River Basins, all of the Yellow, Turkey, and Maquoketa River Basins, and intermediate areas between these river basins which drain directly to the Mississippi River through a number of minor streams (Figure 2).

The scope of this plan entails the study of the following items: (1) Water Quality Management Programs, (2) Existing Development Patterns and Basin Characteristics, (3) Existing Water Quality, (4) Inventories of all Point Sources of Wastewater Discharge, (5) Assessment of Nonpoint Pollution Sources, (6) Stream Segment Analyses and Waste Load Allocations, and (7) Assessment of Needs and Compliance Schedules. The detail of study of this document is as follows:

Chapter

I. Iowa's Water Quality Management Program

A synopsis of the basin planning process is presented along with a brief description of the DEQ's water quality management program and strategy.

II. Existing Development Patterns

Information concerning population, land use economics and recreational activities within the basin is presented.

ACKNOWLEDGMENT

Water Quality Management Plans for the State of Iowa were prepared by the Department of Environmental Quality, Water Quality Management Division, Planning and Analysis Section. We gratefully acknowledge the assistance of the many State and Federal agencies and individuals that have provided data, reviewed drafts, and helped in other ways during the formulation and preparation of this plan. We also acknowledge the work of E. A. Hickok and Associates in the compilation of this plan, and of Stanley Consultants, Inc. in the development of a portion of the preliminary waste load allocations, both under contract to the Department of Environmental Quality.

FOREWORD

Under section 455B.31, Code of Iowa, 1973, the Iowa Department of Environmental Quality (DEQ) is charged with the responsibility of protecting and maintaining surface and groundwater quality throughout the State. To assist the Department in this task, this basin plan has been prepared to coordinate and direct the State's water quality management decisions on a river basin scale.

The national goal, established in the Federal Water Pollution Control Act Amendments of 1972, (the Act), provides for water quality suitable for the protection and propagation of fish and wildlife, as well as for recreational activities in all surface waters by July 1, 1983. The Amendments define basin planning (Section 303(e)) as a key element for the determination and implementation of the necessary requirements to achieve national water quality goals.

Six major river basins, as defined by the Department of Environmental Quality, are partially located in the State of Iowa. Basin boundary lines are drawn to separate hydrological drainage areas (Figure 1). Any minor deviation from this is done only to be consistent with the boundaries of the six Iowa Conservancy Districts, as established by Chapter 457D.3 of the Code of of Iowa. This provides the most compatible use of data among different State agencies.

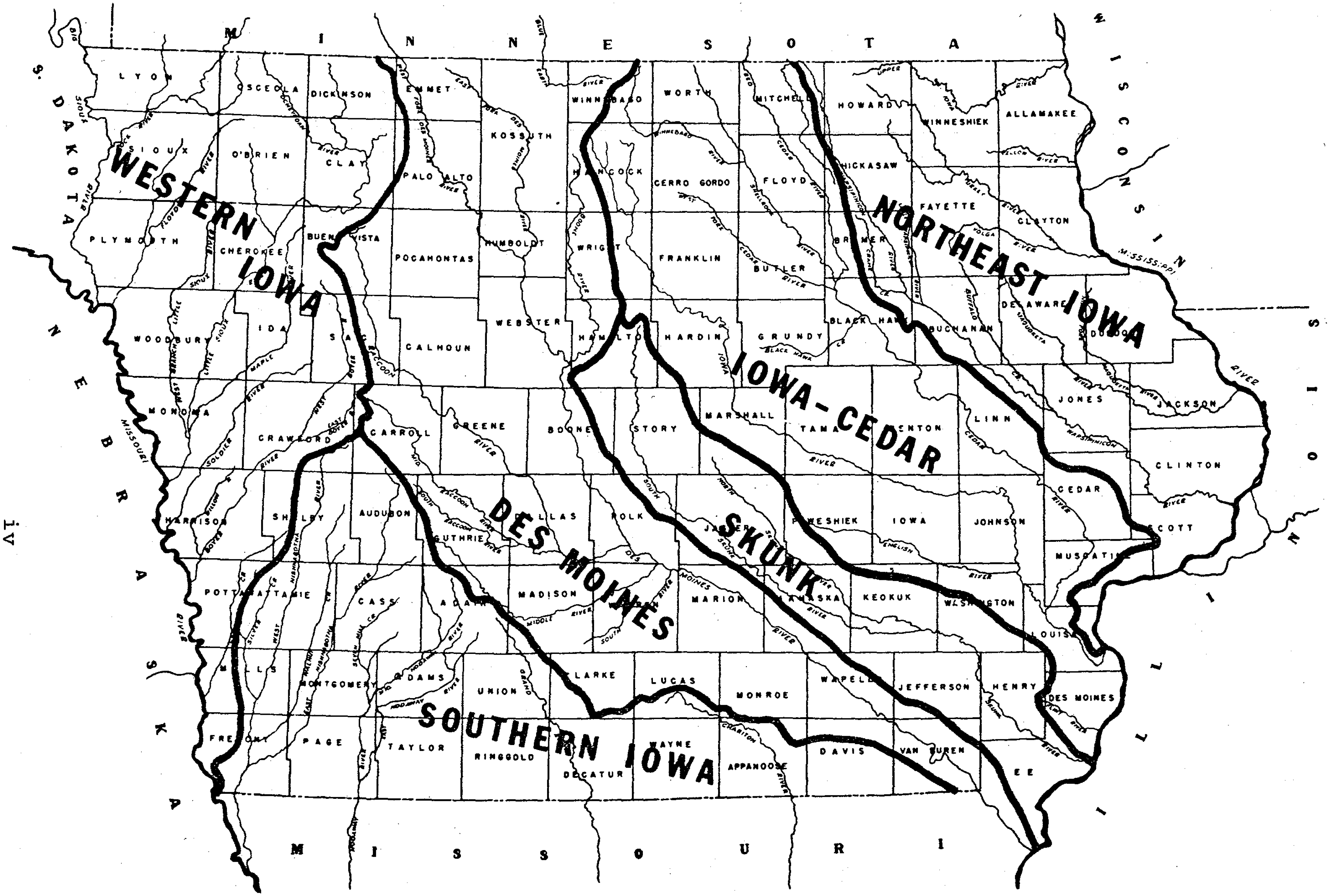


FIGURE 1

IOWA RIVER BASINS

This basin plan is one of a series for the six major river basins in Iowa. These plans are supplemented by the Supporting Document for Iowa Water Quality Management Plans which contains general information of a supporting or background nature applicable to all six basins. The planning documents will be prepared by the Water Quality Management Division of DEQ. The planning information contained herein is part of a continuing planning process. Changes will occur since this plan describes a dynamic process. Basin plans will be reviewed at least every five years with interim revisions as significant changes occur.

This plan includes a determination of existing water quality, applicable standards, and significant point and nonpoint sources of pollution in the Northeastern Iowa Basin. The plan then identifies and sets forth measures to correct the basin's water quality problems. Authority for this basin plan is derived from Section 455B.32, of the Code of Iowa.

This basin plan is specifically directed towards satisfying requirements of section 303(e) of the Federal Water Pollution Control Act, as amended; Public Law 92-500, 86 Statute 816 (1972); (33 United States Congress 1251 et sequens). The plan will serve local and regional governments as well as State and Federal agencies.

SCOPE

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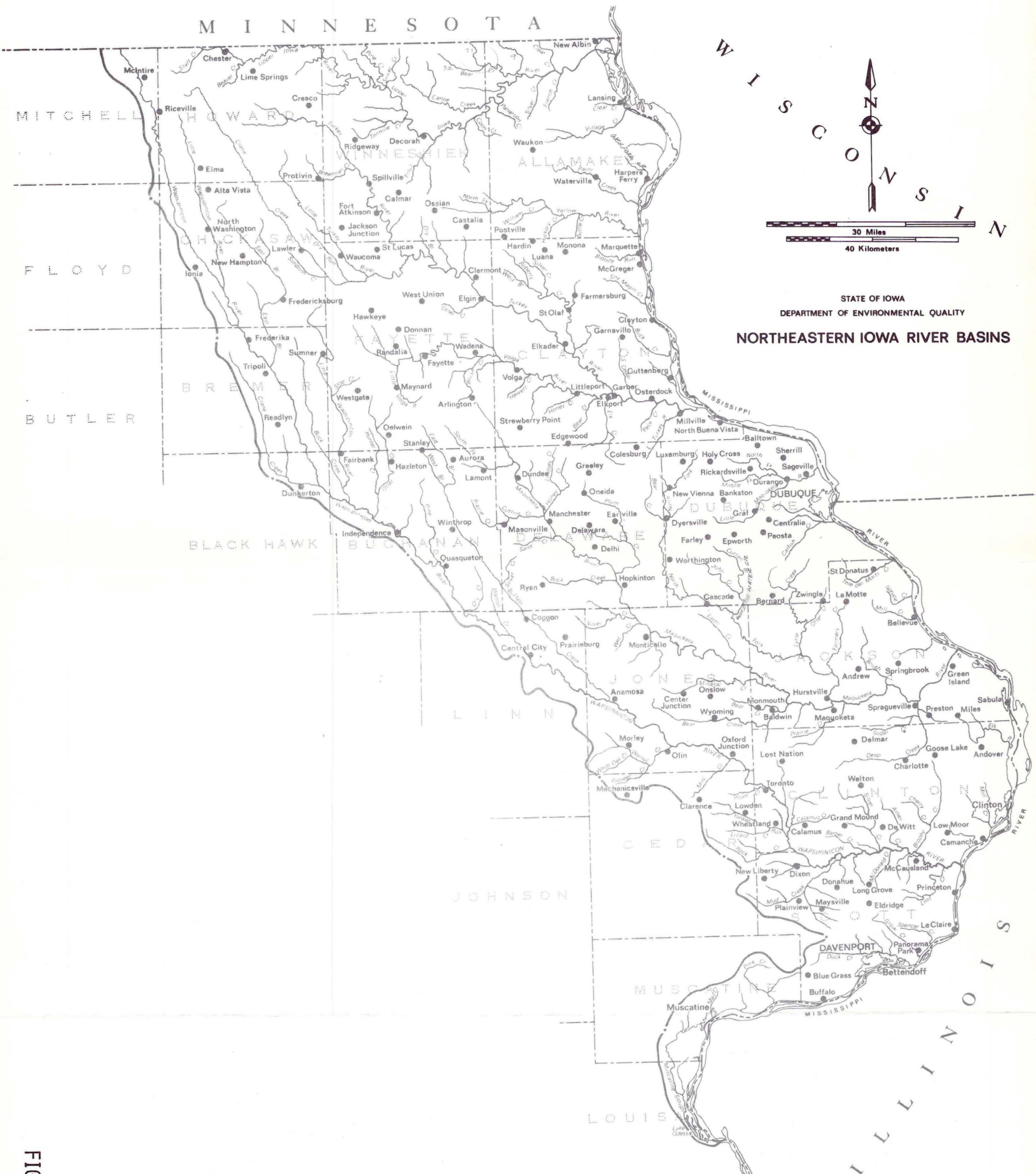
STATE OF IOWA
DEPARTMENT OF ENVIRONMENTAL QUALITY
NORTHEASTERN IOWA RIVER BASINS
N
30 Miles
40 Kilometers
MINNESOTA
WISCONSIN
ILLINOIS
MITCHELL
HOWARD
WINNESHIEK
ALLAMAKEE
FLOYD
CHICKASAW
FAYETTE
CLAYTON
BUTLER
BREMER
BLACK HAWK
BUCHANAN
DELAWARE
DUBUQUE
JACKSON
LINN
JONES
CLINTON
CEDAR
JOHNSON
SCOTT
MUSCATINE
LOUISA
MISSISSIPPI RIVER
WAPSIPINICON RIVER
McIntire
Chester
Lime Springs
Riceville
Cresco
Decorah
Ridgeway
Waukon
New Albin
Lansing
Harpers Ferry
Waterville
Elma
Alta Vista
Protivin
Spillville
Calmar
Fort Atkinson
Jackson Junction
Ossian
Castalia
Postville
North Washington
Lawler
New Hampton
Ionia
Waucoma
St Lucas
Hardin
Luana
Monona
Marquette
McGregor
Clermont
Fredericksburg
West Union
Elgin
Farmersburg
Hawkeye
St Olaf
Garnavillo
Clayton
Donnan
Randalia
Wadena
Fayette
Elkader
Guttenberg
Frederika
Sumner
Tripoli
Volga
Littleport
Garber
Elkport
Osterdock
Maynard
Westgate
Arlington
Strawberry Point
Millville
North Buena Vista
Readlyn
Oelwein
Edgewood
Balltown
Sherrill
Stanley
Colesburg
Luxemburg
Holy Cross
Sageville
Fairbank
Hazleton
Aurora
Lamont
Greeley
Rickardsville
Durango
Dundee
Oneida
New Vienna
Bankston
DUBUQUE
Dunkerton
Manchester
Earlville
Graf
Winthrop
Masonville
Delaware
Dyersville
Centralia
Peosta
Independence
Delhi
Farley
Epworth
Quasqueton
Worthington
Hopkinton
St Donatus
Ryan
Cascade
Bernard
Zwingle
La Motte
Bellevue
Coggon
Prairieburg
Monticello
Central City
Springbrook
Green Island
Andrew
Anamosa
Center Junction
Onslow
Hurstville
Monmouth
Baldwin
Maquoketa
Spragueville
Preston
Miles
Sabula
Wyoming
Delmar
Morley
Oxford Junction
Olin
Lost Nation
Goose Lake
Andover
Charlotte
Mechanicsville
Toronto
Welton
Clarence
Lowden
Wheatland
Grand Mound
Calamus
De Witt
Clinton
Low Moor
Camanche
New Liberty
Dixon
McCausland
Donahue
Long Grove
Princeton
Maysville
Plainview
Eldridge
Le Claire
DAVENPORT
Panorama Park
Bettendorf
Blue Grass
Buffalo
Muscatine

FIGURE 2

III. Basin Characteristics

The physical characteristics of the basin, including topography, climatology, physiography, geology, hydrogeology, hydrology, and ground water quality are discussed.

IV. Water Quality

Iowa Water Quality Standards and Stream Classifications are delineated. Available water quality data have been accumulated and evaluated to present the best possible picture of the recent history of basin water quality. Existing water quality is described and then compared with the Iowa Water Quality Standards.

V. Point Source Discharge Inventory

Available records have been reviewed to determine the location and characteristics of point source wastewater discharges. This information is tabulated and summarized.

VI. Waste Load Allocations and Ranking

The results of the waste load allocation analyses for the basin are listed. Waste load reductions for each point source waste dischargers are given. Segments are classified and ranked. Dischargers are ranked.

VII. Nonpoint Pollution Sources

The problems of nonpoint pollution sources are addressed. Combined sewer overflows, urban runoffs, and rural sources of pollution from animal feeding operations and general agricultural activities are characterized. Based upon information extrapolated from other areas, the potential pollution from typical sources is identified.

VIII. Needs and Compliance Schedules

An evaluation of the needs for improved wastewater treatment in the basin is presented. A summary of the estimated costs associated with these needs is also given.

IX. Conclusions and Recommendations

Conclusions drawn from the plan are presented along with several recommendations that would aid in attaining the goal of improved water quality.

X. Review and Revision

The procedures for review and revision of this plan are briefly described.

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CHAPTER I

IOWA'S WATER QUALITY MANAGEMENT PROGRAM

NORTHEASTERN IOWA BASIN

The main objective of water quality management is protection and enhancement of water resources to ensure acceptable conditions for designated uses. The establishment of a realistic management program requires a comparison of existing water quality with the desired water quality.

The Iowa Water Quality Standards, as adopted by the Iowa Water Quality Commission, establish a baseline for desired water quality and stream uses. The National Water Quality Criteria, as proposed by the U.S. Environmental Protection Agency (EPA), provides an additional measure of desirable water quality.

WATER QUALITY STANDARDS

Iowa's Water Quality Standards and accompanying use classifications were established by the Water Quality Commission. They were adopted by the State on February 12, 1974 and approved by the U.S. Environmental Protection Agency on March 26, 1974. When a water quality standard is violated the water, according to law, is polluted and its quality must be improved.

Water Use Classifications

The Department of Environmental Quality has responsibility for establishment of water use classifications for the surface waters of the State. Assistance in this task has been provided by the State Conservation Commission which has the major responsibility for fish and wildlife protection. Accordingly, the DEQ has defined four surface water-use classifications and has placed all surface waters of the State into one or more of these classifications. These classifications are:

Class A - Primary Contact Recreation; Class B - Wildlife, Secondary Contact Recreation and Aquatic Life (with subclasses for cold and warm waters); Class C - Potable Water Supply; and a General Water Quality Criteria. All surface waters are designated under the General Water Quality Criteria. In addition, many streams are also designated for one or more of the Class A, Class B, or Class C uses. Each of the use classifications imply specific water quality standards.

Surface Water Quality Standards

Iowa Water Quality Standards define the constituent levels which may be present in the surface waters of the State. Specific concentrations of various constituents which should not be violated are assigned to each water use, in order to protect the water for that particular use.

The water quality standards shall be met at all times when the flow of the receiving stream equals or exceeds the seven day, 1-in-10 year low flow (7Q10). Exceptions may be made for intermittent or extremely low flow streams. When intermittent streams are classified for aquatic life protection, the Water Quality Commission may waive the (7Q10) low flow requirement and establish a minimum flow in lieu thereof. Such a waiver shall be granted by the Commission only when it has been determined that the aquatic resources of the receiving waters are of little significance at flows less than the established minimum.

The specific criteria which apply to A, B, C, or General classifications are detailed in Chapter II of the Supporting Document For Iowa Water Quality Management Plans (1).

Revision of Water Quality Standards

The Act requires that the State shall from time to time, but at least once every three years, hold public hearings to review water quality standards and, if appropriate, modify and adopt new standards.

Some of the most likely changes in the Standards will be revisions of the use classifications. Since the National water quality goal is swimmable-fishable waters by 1983, most anticipated changes will be to upgrade existing Class B waters to include the current Class A usage. There will also be cases of upgrading waters, to which only general criteria apply, Classes A and B. Other revisions that may take place are changes in the criteria of the current Water Quality Standards. Any revisions in the Standards will be subject to public hearings and approval by the EPA before they may become law.

IMPLEMENTATION STRATEGY

If a management plan is to be effective, it must include a strategy for implementation of its proposals. This section gives a brief description of the DEQ's strategy for the implementation of its basin plans.

Strategy Summary

In most cases, water quality violations are the result of man's activities. Typical sources of pollution can include municipal discharges, industrial discharges, and runoff or nonpoint discharges associated with agricultural practices. The solution to water pollution is to identify the contributing sources and either eliminate or control them to the extent necessary to assure that water quality standards will not be violated.

Waste load allocation studies are performed to estimate the quantities of pollutants which may be discharged to receiving waters without exceeding the limits allowed by the water quality standards. Through the use of the water load allocations, effluent limitations are established for municipal and industrial wastewater point source discharges. Only point sources of pollution are addressed in the waste load allocations in the initial version of the basin plans. This is because point sources of pollution are easier to identify and control. Nonpoint sources of pollution will receive further considerations in subsequent revisions to the plans.

Regardless of what the waste load allocation study indicates, to be allowable, the Federal Water Pollution Control Act Amendments of 1972 (the Act), Public Law 92-500, requires publicly owned treatment plants to provide as a minimum, "secondary treatment", and industrial plants to provide, as a minimum, "best practicable control technology currently available" (B.P.T.) by July 1, 1977. The actual effluent limitations required under these degrees of treatment are described in Chapter VI.

The principal mechanism for attaining and maintaining compliance with the water quality standards is through the issuance of operation permits to all point sources of wastewater discharge. The permits contain either minimum allowable effluent limitations or limitations more stringent as necessary to assure compliance with water quality standards. Where existing sources are not in compliance with the effluent limitations, the operation permit will include an implementation schedule to assure compliance within a reasonable time period.

An additional step in the implementation of remedial measures to abate water pollution exists in the case of municipal wastewater treatment plants. Public Law 92-500, the Act, has established a program for assisting publicly owned waste treatment works with funding for improvements necessary to meet the goals of the Act. The DEQ, as the state water pollution control agency, has responsibility for administering the program. The final step, then, in the DEQ's strategy for implementation of the plan, is to allocate the federal funds available for improvement of Iowa municipal treatment facilities.

Monitoring and Surveillance

Stream Sampling Station Network - The present Iowa stream sampling station network is a series of sampling points distributed throughout the State. These are permanent stations, sampled at the same location and on a quarterly frequency. The samples are normally analyzed for the same parameters every quarter. The objective of the sampling network is to give a general indication of water quality. The network is effective for measuring trends of either improvement or degradation of water quality. Although only minimal assistance is obtained in the area of enforcement, the network provides some background data for planning and assessing the effectiveness of the program.

The present network consists of thirty-six (36) stations across Iowa, each sampled quarterly. Seven of these stations are on the Mississippi River, one near Lansing and the other at the Davenport Water Plant Intake. The other stations are located on the Maquoketa River near Maquoketa, the Turkey River near Garber, the Upper Iowa River at Decorah and two stations on the Wapsipinicon River, one at Independence and one near Dewitt. All stations are sampled by the State Hygienic Laboratory of the University of Iowa, under contract to the DEQ. The State Hygienic Laboratory also does the analyses.

In order to be more effective as a trend indicator, the monitoring network should be expanded. To be most effective, stations should be located below major point source discharges, and at points on the stream of distinct change in characteristic. These locations would be at points of confluence of major tributaries, above and below impoundments, and at points of change of water quality standards designation.

Intensive Stream Water Quality Surveys - The limiting factor in the effectiveness of the stream sampling network is its inability to detect cause and effect relationships. The DEQ's water quality monitoring program therefore includes a complementary program of intensive stream water quality surveys. The intensive surveys are in-depth studies of water quality in a specific area or segment of a stream, over a finite time period. The purpose of the survey is to provide a detailed determination of the biological, physical, and chemical qualities of the stream water. Information obtained is used to determine the effects of a specific point source or combination of point sources upon the receiving stream. The surveys provide documentation for enforcement actions and determine the effectiveness of any corrective measures initiated. Such surveys are also used for evaluating priorities, verifying waste load allocations, and as aids for planning.

The bulk of the intensive surveys program is conducted by the State Hygienic Laboratory. The lab usually performs both sampling and sample analyses. Intensive surveys are also conducted by the DEQ office to obtain answers to specific questions. For example, limited surveys are occasionally conducted by DEQ Regional staff in connection with point source discharge compliance inspections.

All survey data storage and analysis are performed using computer data processing. The stream water quality data is also stored in the U.S. Environmental Protection Agency computer storage system, STORET. The STORET system includes a variety of report and anlysis formats for evaluating and using the data.

Point Source Discharge Self-Monitoring - The principal tool for the management of point source discharge monitoring and enforcement of effluent limitations is the State Operation Permit Program, in coordination with the National Pollutant Discharge Elimination System (NPDES Discharge Permit Program). The permits not only set discharge effluent limitations and prescribe compliance schedules for bringing about corrections, but also specify a program for effluent monitoring and recording by the permit holder.

Dischargers are currently required to report to the DEQ each month. Report contents are specified and are tailored to the size and complexity of the plant and to the effluent limitations specified in the permit. Plant flows are required to be recorded as well as certain laboratory test results.

The self-monitoring reports are used as a screening mechanism to point out operation problems and existing or impending effluent limit violations. The reports are used as a guide to direct the DEQ resources to the needs for more detailed monitoring and possible enforcement action.

More importantly, however, the reports serve as an aid to the operator in evaluating his own operation. The requirements in effect mandate the availability of operational data which the operator can then use to improve his operation.

Another self-monitoring program is the State initiated Effluent Quality Analysis Program (EQAP). This is a program where the State Hygienic Laboratory mails specially prepared sample bottles to each discharger. The plant operator collects a sample at times and locations recommended by the DEQ, and mails the sample back to the State Hygienic Laboratory for analysis. Samples are analyzed monthly for Biochemical Oxygen Demand (BOD) and, in some cases, ammonia. Other water quality parameters compatible with acid fixing can also be analyzed from the EQAP sample. Occasionally, heavy metal or phosphorus analyses are performed at the request of the DEQ.

Plant Inspection - The DEQ also conducts on-site plant inspections. The purpose of the inspection is to provide an in-depth analysis of the operation, maintenance, and effectiveness of the treatment plant. The inspections provide verification of self-monitoring reports and determination of whether the plant is in compliance with permit stipulations.

Influent and effluent samples are collected and analyzed when possible, but in many cases visual observations of the effluent by the inspector can satisfactorily make the determination. The inspection also includes an evaluation of the effects of the effluent on the receiving stream, occasionally by sampling, but more often by visual observation.

The advantage of the on-site inspection over the other monitoring programs is the opportunity to make cause and effect evaluations. The inspector can observe the raw waste load and the operation and maintenance factors which determine the efficiency and effectiveness of the treatment process.

The value of the inspections is twofold; first, they provide a valuable tool for evaluating permit compliance and documenting the need for enforcement actions, and secondly, and equally important, they provide a vehicle for assistance to the operator. The inspectors can provide counsel and advice to the local officials on meeting permit requirements as well as operation and maintenance methods to improve plant operation and efficiency.

Plant inspections are normally made by the DEQ regional staff. The regional staff make the inspections when minimal or no sampling is needed in conjunction with the inspection. Central office staff make inspections when intensive composite sampling is required. The number of inspections conducted each year is limited by the availability of fiscal and personnel resources. Approximately three to four hundred municipal and industrial inspections are made each year, along with a similar number of quick stop visits. All municipal and major industrial plants should be inspected each year. The number of inspections will be increased as staff is added to the Regional offices.

Waste Load Allocations

Waste load allocations have been made for point sources of wastewater discharge in order to maintain water quality standards. The scope of the allocations was limited to evaluation of effluent limitations necessary to meet the dissolved oxygen (DO) and ammonia-nitrogen (NH_3-N) standards, at the 7-day, 1-in-10 year low stream flow.

The DO and NH_3-N parameters were selected for evaluation because they are generally the most critical criteria of the water quality standards. Data from five years of municipal treatment plant effluent sampling are available on these parameters and are readily adaptable to data processing. Other criteria within the water quality standards can normally be met with secondary treatment.

It is recognized that other parameters could be considered in the waste load allocation analyses. An analysis of historical water quality data shows that other water quality criteria have been violated and that critical conditions may also exist for some parameters during high stream flow periods. Some other parameters of particular concern include heavy metals, toxic elements, fecal coliform and thermal discharges. Where standards violations are apparent for parameters other than DO and NH_3-N they are studied on an individual basis and effluent limits incorporated into the operation permits. A more detailed waste load allocation analysis, however, will have to be left until subsequent revisions of this plan when additional data and information become available.

To predict the variation in DO and ammonia concentrations in the streams, a computer-based mathematical model was used. Input data for the model was developed from existing information and cursory field investigations of the streams. When necessary, conservative assumptions have been made that tend to assure a high degree of protection for water quality without necessitating unrealistically stringent effluent limitations. Future stream surveillance should help to verify particular constants and assumptions used, and improve the validity of the model. Based upon existing data, prediction of the impact of different wastewater loads upon the DO and ammonia concentrations may be performed.

A detailed discussion of the mathematical model, methodology, and assumptions used in the waste load allocation analysis is included in Chapter IV of the supporting document (1). The final allocations for the Northeastern Iowa Basin are contained in Chapter VI of this report.

Permit System

The major mechanism by which the water quality management plan will be implemented is the wastewater construction and operation permit program conducted by the DEQ, under authority of Chapter 19, of the rules of the Department (1973 IDR). Any person intending to construct, modify or extend any wastewater disposal system in the State of Iowa must first obtain a construction permit from the Executive Director of DEQ. An operation permit is also required prior to the operation of any disposal system, or the discharge of sewage, industrial waste, or other wastes from any discharge source. Chapter 455B of the Code also has provisions included for correcting violations of any permit, rule, standard, or order issued under Part 1 of Division III of the Chapter.

NPDES - The Federal Water Pollution Control Act Amendments of 1972 (the Act) established a National Pollutant Discharge Elimination System (NPDES) permit program. Any person presently discharging wastewater to public waters is required to obtain an NPDES permit. Any person proposing a disposal system which will result in a wastewater discharge is required to apply for an NPDES permit at least 180 days before such discharge is to commence.

The Act also established a procedure whereby the EPA can delegate permit authority to those States that desire to administer the NPDES program. The State must demonstrate ability to conduct the program and must have adequate legal authority to enforce the permits. The DEQ is currently preparing a delegation request to EPA for issuance of NPDES permits in Iowa.

Operation Permits - An operation permit is a legally enforceable document which specifies the type of waste water which may be discharged, as well as the allowable quantities, concentrations, and rates of discharge. As a minimum, the effluent limitations are equivalent to secondary treatment for municipalities or BPT for industries, but, more stringent limits may be required as needed to meet water quality standards.

The permits also contain self-monitoring and reporting provisions that require dischargers to monitor their effluents and report the results to the DEQ. The DEQ data processing system stores and reports the water quality and compliance schedule data in formats designed to point out violations and problem areas. Fiscal and personnel constraints limit the number of violations and problem areas that can be effectively pursued. Staff resources are, therefore, directed to those discharges which are determined to be of sufficient importance by the priority ranking formula.

Provisions of the State construction and operation permit program also require that certain agricultural operations also obtain a permit for wastewater disposal. This subject is discussed in Chapter VII. Industries which discharge their wastewater to municipal plants do not need an operation permit, but must follow certain pre-treatment standards as published by EPA.

Operation permits are written for a maximum of five years, with renewal application required prior to expiration. A permit can be modified at any time if there is a violation of any terms or condition of the permit, a change in any condition that requires either a temporary or permanent reduction or elimination of the permitted discharge, or if it is found that the permit was obtained under any type of misrepresentation of fact.

Many dischargers are not currently treating their wastewaters to a sufficient degree to comply with the final effluent limitations of their permit. In these cases the permits are written with interim and final effluent limitations and legally enforceable compliance schedules. These compliance schedules usually specify a series of interim dates so as to assure steady progress on the remedial efforts. The final compliance date, however, is not later than July 1, 1977.

Iowa water pollution control law provides for stiff penalties for violations of permit and other rules or standards. A large bulk of the DEQ compliance action work load is directed toward negotiating corrections. Negotiations are aimed at identifying practical remedial measures. Legal enforcement actions follow only where negotiations are not effective.

Water Quality Management Deadlines

As already mentioned, this document will help to direct the water quality management strategies necessary to implement a remedial program needed to meet the goals of the Act. The Act and the DEQ specify several deadlines that must be met in the implementation of this management program. Several key dates which have been established both by the EPA and the DEQ for improving wastewater treatment to protect National and State water quality follow. These dates are used to establish implementation schedules for the remedial measures defined by this plan.

Date	Action
December 31, 1974	National Pollutant Discharge Elimination System Permits issued.
June 30, 1975	Section 303(e) basin plans completed.
July 1, 1977	Secondary treatment required for all publicly-owned treatment works.
July 1, 1977	Best practicable waste treatment technology for all industrial discharges.

July 1, 1977	More stringent effluent limits to meet Iowa water quality standards.
July 1, 1983	Best practicable waste treatment technology for all publicly-owned treatment works.
July 1, 1983	Best available technology for all industrial discharges.
July 1, 1985	Zero pollutant discharge.

Construction Grants

If all point source dischargers are to meet the effluent limitations imposed by the waste load allocations, considerable monetary expenditures will be required on behalf of municipalities and industries. Industrial dischargers must provide their own waste treatment financing. The Federal Water Pollution Control Act Amendments of 1972, under Title II - "Grants for Construction of Treatment Works" provide for federal grants for publicly owned waste water treatment facilities. Municipalities may apply to the EPA through the DEQ for federal grants of 75% of eligible costs of their wastewater treatment works improvements. Municipalities must then provide from other sources, the remaining 25% of the cost. Eligible project costs include those for treatment, interceptors, and collection facilities. Collection facilities have been assigned lowest priority.

In the past, federal funds allocated to Iowa had been sufficient to cover the grant funding of all needed treatment facilities, however, during the past two years the needs have outgrown the availability of federal funds. Nationwide federal allotments for fiscal years 1974 and 1975 were $3 billion and $4 billion, respectively. Of the national allotment, Iowa's shares were $34.7 million and $39.3 million respectively. Current needs for the State for all eligible facilities excluding storm sewers, based on 1973 dollars is $989,584,000, as contained in the 1974 "Needs Survey" for the State of Iowa. These needs will continue to increase as better information is developed through the waste load allocations and basin planning processes. Inflation is also having a significant influence on treatment facility costs.

Priorities for Funding - To receive grant funding a municipality must proceed through certain requirements. The DEQ is responsible for establishing an orderly priority process for the administration and obligation of federal grant funds. All municipalities are placed on the state discharge inventory and assigned a discharge priority. Should a municipality have a need for improvement or construction of wastewater treatment facilities and apply for federal grant funds, it is then placed in the construction grant priority listing according to its discharge priority rank. The construction grant priority list is revised annually. After determination of the available federal grant money for the year, the annual project list can be established based upon the number of projects from the priority list that can be funded.

Prior to adoption of the annual "priority list" and "project list" for each fiscal year, a public hearing is held where interested persons may voice objections to the proposed lists. Following consideration of public hearing comments the final lists are prepared and approved by the Water Quality Commission and the EPA.

Types of Grants - Once a municipality has been placed upon the "project list" and has been found to be eligible for grant funding, a three-step grant process is initiated in accordance with Federal Regulations 40 CFR 35, promulgated by EPA to implement Title II of the Federal Act.

Step one, known as the facility plan, contains an evaluation of the water pollution control problem; explores a number of alternatives to eliminate the problem; conducts a cost-effectiveness study for each alternative; evaluates the environmental impact of each alternative; and finally, chooses the specific alternatives which seem to have the most environmental, economic, and social benefits. The facility plan must be submitted to the DEQ and the EPA for approval before the second step can be considered.

Step two covers the preparation of construction plans and specifications which are based on the alternative chosen in the facility plan. After approval of the plans and specifications by the DEQ and the EPA, step three, which is the actual construction of the required facilities, can be initiated. Grants are made to applicants for each of the three steps.

Before the facility planning (Step 1) process is begun, the DEQ will inform the applicant of the minimum quality of effluent which can be discharged to the receiving waters. The facility planning for a specific discharge is then directed at meeting these effluent limitations.

Priority System

Application of the waste load allocations and effluent limitations result in considerable needs to upgrade or expand existing wastewater treatment facilities. Although there is considerable expense involved to meet State and Federal water quality goals, the financial resources available each year for publicly owned facilities are limited. Not all needed projects can be funded at once. To solve this problem, a system of priorities has been established. This section describes a portion of the system proposed for use by the State of Iowa.

Stream Segment Priority Ranking - Each major river basin is first divided into various stream segments. Each stream segment consists of surface waters that have common hydrologic characteristics and natural, physical, chemical, and biological processes. In accordance with EPA guidelines, the stream segments must be classified either effluent limited (EL) or water quality limited (WQ).

Segment classification is a contributing factor in the determination of the segment ranking, discharger ranking, and compliance scheduling. The two segment types are described as follows:

1. An effluent limited (EL) segment is any segment where it is known that water quality is meeting and will continue to meet standards, or where there is adequate demonstration that standards will be met after application of secondary treatment or BPT to all point discharges to the segment.
2. A water quality limited (WQ) segment is any segment where it is known that water quality does not currently meet applicable standards and it is not expected that standards would be met even after application of secondary treatment or BPT to all point discharges to the segment.

All segments are next ranked in order of abatement priority. The ranking methodology attempts to take into account: (1) severity of pollution problems, (2) population affected, (3) need for preservation of high quality waters, and (4) national priorities.

Two major concepts were considered necessary and sufficient to distinguish any segment from other segments of the basin. These are: (1) the degree of usefulness of the segment, assuming water quality standards are met, and (2) the number of discharges required to meet effluent limitations in order to bring the segment into compliance with water quality standards. These concepts, thus, form the basis of the ranking methodology.

The specific formula used to calculate the total points for a segment is as follows:

$$\text{TOTAL SEGMENT POINTS} = (0.5 + A + B_C + B_W + C + BC + AES + POP) \times SQ$$

Where: A = 2 if the segment contains any designated class A waters and 0 otherwise.

B_C = 2 if the segment contains any designated class B cold waters and 0 otherwise.

B_W = 1 if the segment is designated as a class B warm waters and 0 otherwise.

C = 2 if the segment contains any designated class C waters and 0 otherwise.

BC = 1 if the segment is designated as being useful for either boating and/or canoeing and 0 otherwise.

AES = 1 if the segment is considered to include an area of significant aesthetic value and 0 otherwise.

$$POP = \begin{bmatrix} 2.0 \\ 1.5 \\ 1.0 \\ 0.5 \\ 0 \end{bmatrix} \text{ if } \begin{bmatrix} 30 \text{ or more} \\ 15 \text{ to } 30 \\ 5 \text{ to } 15 \\ 0.5 \text{ to } 5 \\ 0 \text{ to } 0.5 \end{bmatrix} \text{ thousand people reside}$$

within a 10 mile wide corridor adjacent to either side of the segment and at least one of the above terms (A, B_C, B_W, C, BC, or AES) is nonzero.

SQ = 6 if the segment is designated as water quality limited and more than four dischargers have a waste load allocation more stringent than secondary treatment.

SQ = 5 if the segment is designated as water quality limited and three or four dischargers in the segment have a waste load allocation more stringent than secondary treatment.

SQ = 4 if the segment is designated as water quality limited and one or two dischargers in the segment have a waste load allocation more stringent than secondary treatment.

SQ = 3 if the segment is designated as effluent limited with water quality standards violated.

SQ = 2.5 if the segment is designated as effluent limited with water quality standards met.

SQ = 2 if the pollution load to the segment at low flow is contributed equally by point and non-point sources.

SQ = 1 if the pollution load to the segment at low flow is predominantly from non-point sources.

The formula for total segment points contains two factors. The first factor allocates points for the degree of usefulness of the segment. It is felt that the population that uses, or would use, the waters of a segment are those most effected by any pollution problems in the segment and further, that this population increases in direct proportion to the potential usefulness of the segment.

The intent of allowing the points of terms A, B_C, B_W, C, BC, and AES, which designate specific water uses, is obvious.

The term POP is included to provide additional points when a segment has any of the above uses, since any usefulness is considered to be of somewhat greater value if a large population resides nearby. The constant term of .5 is included so the product of factors cannot be zero.

The second factor allocates a varying number of points based on whether the segment is designated as effluent limited or water quality limited. The highest level of points is given to segments which have a large number of discharges required to meet waste load allocations more stringent than secondary treatment or BPT to bring the segment into compliance with water quality standards. The scale of points for this factor basically gives an increasing amount of points in those areas where the greatest degree of point source pollution exists.

The total points for a segment are determined from a product of the points earned in each of the two factors. The formula was written in the form of a product so as to give low total points if either factor was low, and high points only if both factors are high. In this manner the formula weighs both the degree of usefulness of a segment and the severity of the pollution problem.

After the total points are determined for each segment in the basin, the segments are then ranked in decreasing order of points. The number one ranked segment is the segment receiving the most total points.

Following the segment ranking, abatement priority points are assigned to each segment. The abatement points are used as a factor in the municipal discharger ranking which is discussed later. The abatement priority points are determined as follows:

ABATEMENT PRIORITY POINTS = Total number of segments in the basin + 1 - Segment Rank

The selected stream segments, for the Northeastern Iowa Basin are detailed in Chapter VI. Total segment points, segment rank, and abatement priority points are also presented in the chapter.

Municipal Discharger Ranking Methodology - In compliance with 40 CFR 130.43, which states that significant municipal dischargers shall be ranked to be subsequently used in establishing priorities and output estimates for municipal facilities construction, the following discharger ranking methodology has been promulgated for the basin plans. This ranking methodology is also in collaboration with current EPA Basin Plan Guidelines (Part IV, para. c) which states that significant municipal dischargers should be ranked in order of abatement priority.

This methodology ranks the municipal discharges in order of significance based on the following criteria:

1. A means of indicating the relative magnitude of one discharger with respect to all other dischargers.

2. A means of accounting for the present effluent quality of the dischargers.
3. A means of indicating the relative magnitude of the discharger in comparison to the capacity of the stream segment at the point of discharge.
4. A means of indicating the relative magnitude of the discharger in comparison to the total waste load of all other dischargers to the stream segment.
5. A means of comparison of the relative merit of the stream segment, to which the municipality discharges, to other segments in the basin.

To incorporate these criteria in the ranking methodology, the following factors were considered and evaluated. It should be noted that the numbering of the factors corresponds to that of the preceeding criteria.

1. Total pounds of BOD_5 and ammonia-N presently being discharged, using average reported flows.
2. Discharger's present BOD_5 and ammonia-N concentrations as reported through EQAP.
3. Discharger's present BOD_5 and ammonia-N waste load compared to the stream capacity.
4. Discharger's present BOD_5 and ammonia-N waste load compared to the total waste load from all dischargers to the stream segment.
5. Stream segment abatement priority points into which the municipality discharges.

Sufficient data is readily available to assess the degree of significance of a municipal discharger in terms of factors 1, 2, and 3. Likewise the stream segment abatement priority points, as indicated in factor 5, has previously been determined, however, the selection and manipulation of required data needed to comply with factor 4 is considerably more difficult due to the non-coincidental cause and effect nature of certain discharged pollutant materials. Thus a blending of factors 3 and 4 was deemed the most feasible alternative. This was accomplished by comparing the discharger's present BOD_5 and ammonia-N waste load to the respective values allowed for the discharger under its waste load allocation. This comparison was felt reasonable and justified since the calculations performed in determining waste load allocations take into account both stream capacities and other discharger's waste loads.

This methodology thus ranks a discharge with respect to its relative share of the waste load to the segment, as well as to the waste load the discharger contributes at its present degree of treatment. This rationale also takes into account population equivalency in lieu of just the contributing population, the relative overloading of the stream segment as determined by waste load allocations analysis, and the relative ranking of the stream segments as determined by the segment ranking methodology.

The specific formula used to rank dischargers is as follows:

$(A_1 + D_1)\ B_1 + (A_2 + D_2)\ B_2 + C$ = Discharger priority points.

The discharger ranking formula consists of four elements which attempt to incorporate the criteria described above. The four elements are as follows:

Element A: Present Effluent Discharge;

$$A_1 = \begin{bmatrix} 60 \\ 50 \\ 40 \\ 30 \\ 20 \\ 10 \\ 0 \end{bmatrix} \quad \text{if the present } BOD_5 = \begin{bmatrix} >60 \text{ mg/l} \\ 60\text{-}50.1 \\ 50\text{-}40.1 \\ 40\text{-}30.1 \\ 30\text{-}20.1 \\ 20\text{-}10.1 \\ 10\text{-}0 \end{bmatrix}$$

$$A_2 = \begin{bmatrix} 60 \\ 50 \\ 40 \\ 30 \\ 20 \\ 10 \\ 1 \end{bmatrix} \quad \text{if the present } NH_3\text{-}N = \begin{bmatrix} >40 \text{ mg/l} \\ 40\text{-}30.1 \\ 30\text{-}23.1 \\ 23\text{-}15.1 \\ 15\text{-}\ 8.1 \\ 8\text{-}\ 2.1 \\ 2\text{-}\ 0 \end{bmatrix}$$

This element uses the present average reported BOD_5 and ammonia-N values as representative effluent values, (where possible).

Element B: Degree of stream overloading;

a. BOD Overloading Factor:

$$1 - \frac{\text{lb. W.L.A.}}{\text{lb. PRES}} = B_1$$

where: lb. W.L.A. is the total lbs/day of BOD_5 allowed, as determined by the waste load allocation lb.

lb. PRES is the average lbs/day of BOD_5 which is currently being discharged.

2. Ammonia-N Overloading Factor:

$$1 - \frac{\text{lbs. W.L.A.}}{\text{lbs. PRES}} = B_2$$

where: lbs. W.L.A. is the total lbs/day of NH_3-N allowed as determined by the waste load allocations.

lbs. PRES is the average lbs/day of NH_3-N which is currently being discharged.

Note: B_1 and B_2 are only allowed to vary from zero to 1.00 in this methodology. All other values are set equal to zero.

Element C: The segment abatement priority points are used for element C.

Element D: Total contributing lbs. of BOD_5 and NH_3-N:

$$D_1 = \begin{bmatrix} 0 \\ 1 \\ 3 \\ 5 \\ 7 \\ 9 \\ 12 \\ 14 \\ 16 \\ 18 \\ 21 \\ 25 \end{bmatrix} \text{ if the present } BOD_5 = \begin{bmatrix} 1.5 \text{ or less} \\ 1.5-3 \\ 3-5 \\ 5-10 \\ 10-20 \\ 20-50 \\ 50-100 \\ 100-250 \\ 250-750 \\ 750-1500 \\ 1500-2500 \\ 2500 \text{ or more} \end{bmatrix} \text{ lbs./day}$$

$$D_2 = \begin{bmatrix} 0 \\ 1 \\ 3 \\ 5 \\ 7 \\ 9 \\ 12 \\ 14 \\ 16 \\ 18 \\ 21 \\ 25 \end{bmatrix} \text{ if the present } NH_3\text{-N} = \begin{bmatrix} .75 \text{ or less} \\ .75-1.5 \\ 1.5-2.5 \\ 2.5-5 \\ 5-10 \\ 10-25 \\ 25-50 \\ 50-125 \\ 125-375 \\ 375-750 \\ 750-1250 \\ 1250 \text{ or more} \end{bmatrix} \text{ lbs./day}$$

This element takes into account the actual waste load which the stream receives, instead of a representation of the actual population.

The relative position of each discharger is determined by its total points as calculated by the discharger ranking formula. The dischargers are finally ranked in decreasing order of discharger priority points. The ranking of municipal dischargers in the Northeastern Iowa Basin, as well as the priority points for each discharger, are presented in Chapter VI.

REFERENCES

1. Supporting Document For Iowa Water Quality Management Plans, Iowa Department of Environmental Quality, Water Quality Management Division, Des Moines, Iowa, 1976.

CHAPTER II

EXISTING DEVELOPMENT PATTERNS

NORTHEASTERN IOWA BASIN

POLITICAL SUBDIVISIONS

The Northeastern Iowa Basin includes twenty-one counties or parts thereof. Table II-1 lists those counties, or their respective subdivisions, within the basin. One hundred sixty-four incorporated communities are included within the basin boundaries. The 1970 total population of these incorporated municipalities was 378,041 people. Thirty-seven cities had populations greater than 1,000. Nine cities had populations in excess of 5,000. Two cities, Davenport and Dubuque, have populations over 50,000,with Davenport largest at 98,500. Figure II-1 shows the incorporated municipalities in the basin and Table II-2 summarizes their 1970 and projected 1990 populations.

POPULATION PROJECTION

The DEQ has made population projections for those cities for the year 1990, based on the projections of Taylor (1). For those individual municipal projections not estimated by Taylor, the 1990 population of the community was estimated by multiplying its 1970 population by the ratio of the projected 1990 county population to the 1970 county population. The population projections for 1990 that were used for this study are indicated in Table II-2.

TABLE II-1

PORTION OF COUNTIES WITHIN

THE NORTHEASTERN IOWA BASIN

COUNTY	PERCENT
Allamakee	100.0
Blackhawk	11.8
Bremer	53.7
Buchanan	75.5
Cedar	25.1
Chickasaw	83.8
Clayton	100.0
Clinton	100.0
Delaware	100.0
Dubuque	100.0
Fayette	100.0
Floyd	0.6
Howard	100.0
Jackson	100.0
Jones	99.5
Linn	19.2
Louisa	18.1
Mitchell	12.8
Muscatine	34.3
Scott	93.6
Winneshiek	100.0

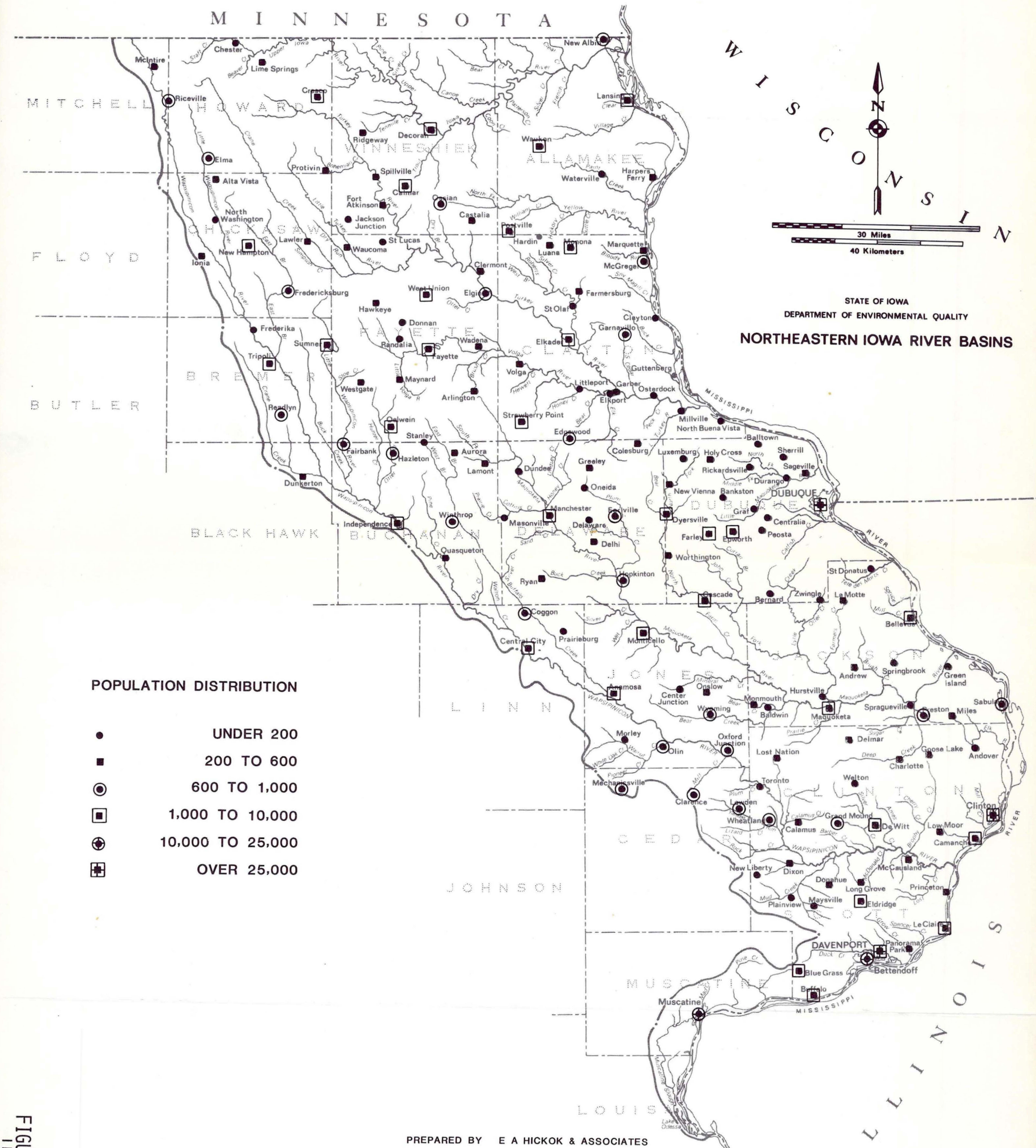


FIGURE II-1
II-3

TABLE II-2

EXISTING AND PROJECTED POPULATIONS (AFTER TAYLOR (1))

NORTHEASTERN IOWA BASIN

TOWN	COUNTY	POP. 1970	POP. 1990
Alta Vista	Chickasaw	283	318
Andover	Clinton	90	120
Anamosa	Jones	4,389	4,687
Andrew	Jackson	335	456
Arlington	Fayette	481	536
Aurora	Buchanan	229	256
Baldwin	Jackson	172	234
Balltown	Dubuque	79	153
Bankston	Dubuque	28	54
Bellevue	Jackson	2,336	3,148
Bernard	Dubuque	148	288
Bettendorf	Scott	22,315	45,344
Blue Grass	Scott	1,032	2,167
Buffalo	Scott	1,513	2,219
Calamus	Clinton	396	529
Calmar	Winneshiek	1,008	2,772
Camanche	Clinton	3,470	7,137
Cascade	Dubuque	1,744	2,256
Castalia	Winneshiek	210	210
Center Junction	Jones	172	200
Central City	Linn	1,116	1,116
Centralia	Dubuque	105	204
Charlotte	Clinton	444	593
Chester	Howard	185	185
Clarence	Cedar	915	960
Clayton	Clayton	113	139
Clermont	Fayette	582	649
Clinton	Clinton	34,719	39,822
Coggon	Linn	656	1,020
Colesburg	Dubuque	379	737
Cresco	Howard	3,927	5,270
Davenport	Scott	98,469	103,293
De Witt	Clinton	3,647	5,266
Decorah	Winneshiek	7,458	9,046
Delaware	Delaware	153	194

TABLE II-2 (cont.)

TOWN	COUNTY	POP. 1970	POP. 1990
Delhi	Delaware	527	669
Delmar	Clinton	599	800
Dixon	Scott	276	315
Donahue	Scott	216	246
Donnan	Fayette	18	20
Dyersville	Dubuque	3,437	5,155
Dubuque	Dubuque	62,309	71,094
Dundee	Delaware	166	210
Dunkerton	Black Hawk	563	874
Durango	Dubuque	55	107
Earlville	Delaware	751	954
Edgewood	Clayton	786	973
Eldridge	Scott	1,535	5,423
Elgin	Fayette	631	704
Elkader	Clayton	1,592	2,388
Elkport	Clayton	87	107
Elma	Howard	601	601
Epworth	Dubuque	1,132	2,204
Fairbank	Buchanan	810	906
Farley	Dubuque	1,096	2,133
Farmersburg	Clayton	232	287
Fayette	Fayette	1,947	3,212
Fort Atkinson	Winneshiek	339	339
Fredericksburg	Chickasaw	912	1,025
Frederika	Bremer	190	205
Garber	Clayton	148	183
Garnavillo	Clayton	634	784
Goose Lake	Clinton	218	247
Graf	Dubuque	70	136
Grand Mound	Clinton	627	712
Greeley	Delaware	323	410
Green Island	Jackson	112	152
Guttenberg	Clayton	2,177	3,265
Harpers Ferry	Allamakee	227	260
Hawkeye	Fayette	529	590
Hazelton	Buchanan	626	700
Holy Cross	Dubuque	290	564
Hopkinton	Delaware	800	1,016
Hurtsville	Jackson	88	119
Independence	Buchanan	5,910	6,991

TABLE II-2 (cont.)

TOWN	COUNTY	POP. 1970	POP. 1990
Ionia	Chickasaw	270	303
Jackson Junction	Winneshiek	106	106
La Motte	Jackson	326	444
Lamont	Buchanan	498	557
Lansing	Allamakee	1,128	1,623
Lawler	Chickasaw	513	576
Le Claire	Scott	2,520	4,536
Lime Springs	Howard	497	497
Littleport	Clayton	97	120
Long Grove	Scott	269	307
Lost Nation	Clinton	547	621
Low Moor	Clinton	347	394
Lowden	Cedar	667	700
Luana	Clayton	225	278
Luxemburg	Dubuque	185	360
Manchester	Delaware	4,641	6,153
Maquoketa	Jackson	5,677	6,994
Marquette	Clayton	509	630
Masonville	Delaware	147	186
Maynard	Fayette	503	561
Maysville	Scott	170	194
McCausland	Scott	226	258
McGregor	Clayton	990	1,225
McIntire	Howard	234	234
Mechanicsville	Cedar	989	1,038
Miles	Jackson	409	557
Millville	Clayton	27	33
Monmouth	Jackson	257	350
Monona	Clayton	1,395	2,092
Monticello	Jones	3,509	4,712
Morley	Jones	123	143
Muscatine	Muscatine	22,405	27,199
New Albin	Allamakee	644	739
New Hampton	Chickasaw	3,621	4,526
New Liberty	Scott	141	161
New Vienna	Dubuque	392	763
North Buena Vista	Clayton	118	146
North Washington	Chickasaw	134	150
Oelwein	Fayette	7,735	8,926
Olin	Jones	710	828

TABLE II-2 (cont.)

TOWN	COUNTY	POP. 1970	POP. 1990
Oneida	Delaware	55	69
Onslow	Jones	253	295
Ossian	Winneshiek	847	847
Osterdock	Clinton	59	67
Oxford Junction	Jones	666	777
Panorama Park	Scott	219	250
Peosta	Dubuque	116	225
Plainview	Scott	23	26
Postville	Allamakee	1,546	2,125
Prairieburg	Linn	182	285
Preston	Jackson	950	1,293
Princeton	Scott	633	722
Protovin	Howard	333	333
Quasqueton	Buchanan	464	519
Randalia	Fayette	81	90
Readlyn	Bremer	616	666
Riceville	Howard	877	877
Richardsville	Dubuque	193	375
Ridgeway	Winneshiek	218	218
Rowley	Buchanan	241	270
Ryan	Delaware	343	435
Sabula	Jackson	845	1,150
Sageville	Dubuque	338	658
St. Donatus	Jackson	164	223
St. Lucas	Fayette	194	216
St. Olaf	Clayton	140	173
Sherrill	Dubuque	190	369
Spillville	Winneshiek	361	361
Spragueville	Jackson	112	152
Springbrook	Jackson	196	266
Stanley	Fayette	151	168
Strawberry Point	Clayton	1,281	1,772
Sumner	Bremer	2,174	2,271
Toronto	Clinton	145	164
Tripoli	Bremer	1,345	1,759
Troy Mills	Linn	250	250
Volga	Clinton	305	346
Wadena	Fayette	237	264
Waterville	Allamakee	158	181
Waucoma	Fayette	357	398
Waukon	Allamakee	3,883	5,276

TABLE II-2 (cont.)

TOWN	COUNTY	POP. 1970	POP. 1990
Welton	Clinton	104	118
West Union	Fayette	2,624	3,531
Westgate	Fayette	204	227
Wheatland	Clinton	832	945
Winthrop	Buchanan	750	839
Worthington	Dubuque	365	710
Wyoming	Jones	746	870
Zwingle	Dubuque	96	186

ECONOMICS

Information for this section, was obtained from the Upper Mississippi River Comprehensive Basin Study (2).

A brief economic profile for the Northeastern Iowa Basin is given in Table II-3.

Labor Force

The labor force is expected to grow with the population between 1960 and 2000 at about the same rate as the national changes projected for the same period. The percent of population in the labor force follows the same pattern exhibited by other agricultural areas, with a relatively high proportion of men to women in the labor force. These relative labor participation rates are expected to continue to the turn of the century.

Personal Income

Personal per capita income is expected to increase at about the same rate as the national average. As higher wage industries replace agriculture in the basin, per capita income is expected to move close to the national level by the year 2020. Total personal income is expected to be somewhat less than the national average between 1960 and 2020.

TABLE II-3

ECONOMIC PROFILE OF THE NORTHEASTERN IOWA BASIN

	Population, thousand			Personal Income	
	Total	Nonfarm	Farm	Total Income	Per Capita Income
Year	Number	Number	Number	Million 1960 Dollars	Dollars
1960	474	357	117	950	2,006
1980	619	522	97	2,240	3,622
2000	856	781	75	5,274	6,158
2020	1,190	1,126	64	11,650	9,832

	Employment, thousand				
Year	Total	Noncommodity Producing[a]	Commodity Producing[b]	Manufacturing Commodities	Nonmanufacturing Commodities
1960	173	91	82	43	39
1980	225	144	81	48	33
2000	296	219	77	51	26
2020	408	333	75	55	20

Employment for Selected Manufacturing Industries by SIC[d], thousand

Year	20 Food	28 Chem	29 Petrol Prod	32 Stone, Clay, Glass	33 Primary Metals	34,35 Fabr Met & Nonelec Mach	Total
1960	21	1	-	(c)	4	7	33
1980	22	1	-	(c)	5	7	35
2000	22	1	-	-	5	7	36

Output (Value Added) for Selected Manufacturing Industries by SIC, million 1960 dollars

Year	20 Food	28 Chem	291 Petrol Ref	324 Hyd Cemt	33 Primary Metals	34,35 Fabr Met & Nonelec Mach	Total
1960	215	33	-	-	52	83	383
1980	519	73	-	-	120	147	859

[a]Noncommodity group includes the following SIC categories: 15-17 Construction; 40-49 Transportation, Communications, and Public Utilities; 50 Wholesale Trade; 52-59 Retail Trade; 60-67 Finance, Insurance, and Real Estate; 70-89 Services; and 91-93 Government.

[b]Commodity group includes SIC categories: 01-09 Agriculture; 10-14 Mining; 19 Ordnance; 20 Food; 21 Tobacco; 22 Textiles; 23 Apparel; 24 Lumber; 25 Furniture; 26 Pump and Paper; 27 Printing and Publishing; 28 Chemicals; 29 Petroleum Products; 30 Rubber and Plastics; 31 Leather Products; 32 Stone, Clay, and Glass; 33 Primary Metals; 34 Fabricated Metals; 35 Nonelectrical Machinery; 36 Electrical Equipment; 37 Transportation Equipment; 38 Instruments; and 39 Miscellaneous Manufacturing and Other Manufacturing.

[c]Less than 500 employees.

[d]Standard industrial classification.

Employment

As shown in Table II-4, civilian employment in a selected area, detailed in Figure II-2, which includes a major portion of the Northeastern Iowa Basin (and portions of adjacent Illinois and Wisconsin), is expected to continue the growth of the recent past. In the period from 1960 to 2020, civilian employment will more than double from 522 thousand to 1.34 million. This rate of increase is about the same as the projected national average.

Employment in industries selling primarily outside the region (export industries) is expected to grow more slowly than total employment. By the turn of the century, residentiary industries are expected to employ 80 percent more workers than export industries. This will be a reversal from 1950 to 1960, when there were fewer residentiary industry employees than export industry employees.

Both manufacturing and services surpassed agriculture as the largest industry in the region between 1950 and 1960. By 2020, agriculture is expected to decline to half of the 1960 level, with its share of the employment sector declining to only 1/25th. As recently as 1950, one-fourth of the employment in the region was agricultural.

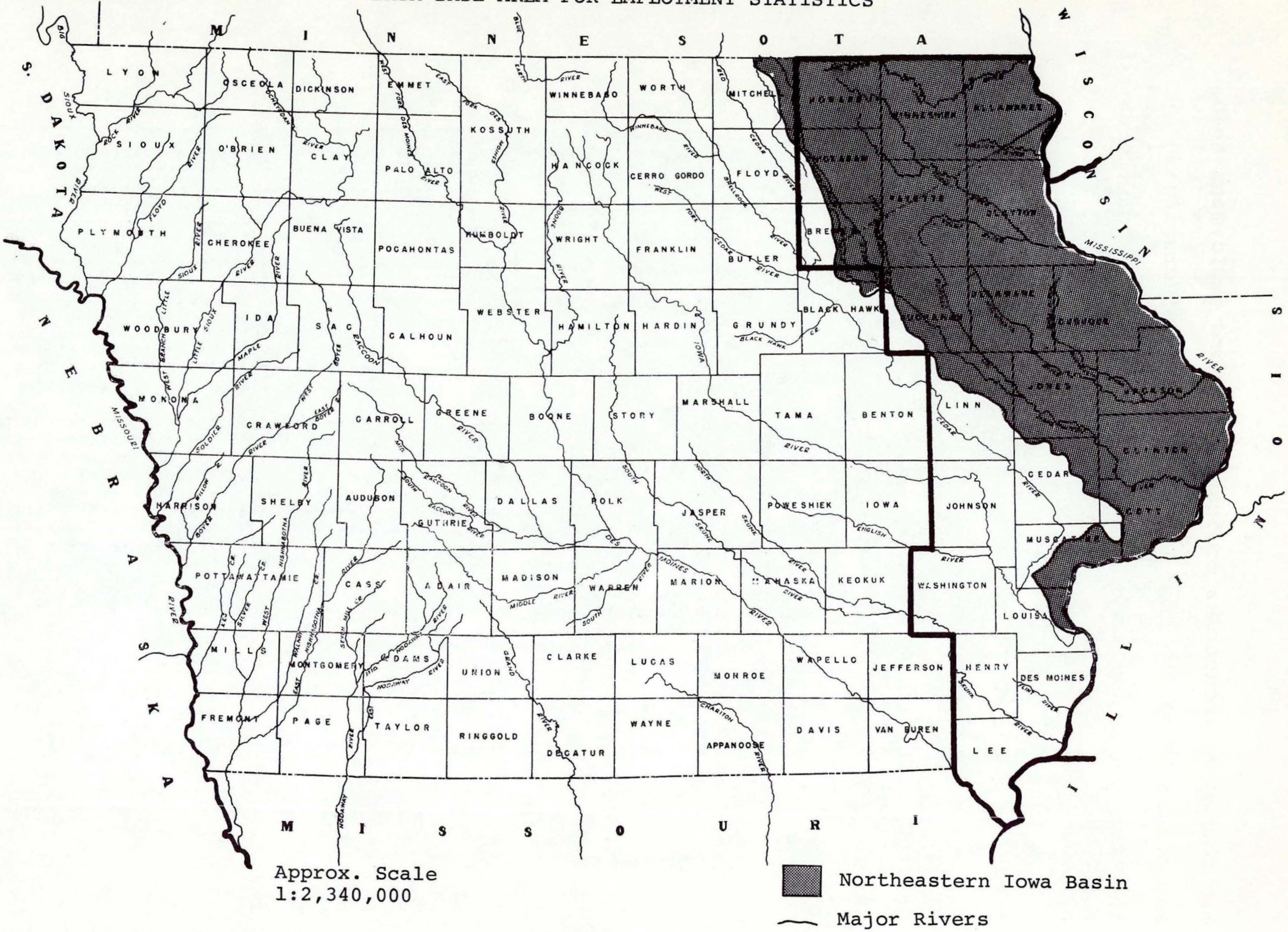
TABLE II - 4

SUMMARY ECONOMIC DATA (2) FOR SELECTED AREA SHOWN IN FIGURE II - 2

NORTHEASTERN IOWA BASIN

	Unit	1950	1960	1970	1980	1990	2000	2100	2020
Population............................	thousands	1,302	1,432	1,573	1,844	2,193	2,552	3,062	3,669
Students............................	thousands	20	25	43	58	63	67	-	-
Total, excluding students............	thousands	1,282	1,407	1,530	1,786	2,130	2,485	-	-
Male............................	thousands	640	693	743	874	1,048	1,225	-	-
Female............................	thousands	642	714	787	912	1,082	1,260	-	-
Total, 15 - 69 yrs. excl. students...	thousands	849	853	923	1,088	1,264	1,475	-	-
Male............................	thousands	422	417	447	530	621	726	-	-
Female............................	thousands	427	435	476	557	643	749	-	-
Total, excluding rural farm...........	thousands	965	1,136	1,310	1,614	1,993	2,382	2,904	3,523
Labor Force:									
Total............................	thousands	-	553	594	682	804	943	-	-
Male............................	thousands	-	382	385	442	521	611	-	-
Female............................	thousands	-	171	209	240	283	333	-	-
Labor Force Participation Rate:									
Total............................	percent	-	61.5	64.3	62.7	63.4	64.0	-	-
Male............................	percent	-	86.2	86.1	83.3	84.0	84.2	-	-
Female............................	percent	-	37.5	43.9	43.0	44.0	44.4	-	-
Employment (jobs):									
Total............................	thousands	482	522	595	694	818	948	1,137	1,344
Export............................	thousands	249	267	278	294	315	338	-	-
Residentiary......................	thousands	233	255	317	400	503	609	-	-
Total Employment (persons)............	thousands	-	-	565	659	777	900	-	-
Unemployment Rate......................	percent	2.2	3.4	4.8	3.3	3.4	4.6	-	-
Personal Income:									
Total............................	mil. 1960 $	2,310	2,972	4,597	7,028	10,696	16,172	24,787	37,071
Wages and salaries....................	mil. 1960 $	1,660	2,022	3,135	4,723	7,209	10,900	-	-
Other income..........................	mil. 1960 $	650	950	1,462	2,305	3,487	5,272	-	-
Per capita............................	1960 $	1,775	2,075	2,921	3,811	4,877	6,337	8,096	10,103
Wages and salaries per employee.......	1960 $	3,446	3,871	5,268	6,808	8,814	11,500	-	-

FIGURE II-2
DATA BASE AREA FOR EMPLOYMENT STATISTICS



Manufacturing industries accounted for more employment than any others in 1960. From 1950 to 1960, manufacturing in the region grew faster by 50 percent than in the country as a whole.

Food and food-related products, and non-electric machinery and equipment are the two largest industries engaged in manufacturing. Growth potential is low for both of these industries. The food industry is expected to remain stable with little growth in employment, while the non-electric machinery should show a drop in total employment by 2000. However, the electrical machinery and equipment industry is projected to nearly triple in employment from 1960 to 2000. This industry will account for most of the growth in the manufacturing sector, surpassing the non-electric equipment industry in size of employment by 1990.

Fabricated metals manufacturing, a substantial source of employment, is expected to remain nearly constant in absolute numbers of workers. Mining activity is projected to remain very minor through 2020.

Services are expected to increase by a factor of six between 1960 and 2020. The increase will make services the largest single employer by 1980. Government employment will increase by a factor of five from 1960 to 2020. Finance insurance and real estate are expected to more than double over the period. Construction will keep a nearly even pace with the general growth in employment, as will wholesale trade. Retail trade, transportation, communications, and public utilities will decrease its percentage share of total employment.

RECREATIONAL ACTIVITIES

The Northeastern Iowa Basin provides a limited amount of water-related recreational activities. The following areas are suitable for recreational sites.

1. Hills with trees for nature observation, hiking, and camping.
2. Lakes or streams for swimming, boating, water skiing, tubing and fishing.
3. Flood plains and plateaus for organized sport activities.
4. A combination of the above as a game habitat.

A common consideration of all available county and city plans reviewed for the study was the concept of retaining land along rivers for conservancy belts. These are to be left in a natural state for recreational pursuits, such as hiking and stream access.

The Upper Iowa River system is unique in the State in that most of the major waters are classified as cold water streams. The exceptions are the Upper Iowa River itself below Decorah, which is a warm water stream, and some of the very small creeks, which are not classified.

According to Knutson in the "Environmental Inventory Report on the Dry Run Flood Control Project in Decorah" Iowa, there are forty-six cold water streams in the Northeastern Iowa Basin (mostly in the Upper Iowa Basin) which are stocked with Rainbow Trout and Brown Trout, including the Upper Iowa River itself between Decorah and Lime Springs. In 1973, a total of 10,000 trout were stocked in the Upper Iowa River itself, with about another 30,000 stocked in the streams associated with Twin Springs and Silver Springs.

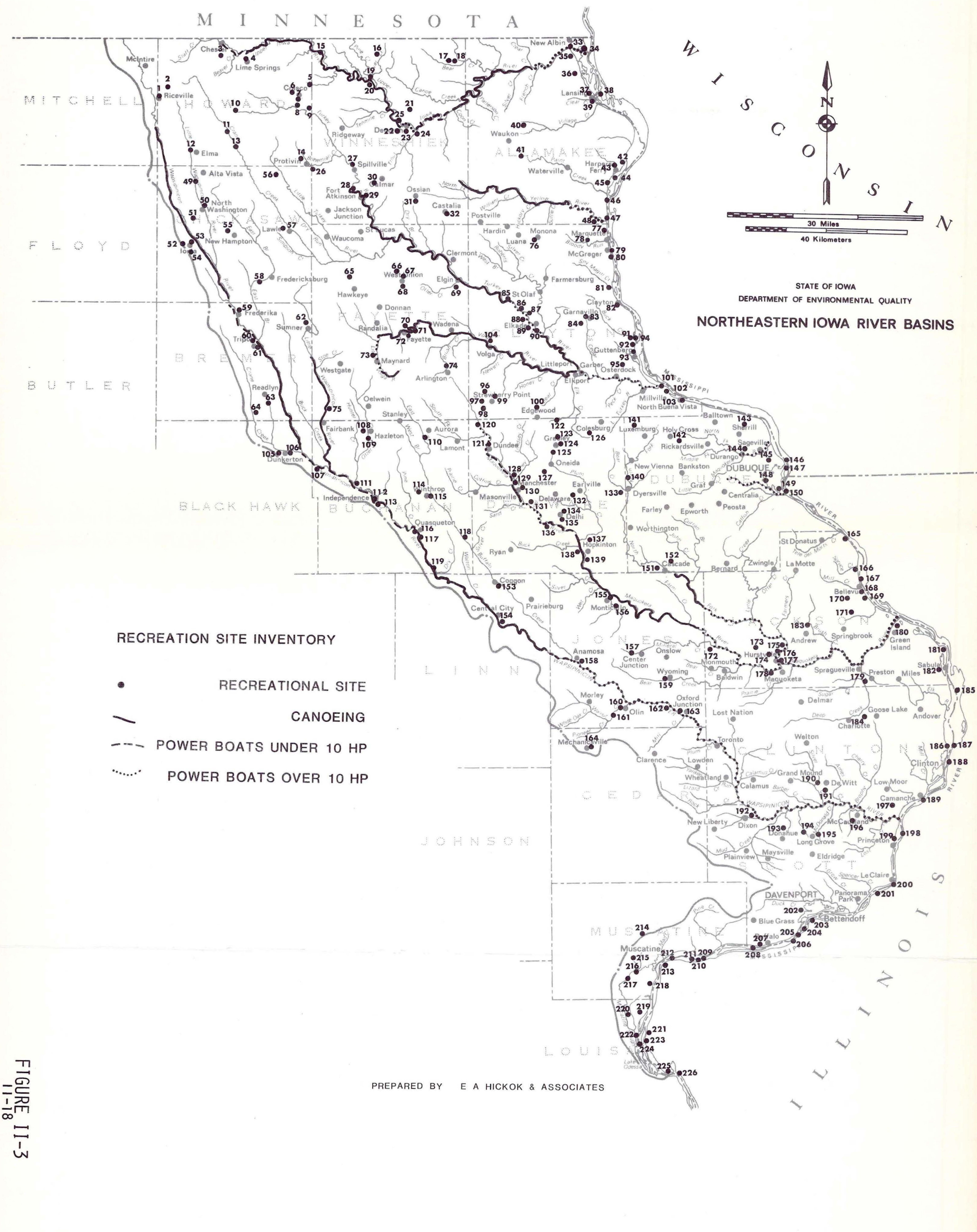
The Upper Iowa River is also a popular stream for the growing sport of tubing (riding with the current in inner tubes). Canoeing is also especially popular on this river.

Because of the varied topography and the associated soil types and micro-climate types that exist immediately along the rivers of the Upper Iowa Basin, there are many unique plant and vegetation types that encourage hiking. Some of the cold water creeks in the other rivers of the Northeastern Iowa Basin have similar attributes.

From a recreational standpoint, water must be of sufficient quality to support the propagation of desirable forms of fish and wildlife. Iowa "Class B" warm water standards should be adequate to satisfy this requirement (see Chapter IV, Water Quality). In areas where human body contact with the water is permitted, "Class A" standards are required for public health reasons. Maintenance of either Class A or Class B standards are required to retain an aesthetically acceptable water condition.

Figure III-3 shows the location of areas for boating activities in the Northeastern Iowa Basin. In areas allowing power boats in excess of 10 horsepower, it is assumed that water-skiing (and swimming) would occur and that Class A standards should apply even though they may not now be in effect. Total or partial body contact with water would probably occur in areas not specifically designated. For example, body contact would generally occur in the canoeing regions. However, only those areas designated as body contact areas need to meet Class A standards.

Figure III-3 also shows the location of existing and proposed recreational sites in the river basin. Table II-5, based on information in "Outdoor Recreation in Iowa", Vol. V(b), lists data relative to each site.(3) Average peak daily attendance at



MINNESOTA
WISCONSIN
ILLINOIS
N
30 Miles
40 Kilometers
STATE OF IOWA
DEPARTMENT OF ENVIRONMENTAL QUALITY
NORTHEASTERN IOWA RIVER BASINS
RECREATION SITE INVENTORY
RECREATIONAL SITE
CANOEING
POWER BOATS UNDER 10 HP
POWER BOATS OVER 10 HP
MITCHELL
HOWARD
WINNESHIEK
ALLAMAKEE
FLOYD
CHICKASAW
FAYETTE
CLAYTON
BUTLER
BREMER
BLACK HAWK
BUCHANAN
DELAWARE
DUBUQUE
JONES
JACKSON
LINN
CEDAR
CLINTON
JOHNSON
SCOTT
MUSCATINE
LOUISA
MISSISSIPPI RIVER
WAPSIPINICON
DAVENPORT
DUBUQUE
PREPARED BY E A HICKOK & ASSOCIATES

FIGURE II-3

TABLE II-5

EXISTING AND PROPOSED RECREATION FACILITIES

NORTHEASTERN IOWA BASIN

NO.	NAME OF AREA	OWNERSHIP	USAGE	ACRES TOTAL AREA	ACRES LAND AREA	ACRES WATER AREA	ARCHERY/GUN CLUB	BOATING	BOATING ACCESS	CAMPING	FISHING	GOLF COURSE	HIKING TRAILS	HUNTING	PICNICKING	SWIMMING
1	Lake Hendricks	County	2	130	78	52		*	*	*	*		*	*	*	*
2	Cowan Wildlife Area	County	1	1	1						*			*		
3	Dicken Wildlife Area	County	1	14	14						*					
4	Iowa River Access	County	2	10	5	5	*			*	*				*	
5	Big Elks Trout Stream	County	1	1	1		*				*					
6	Scharnwelter Wildlife	County	1	1	1										*	
7	Turkey River Access	State	2	87	84	3				*	*		*	*	*	
8	Vernon Spring Park	County	2	64	64			*	*	*	*	*			*	
9	Cardinal Marsh	State	1	862	776	96				*	*			*	*	
10	Houska Johnson Area	County	1	20	20					*	*				*	
11	Roman Park	County	1	1	1					*					*	
12	Merricks Pond	County	1	13	10	3					*			*		
13	Carroll Access Area	County	1	2	1	1										
14	Stephen Wildlife Area	County	1	3	3									*		
15	Kendoville Access	State	1	10	10					*						
16	Coldwater Spring and Cave	Private	2	61	60	1					*			*		
17	South Bear Access	State	2	235	232	3				*	*			*	*	
18	North Bear Creek	State	2	445	440	5				*	*			*	*	
19	Bluffton Area	State	1	94	84	10				*	*			*	*	
20	C. Baker Park	County	1	12	12			*	*	*	*					
21	Canoe Creek	State	1	224	220	4		*		*	*				*	
22	Twin Spring	State	1	6	4	2					*			*		
23	Spring Trout Run	State	2	91	78	13					*			*	*	
24	Merlin Moe Park	County	1	10	10					*					*	
25	Melanophy Springs	State	1	64	62	2				*	*			*	*	
26	Ludwig Access	County	1	10	9	1				*					*	
27	Inwood Camping & Picnicking	Private	1												*	
28	Ft. Atkinson State Reserve	State	1	5	5										*	
29	St. James Lutheran Church	State	1	1	1											
30	Lake Meyer	County	2	126	88	38		*	*		*				*	

TABLE II-5

EXISTING AND PROPOSED RECREATION FACILITIES

NORTHEASTERN IOWA BASIN

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31	Carey's Campground; Ossian	Private	1													
32	Walden Pond	Private	4	40	40					*						
33	Fish Farm Mounds St. Reserve	State	1	3	3											
34	Duck Lake on New Albins Big Lake	State	2	200		200		*	*		*			*		
35	Mud Hen Lake	State	2	164		164			*		*			*		
36	Kains Siding & Area	State	1	200	200											
37	Lansing State Park	State	1	22	22			*	*		*					
38	Lansing Big Lake	State	1	679	679			*			*			*		
39	Private Boat Landing; Lansing	Private	1					*	*		*					
40	French Creek	State	2	462	459	3		*		*	*				*	
41	Little Paint Creek	State	2	470	465	5				*	*		*	*	*	
42	Upper Mississippi River National Wildlife Reserve	Federal	2	27548	6060	21488		*			*					
43	Private Boat Landing; Harpers	Private	1					*	*	*	*			*		
44	Nobles	State	1	30	20	10		*	*		*			*		
45	Waukon Jct. Access	State	2	204	54	150		*	*		*			*		
46	Yellow R. State Forest	State	2	5761	5753	8				*	*		*			
47	Effigy Mounds National Monument	Federal	2	474	474								*			
48	Effigy Mounds National Monument	Federal	2	900	790	110							*			
49	Goodale Conservation Area	County	1	22	20	2					*			*	*	
50	Haus Park	County	1	7	7					*	*				*	
51	Wapsi Access Area	County	1	60	60						*				*	
52	Chickasaw Mill	State	2	16	14	2				*	*			*		*
53	Jenn Timber	County	1	16	16											
54	Twin Ponds	County	2	157	144	13				*	*			*	*	
55	Devin Woods	County	1	12	12									*		
56	Saude Park	County	2	13	12	1		*	*	*	*					
57	Adolph Munson Park	County	1	3	3											
58	Split Rock Park	County	1	80	70	10				*					*	*
59	Alcock Park	County	2	22	21	1				*	*				*	
60	Wapsi River Access	County	2	10	10						*			*		

TABLE II-5

EXISTING AND PROPOSED RECREATION FACILITIES

NORTHEASTERN IOWA BASIN

NO.	NAME OF AREA	OWNERSHIP	USAGE	ACRES TOTAL AREA	ACRES LAND AREA	ACRES WATER AREA	ARCHERY/GUN CLUB	BOATING	BOATING ACCESS	CAMPING	FISHING	GOLF COURSE	HIKING TRAILS	HUNTING	PICNICKING	SWIMMING
61	Sweet Marsh	State	2	1907	942	965		*	*	*	*			*		*
62	North Woods Park	County	2	81	74	7				*	*			*		*
63	7-Bridge Park	County	1	50	43	7				*	*			*		*
64	Brandt Park	County	1	10	9	1				*	*					*
65	Gouldsburg Park	County	1	64	64					*		*			*	
66	Goeken Park	County	1	6	6					*					*	
67	Dutton's Cave Park	County	2	46	46					*			*		*	
68	Echo Valley Recreation Area	State	2	217	217					*						
69	Elgin Lake	Private	1	700	700											
70	Volga River Lake	State	3	2585	2585						*			*		
71	Grannis Creek	State	2	179	174	5				*	*			*		
72	Big Rock Access	State	1	334	324	10					*			*		
73	Twin Bridges Park	County	2	6	6					*		*			*	
74	Brush Creek Canyon Recreation Area	State	2	217	217					*						
75	Downing Park	County	1	40	40					*					*	
76	Gateway Park	County	1	3	3						*				*	
77	Boat Landing; Marquette	Private	1					*	*		*					
78	Bloody Run	County	2	135	131	4				*	*		*	*	*	
79	Boat Landing; McGregor	Private	1					*	*	*	*				*	
80	Pikes Peak; McGregor	State	4	870	870					*			*		*	
81	Sny Magill	Federal	2	5	5			*	*	*	*					
82	Clayton Mississippi River Access	County	3	2	2			*	*		*		*		*	
83	Buck Creek Area	County	2	103	103					*	*		*		*	
84	Boat Landings; Barnsville	Private	1													
85	Big Springs Fish Hatchery	State	1	75	67	8								*		
86	Clayton Co. Fairgrounds	County	1	33	33										*	
87	Lovers Leap Park	County	1	10	10											
88	Frieden Park	County	1	1	1			*			*				*	
89	Osborn Plantation	County	2	60	58	2				*	*		*		*	
90	Turkey River Park	County	1	2	2						*	*			*	

TABLE II - 5

EXISTING AND PROPOSED RECREATION FACILITIES

NORTHEASTERN IOWA BASIN

NO.	NAME OF AREA	OWNERSHIP	USAGE	ACRES TOTAL AREA	ACRES LAND AREA	ACRES WATER AREA	ARCHERY/GUN CLUB	BOATING	BOATING ACCESS	CAMPING	FISHING	GOLF COURSE	HIKING TRAILS	HUNTING	PICNICKING	SWIMMING
91	Upper Mississippi River National Wildlife Reserve	Federal	2	13396	2948	10448		*			*				*	
92	Lock and Dam #10	Federal	2					*			*					
93	Guttenberg National Fish Hatchery	Federal	1	1072	1033	39										
94	French Town Lake	Federal	1	11	11			*	*	*	*				*	
95	Merritt Forest	State	1	20	20									*		
96	Klemlein Mills Access	County	1	1	1			*			*				*	
97	Lutheran Bible Camp Strawberry Point	Private	1													
98	Joy Springs	County	2	80	75	5				*	*		*		*	
99	Stone Pine Plantation	County	1	2	2											
100	Bixby Area	State	1	69	69					*						
101	Turkey River Mounds State Reserve	State	1	82	82									*		
102	Mississippi River Shoreline	State	2	27	27			*	*		*			*		
103	Private Boat Landings; Buena Vista	Private	1					*	*	*	*				*	
104	Volga White Pine Forest	County	1	22	22											
105	Wapsi River Green Belt	State	4	509	507	2				*	*			*		*
106	Crane Creek	County	1	5	5						*			*		
107	Cutshaw Bridge	State	1	27	24	3		*	*		*			*		
108	Otter Creek Wildlife	County	1	37	37						*			*		
109	Fontana Park	County	2	124	64	60		*	*	*	*			*	*	
110	Jakeway Forest	County	1	310	310					*	*			*	*	
111	Otterville Bridge	State	2	187	155	32		*	*	*	*			*		
112	Wapsi River Access	County	2	51	26	25		*	*		*			*		
113	Three Elms Area	County	1	75	75						*			*		
114	Dan Laningham Wildlife Area	County	1	3	3									*		
115	Buffalo Creek Area	State	2	78	75	3				*	*				*	
116	Boies Bend	County	1	26	26					*	*				*	
117	Hoover Area	County	1	25	24	1								*		
118	Buffalo Wildlife Area	County	1	60	60						*			*		
119	Troy Mills	State	1	277	202	75					*			*		
120	Backbone State Park & Forest	State	4	1650	1520	130		*	*	*	*		*	*	*	*

TABLE II-5

EXISTING AND PROPOSED RECREATION FACILITIES

NORTHEASTERN IOWA BASIN

NO.	NAME OF AREA	OWNERSHIP	USAGE	ACRES TOTAL AREA	ACRES LAND AREA	ACRES WATER AREA	ARCHERY/GUN CLUB	BOATING	BOATING ACCESS	CAMPING	FISHING	GOLF COURSE	HIKING TRAILS	HUNTING	PICNICKING	SWIMMING
121	Dundee Access	County	1	20	18	2				*	*				*	
122	Double J Corral	Private	1	25	25					*						
123	Fountain Springs Co. Park	County	2	176	174	2				*	*			*	*	
124	Child's Wildlife Area	County	1	10	10									*		
125	Oneida Town Park	County	1	2	2										*	
126	Town Bridge Park	County	1	20	20					*	*			*	*	
127	Wildlife Areas	County	1	6	6									*		
128	Delaware Twp. Forest	County	1	22	22									*		
129	Coffins Grave Park	County	2	22	21	1		*	*	*	*					
130	Bailey's Ford Access	County	2	23	21	2		*	*	*	*				*	
131	Manchester National Fish Hatchery	Federal	1	25	25											
132	Plum Creek Park	County	1	29	29					*				*	*	
133	Tegler's Lake Dyersville	Private	2	12	12					*						
134	Silver Lake and Silver Lake Park	State	2	52	13	39				*	*				*	
135	Burton Wildlife Area	County	1	1		1								*		
136	Turtle Creek River Access	County	2	149	149			*	*	*	*			*	*	
137	Hood Wildlife Area	County	1	10	10									*		
138	Dunlap Park	County	1	1		1					*				*	
139	Hard Scrabble Park	County	2	42	42					*			*	*	*	
140	New Wine Park	County	2	126	126			*	*	*	*		*	*		
141	White Pine Hollow State Forest	State	1	712	712									*		
142	Bankston Park	County	2	120	118	2		*	*	*	*			*	*	
143	Anthony's Resort; Sherrill	Private	1													
144	Findleys Landing	County	1	116	116											
145	Mud Lake Lagoon	County	1	57	57			*	*	*	*			*	*	
146	Upper Miss. R. Nat. Wildlife Res. & Lock Dam #11	Federal	2	1290	1015	275			*		*			*		
147	Private Boat Landing; Dubuque	Private	1													
148	Swiss Valley Park	State	1	27	27						*					
149	Julien Dubuque Grove	State	1	12	12										*	
150	Herman Locks Marina	Private	1	10	10			*	*	*	*					

TABLE II - 5

EXISTING AND PROPOSED RECREATION FACILITIES

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151	Private Landing; Cascade	Private	1													
152	Fillmore Recreation Area	County	2	116	114	2				*	*			*		
153	Buffalo Creek Park	County	2	126	96	30		*	*	*	*					
154	Wakpicada	County	2	215	213	2		*	*	*	*			*	*	
155	Mon-Mag Dam	County	2	63	63			*	*		*				*	
156	Picture Rocks	State	2	427	422	5		*	*		*		*		*	
157	Central Park	County	1	217	192	25		*	*	*	*		*		*	
158	Wapsipinicon State Park	State	4	248	248			*	*	*	*		*	*	*	
159	Camp Wyoming	Private	1	340	340					*			*			
160	Newport Mills	Private	1	43	43					*						
161	Muskrat Slough	State	1	366	146	220								*	*	
162	Jungletown River Access	County	1	2	2			*	*		*			*	*	
163	Wapsi Park	Private	1	17	17											
164	Reorganized Church of Latter Day Saints Camp	Church	1													
165	Upper Mississippi River National Wildlife	Federal	2	8418	1861	6557		*	*		*					*
166	Spruce Creek Access	County	1	44	40	4		*	*	*	*				*	
167	Lock and Dam #12	Federal	2					*	*		*					
168	Bellevue Station	Federal	1	19	19			*	*		*					
169	Duck Creek Area	State	1	2	2			*	*	*	*			*	*	
170	Bellevue State Park	State	3	510	510			*	*	*	*			*		
171	Pleasant Creek Area	Federal	2	20	20			*	*	*	*			*	*	
172	Natural Spring	Private	1	50	35	15										
173	Leisure Lake	Private	1	300	260	40										
174	Blackhawk Wildlife Area	County	1	12	12									*		
175	Lake Hurst	Private	1	21	21			*	*		*				*	
176	Maquoketa Caves State Park	State	3	152	152					*			*			*
177	Horseshoe Pond	County	1	11	11					*			*		*	
178	Camp Stern	Private	1	40	40			*	*	*	*		*			
179	Dalton Pond	State	1	5	3	2					*			*	*	
180	Green Island	Federal	2	2722	1322	1400		*	*					*	*	*

TABLE II-5

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181	Boat Landings; Sabula	Private	1					*	*	*	*					
182	Sabula Fishing Peninsula	County	1	3	3			*	*	*	*					
183	Bluff Mills	Private	1	5	5										*	
184	Goose Lake	State	2	887	462	425		*	*		*			*		
185	Upper Mississippi River National Wildlife Refuge	Federal	2	2870	628	2242										
186	Lock & Dam Pool #13	Federal	2													
187	Bugler's Hollow Area	Federal	2	50	50			*	*	*	*				*	
188	Boat Landings; Clinton	Private	1													
189	Hanson's Boat Dock Camanache	Private	1					*	*	*	*					
190	Crystal Lake	Private	1	50	35	15										
191	Wildwood Camp	Private	1	20	20											
192	Buena Vista Public Use Area	County	3	165	165						*				*	
193	Allens Grove Park	County	2	10	10			*	*	*	*				*	
194	Butler Park	County	2	3	3			*	*	*	*		*		*	
195	Scott County Park	County	3	1268	1248	20		*	*	*	*		*	*	*	
196	Buffalo Bill Cody Homestead	County	2	4	4											*
197	Wapsi Wildlife Area	County	2	260	260					*	*			*		
198	Upper Mississippi River National Wildlife Reserve	Federal	2	708	158	550		*								
199	Princeton Area	Federal	2	1114	814	300		*	*		*		*	*		
200	LeClaire Legion Dock	Private	1	1	1				*					*		
201	Lock & Dam #14 & 15	Federal	2						*					*		
202	Paradise Lake	Private	2	192	192			*	*	*	*			*	*	*
203	Boat Landings; Davenport	Private	1	191	191			*	*	*	*			*		
204	Shady Creek Area	Federal	1	8	8			*	*	*	*			*		
205	Twin Lake	Private	1	40	40											
A	Dude Ranch	Private	1	40	40											
B	Campfire Girls	Private	1	186	186									*		*
C	Boy Scout Camp	Boy Scouts	1	230	230			*	*	*			*		*	
D	Girl Scout Camp	Girl Scouts	1	106	106								*		*	
E	YMCA - YWCA Camp	YMCA - YWCA	1	186	186					*			*			

TABLE II - 5

EXISTING AND PROPOSED RECREATION FACILITIES

NORTHEASTERN IOWA BASIN

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F	Central Turner Camp	Private	1	78	78											
G	Buffalo Outing Club	Private	1	32	32											
206	Harrah's Lake	Private	1	80	80						*				*	
207	Smith's Island Area	Federal	2	6	6			*	*		*				*	
208	Montpelier Area	Federal	2	5	5			*	*	*	*			*	*	*
209	Fairport National Fish Hatchery	Federal	1	59	40	19										
210	Wildcat Den State Park	State	4	321	321					*			*		*	
211	Fairport Station	Federal	2	21	21			*	*	*	*				*	
212	Sportsman's Club	Private	1													
213	Lock & Dam #16	Federal	2													
214	Camp Sacajawea	Private	1	39	39				*				*			
215	Salisbury Cedar River Access	County	1	74	74											
216	Muscatine Slough	State	1	1790		1790							*			
217	Keokuk Lake	State	1	30		30							*			
218	Monsanto Spring Lake	Private	1	115	115						*			*		
219	Plum Lake	State	2	650	400	250		*	*		*			*		
220	Muscatine Slough	State	1	1800	1800						*			*		
221	Port Louisa	Federal	2	1	1			*	*		*				*	
222	Lake Odessa	Federal	2	3207	1207	2000		*	*	*	*		*	*	*	
223	Mark Twain Net	Federal	2	4166	1029	3137		*	*		*	*			*	
224	Iowa River	Private	1	54	29	25				*			*			
225	Toolesboro Access	Federal	2	4	4			*	*		*					
226	Ferry Landing	Federal	2	15	15			*	*	*	*		*	*		

*APPROXIMATE PROBABLE USAGE

Visitors Per Average Peak Day	Usage Class
0-500	1
501-1,000	2
1,001-5,000	3
5,001-10,000	4
10,001-15,000	5
Over-15,000	6

parks was assumed to be 3 percent of the total yearly attendance. Total yearly attendance figures were obtained from state and county parks records, when available, or from estimates by park personnel. All wildlife areas were assumed to have less than 500 persons per peak day.

High user densities at specific recreation sites along the Northeastern Iowa basins and at certain lakes can impart a high pollution load on the nearby groundwater and surface water unless wastes are satisfactorily handled. Although many of the lakes are at present lightly developed, intense development will increase pollution potential. Proper planning of recreational and wastewater handling facilities would control the adverse impact upon water quality.

REFERENCES

1. J.R. Taylor, Provisional Projections of the Population of Iowa Counties and Cities: 1975 to 1990, Iowa State Department of Health, June 1972.

2. Upper Mississippi River Comprehensive Basin Study, vol. VIII, appendix P: Economic Base Study and Projections, prepared by the Economic Advisory Committee, Upper Mississippi River Basin Coordinating Committee, 1970.

3. Outdoor Recreation in Iowa vol. V(b), Iowa Outdoor Recreation Guide, prepared by Planning and Coordination Section, Iowa Conservation Commission, July, 1972.

CHAPTER III

BASIN CHARACTERISTICS

NORTHEASTERN IOWA BASIN

The Northeastern Iowa Basin consists of those basins that drain into the Mississippi River between the Minnesota state line and the height-of-land between the Wapsipinicon and Cedar River sub-basins. The basins are entirely in Iowa except for part of the Upper Iowa River and the Wapsipinicon River which drain a small portion of Minnesota. Streams entering the Mississippi in the northern part of the basin flow generally from west to east, while streams entering the Mississippi in the south flow from northwest to southeast.

The major sub-basins of the Northeastern Iowa Basin are those of the Upper Iowa, Yellow, Turkey, Maquoketa, and Wapsipinicon rivers.

The Wapsipinicon, the longest of the rivers, 225 miles, originates in Mower County, Minnesota. Its headwaters are at approximately 1,700 feet elevation, dropping to 565 feet elevation at its confluence with the Mississippi.

The south fork of the Maquoketa originates in Fayette County Iowa, with one somewhat smaller north fork originating in northwestern Dubuque County. The two forks join at

Maquoketa approximately 20 miles before the river empties into the Mississippi.

The Turkey River originates in Howard County, at 1380 feet, not far from the origin of the Wapsipinicon and Upper Iowa rivers. Its main tributary, the Volga, originates in Fayette County.

The Upper Iowa originates in Mower County, Minnesota. The drainage system of the Upper Iowa River is the major cold water stream system of the state. The major creeks are classified as Class B cold water, while the river itself is Class A, and Class B cold water above Decorah, and Class A and Class B warm water below Decorah. Although its source is in Minnesota, the Upper Iowa flows through Iowa for most of its course.

The Yellow River, 44 miles long, the smallest of the major basins, originates in Winneshiek County and drains part of Allamakee and Clayton counties.

Figure III-1 depicts the basins and Table III-1 lists the area drained by the rivers.

FIGURE III-1

NORTHEASTERN IOWA BASIN

TABLE III-1

DRAINAGE AREAS OF STREAMS IN THE

NORTHEASTERN IOWA BASIN

Stream	Area (Square Miles)	Source*
Upper Iowa River Basin		
Upper Iowa River		
below Beaver Creek	182	b
below Pine Creek	403	b
at USGS, Decorah	511	d
below Canoe Creek	731	b
Total	1,005	b
Paint Creek Basin		
Paint Creek		
at USGS, Waterville	42.8	d
Total	85.5	b
Yellow River Basin		
Yellow River		
at Ion	221	c
Total	241	b
Turkey River Basin		
Turkey River		
at USGS, Spillville	177	d
below Little Turkey River	635	b
Little Turkey River Total	355	b
at discontinued USGS, Elkader	891	d
at USGS, Garber	1,545	d
Volga River Total	403	b
Total	1,684	b

TABLE III-1 (continued)

Little Maquoketa River Basin		
Little Maquoketa River		
at USGS, Durange	130	d
Total	157	b
Maquoketa River Basin		
Maquoketa River		
at USGS, near Manchester	305	d
below Kitty Creek	657	b
below Bear Creek	935	b
below North Fork Maquoketa River	1,550	b
North Fork Maquoketa River Total	592	b
Total	1,879	b
Wapsipinicon River Basin		
Wapsipinicon River		
near Elma	95.2	c
below East Fork Wapsipinicon River	493	b
East Fork Wapsipinicon River Total	148	b
below Little Wapsipinicon River	899	b
Little Wapsipinicon River Total	206	b
at USGS, Independence	1,048	d
below Buffalo Creek Total	1,562	b
Buffalo Creek Total	232	b
at USGS, near DeWitt	2,330	d
Total	2,540	b
Mississippi River Basin		
Mississippi River		
at McGregor	67,500	c
at Clinton	85,600	c

* a - Water Supply Papers of the United States Geological Survey

b - An Inventory of Water Resources and Water Problems - Floyd - Big Sioux River Basins, Iowa Bulletin 7

c - Water Resources Data for Iowa of the United States Geological Survey

d - Low-Flow Characteristics of Iowa Streams Through 1966 Iowa Natural Resources Council Bulletin No. 10

LAKES AND IMPOUNDMENTS

The lakes and impoundments of the Northeastern Iowa Basin are shown on Table III-2.

There are only nine lakes or impoundments wholly within the Northeastern Iowa Basin that exceed 100 acres in area. Nearly all of the significant waters are at the eastern edge of the region along the Mississippi, where waters are impounded behind nine Federal dams. Three large impoundments are found behind Federal Dams 9, 11 and 13 near Harper's Ferry, Dubuque, and Clinton, respectively.

The largest lake entirely within the basin is the 3,000 acre Lake Odessa, which is located along a slough of the Mississippi River bottomlands in Louisa County.

The second largest lake, Harwick, is a private on-stream impoundment in Delaware County with an area of 538 acres. The third largest, Green Island Lake, is an off-stream impoundment along the Mississippi bottomlands in Jackson County.

Fourth, sixth and seventh largest are the three Sweet Marsh segments, A, B, and C, with acreages of 390, 255, and 235 respectively. They are located in Bremer County, and are all off-stream impoundments under state ownership. Fifth largest is South Sabula Lake in Jackson County with an area of 260 acres.

Eighth and ninth largest are the 115 acre off-stream impoundment, North Sabula Lake, next to South Sabula Lake, and 100-acre Backbone Lake in Delaware County, a state-owned on-stream impoundment.

Of the total number of State impoundments and lakes over 3/4 acres, 13 are Class A.

Because of the well-developed drainage system, there is not a single natural lake in the entire system of northeastern basins. The waters behind the Federal dams provide the bulk of waters for navigation, recreation, and other uses.

TABLE III-2

LAKES AND IMPOUNDMENTS
NORTHEASTERN IOWA BASIN

LAKE OR IMPOUNDMENT	COUNTY	SURFACE ACRES	LOCATION*	OWNERSHIP	TYPE OF WATER**	SURFACE WATER CLASSIFICATION		
						A	B	C
Sweet Marsh (Seg. A)	Bremer	390	12-93-35	State	OSI		X	
Sweet Marsh (Seg. B)	Bremer	255	12-93-35	State	OSI		X	
Sweet Marsh (Seg. C)	Bremer	235	12-93-35	State	OSI		X	
Sweet Marsh Reservoir	Bremer	85	12-93-35	State	OSI		X	
Frederika Impoundment	Bremer	20	12-93-7	City	OSI		X	
Fontana Mill	Buchanan	60	9-90-9	C.C.B.	OnSI		X	
Independence Impcund.	Buchanan	-	9-89-27	Private	OnSI	X	X	
Littleton Impoundment	Buchanan	15	10-89-10	Private	OnSI			
Stanley Pond	Buchanan	3	9-90-1	Private	FP			
Quasqueton	Buchanan	15	8-88-34	Private	OnSI	X	X	
Bennett Lake	Cedar	10	1-80-11	C.C.B.	OSI		X	
Split Rock	Chickasaw	10	12-94-33	C.C.B.	OSI		X	
Berger Pond	Clayton	1	5-94-33	Private	FP			
Butikofer Pond	Clayton	.75	5-93-11	Private	FP			

TABLE III-2 (continued)

LAKES AND IMPOUNDMENTS
NORTHEASTERN IOWA BASIN

LAKE OR IMPOUNDMENT	COUNTY	SURFACE ACRES	LOCATION*	OWNERSHIP	TYPE OF WATER**	SURFACE WATER CLASSIFICATION		
						A	B	C
Elkader Impoundment	Clayton	20	5-93-23	State	OnSI		X	
Johnson Ponds	Clayton	1.5	5-94-13	Private	FP			
Johnson Pond	Clayton	3	5-94-27	Private	FP			
Klink Pond	Clayton	1.14	5-92-4	Private	FP			
Backbone Lake	Delaware	100	6-90-15	State	OnSI	X	X	
Harwich Lake	Delaware	538	5-88-25	Private	OnSI	X	X	
Manchester Impound.	Delaware	14	5-89-29	Private	OnSI			
Quaker Mills	Delaware	64	5-89-18	Private	OnSI	X	X	
Silver Lake (Delhi)	Delaware	10	4-88-16	C.C.B.	OSI		X	
Sportsman Pond	Delaware	12	3-88-10	Private	OSI			
Worthington Ponds	Delaware	50	3-88-9	Private	OSI			
Maus Pond	Dubuque	10	3-89-31	City	Pit		X	
Ashby Quarry	Fayette	5	9-93-26	Private	PP			
Fairbank Impoundment	Fayette	8	10-91-32	Private	OnSI			
Mare Mard Impoundment	Fayette	5	9-92-15	City	OnSI		X	

TABLE III-2 (continued)

LAKES AND IMPOUNDMENTS
NORTHEASTERN IOWA BASIN

LAKE OR IMPOUNDMENT	COUNTY	SURFACE ACRES	LOCATION*	OWNERSHIP	TYPE OF WATER**	SURFACE WATER CLASSIFICATION		
						A	B	C
Lake Oelwein	Fayette	23	9-91-28	City	OnSI	X	X	
Plogenhoelhl Pond	Fayette	7	9-95-12	Private	FP			
Waucoma Impoundment	Fayette	10	10-95-9		OnSI		X	
Lake Hendricks	Howard	50	14-99-18	C.C.B.	OSI	X	X	
Lime Springs Impound.	Howard	20	12-100-20	C.C.B.	OnSi		X	
Merrick Pound	Howard	7.5		C.C.B.	GP		X	
Vernon Spring	Howard	23	11-99-33	C.C.B.	OnSI		X	
Dalton Lake	Jackson	1.5	5-84-34	State	OSI		X	
Green Island Lake	Jackson	526	6-85-16	Federal	OSI			
Horseshore Impound.	Jackson	28	2-84-13	Private	OnSI			
North Sabula Lake	Jackson	115	7-84-8	Federal	OSI	X	X	
South Sabula Lake	Jackson	260	7-84-26	Federal	OSI	X	X	
Central Park Lake	Jones	25	3-84-1	C.C.B.	OSI	X	X	
Buffalo Creek	Linn	35	6-86-3	C.C.B.	OSI		X	
Central City Impound.	Linn	83	6-85-3	C.C.B.	OnSI	X	X	

TABLE III-2 (continued)

LAKES AND IMPOUNDMENTS
NORTHEASTERN IOWA BASIN

LAKE OR IMPOUNDMENT	COUNTY	SURFACE ACRES	LOCATION*	OWNERSHIP	TYPE OF WATER**	SURFACE WATER CLASSIFICATION A	B	C
Central City Pounds	Linn	2	6-85-3	C.C.B	GP		X	
Lake Odesa	Louisa	3,000	2-73-2	State	OX LK	X	X	
Cody Lake	Scott	5	4-80-20	C.C.B.	OSI		X	
Odetta Lake	Scott	7	4-80-29	C.C.B.	OSI		X	
Cardinal Marsh	Winneshiek	62	10-99-7	State	OSI			
Fort Atkinson Impound.	Winneshiek	18	9-96-5	Private	OSI			
Upper Dam Impoundment	Winneshiek	28	7-98-2	State	OnSI			
Lake Meyers	Winneshiek	38	9-97-34	C.C.B.	OSI	X	X	
Spillville Impound.	Winneshiek	8	9-97-19	Private	OnSI			
Upper Dam Impoundment	Winneshiek	22	7-98-8	State	OnSI			

*Range-Township-Section

** Type of Water -

FP--- Farm Pond
GP--- Gravel Pit
NL--- Natural Lake
OnSI- On Stream Impoundment
OSI-- Off Stream Impoundment
OX LK--- Oxbow Lake

PHYSIOGRAPHIC FEATURES

Northeastern Iowa's physiographic features, as described in Water Resources of Iowa (1), are the result of two major uplifts subsequently modified by several invasions of continental glaciers, followed by erosion during glacial interludes and after. During the period prior to glaciation, a complex and varying thickness of sediments, now represented mostly by sandstone, shale, limestone, and dolomite, were deposited chiefly by shallow seas that intermittently covered the area.

Unique erosional landscapes exist in the eastern part of the northeastern basins because bedrock is more evident than elsewhere in Iowa. The bedrock, of sedimentary origin, is a highly visible feature, especially along the Mississippi River.

Following the Cretaceous period, the area was reduced to gentle slopes, with elevation changes around 200 feet. This feature today is called Dodgeville Peneplain. However, before the Pleistocene Epoch, uplift again occurred, resulting in the formation of a new plain, now called the Lancaster Peneplain. Topographical variations of around 400 feet were present prior to the coming of the first glacier, with the Dodgeville Peneplain being the high ground.

Subsequent erosion has resulted in a variation in topography of about 600 feet, with the Dodgeville Peneplain still forming the high ground and the Mississippi floodplain constituting the low ground. Tributaries of the Mississippi in the extreme northeast of Iowa flow from the old bedrock to the alluvial fill of the Mississippi. The alluvium along the Mississippi is as much as 200 feet deep.

After the final uplift associated with the beginning of the Lancaster Peneplain, the first of the glaciers, the Nebraskan, invaded the region, covering most of northeastern Iowa with ice. The Nebraskan till was deeply eroded in those areas not subsequently covered by the Kansan glacier. Only isolated patches of residuum remain on the bedrock uplands. Wisconsin loess covered these uplands.

The Kansan glacier, the second of the series, spread over Northeastern Iowa except for Allamakee and eastern Winneshiek, Clayton and Dubuque counties.

Erosion and the deposition of loess have so modified the landscape that it is difficult to recognize glacial features of the Nebraskan and Kansan drift in those parts of Iowa not invaded by more recent glaciers.

The third glacier to invade the area was the Illinoian, which came from the east and invaded only parts of Clinton, Scott, Muscatine, and Louisa counties. The Illinoian topography has been highly modified also so that its marks are visible only as flat divides in the above-mentioned counties.

The Iowa substage, the first of the substages of recent Wisconsin glacier, advanced generally from the north well to the west of the Mississippi, but failed to enter Allamakee, Muscatine, and Louisa counties at all, and stopped short of most of Winneshiek, Clayton, Dubuque, Jackson, Clinton, Cedar and Scott counties. Indeed, no county entirely within the Northeastern Iowa Basin was completely covered by the Wisconsin glacier.

This represented the last glacier to invade the northeastern Iowa basins, except for extreme western Clinton county, which was barely invaded by the second sub-stage of the Wisconsin, the Tazewell.

The Iowan drift, which roughly covers the western half of the basin, is still highly evident. The break between the Iowan drift and the non-invaded region can easily be seen by an observer on the scene. In the west, the land is a broad, flat-to-gently-rolling plain, moderately well drained, and dotted with boulders. To the east is well-drained land with deep, narrow valleys and highly exposed bedrock.

SOILS

The publication (Bulletin 7), An Inventory of Water Resources and Water Problems, Northeastern Iowa River Basins, Iowa, gives an excellent discussion of soils in this area, which consists of those of the Iowan drift, those of the loess area, and those of the bottomlands and terraces (3).

The soils in this basin are the product of a combination of environmental factors including parent material, climate, natural vegetation, slope, drainage and time. These factors have given rise to a number of soil types which can be grouped into several major soil associations; namely, Carrington-Clyde, Cresco-Kasson-Clyde, Fayette, Tama-Downs, Tama-Muscatine, and Fayette-Dubuque-Stony Land. A soil association is a landscape that has a distinctive proportional pattern of soils. All parts of the association are not necessarily uniform in character, but each has an arrangement of soil types and topography which gives it a characteristic landscape. (Iowa State College, 1949). The principal soil association areas of Northeastern Iowa are shown in Figure III-2. The area normally contains one or more major soils and, at least, one minor soil, and are named for the major soils.

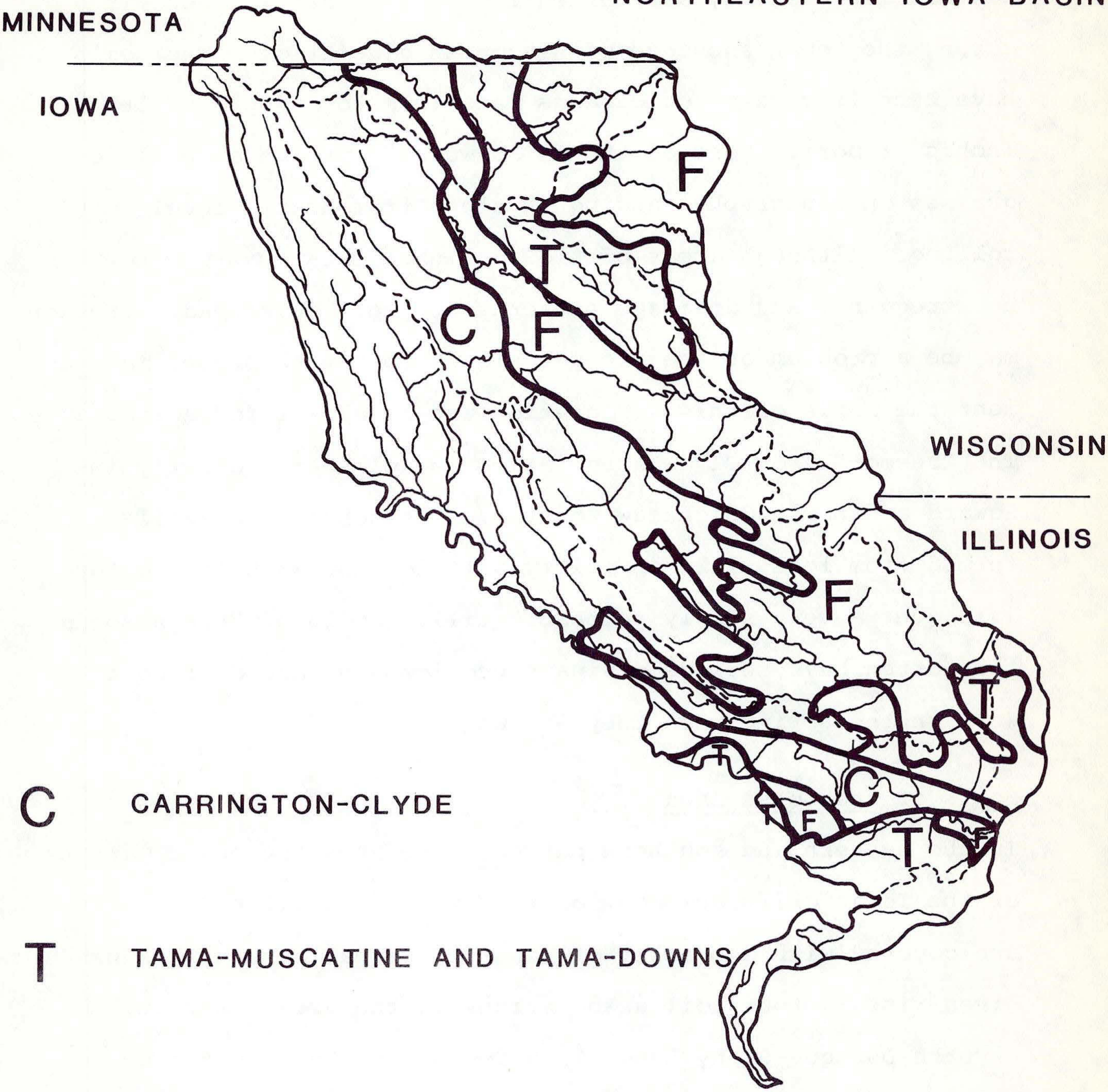
Soils of the Iowan Drift

Iowan drift soils make up two soil associations; Carrington-Clyde and Cresco-Kasson-Clyde. The soils of the Carrington-

FIGURE III-2

MAJOR SOIL GROUPS

NORTHEASTERN IOWA BASIN



C CARRINGTON-CLYDE

T TAMA-MUSCATINE AND TAMA-DOWNS

F FAYETTE AND FAYETTE-DUBUQUE-STONYLAND

Clyde Association, located in the western part of the Northeastern Iowa Basins, are formed from drift material deposited during the Iowan substage of Wisconsin glaciation. The soils have been leached of calcareous materials to a depth of 36 inches or more. Most of the soils were formed under prairie grasses on topography ranging in slope from nearly level to rolling. Although areas of slow drainage exist, ponding is not frequent, and drainage patterns are well developed. Erosion may be a problem on the steeper slopes, but with proper management the soils of this association are excellent for agriculture. The Cresco-Kasson-Clyde Association is delineated chiefly in Howard and north Chickasaw Counties. It consists of soils formed from loess-like or gritty silt loam outwash-like materials over a very slowly permeable till. Soils of this association often have serious drainage problems and are difficult to work in the spring when they are wet.

Soils of the Loess Area

In the eastern and southern parts of the area the outer margins of the Iowan drift and most of the Kansan and Illinoian drifts are covered with a blanket of wind-deposited loess. This has given rise to four soil associations in the area; Fayette, Fayette-Dubuque-Stony Land, Tama-Downs, and Tama-Muscatine. The Fayette and Fayette-Dubuque-Stony Land Associations occur in the rolling-to-steep lands in the eastern part of the area where forest replaces grass as the predominant natural vegetation. All of these soils were formed under trees from loess or limestone bedrock. The Tama-Downs and Tama-Muscatine Associations are found where the loess is thick and the original vegetation was prairie grass, except for the Downs soils which occur in areas which recently have been invaded by trees.

Soils of the Bottomlands and Terraces

Terrace and bottomland soils are not extensive in this part of the state because of the limited development of flood-plains and terraces along the relatively narrow stream valleys and the bluff-flanked Mississippi River. The terraces lie above flood stages and are remnants of old floodplains which formed when the streams were flowing at higher levels. The bottomland soils are formed from the more recent alluvium on the modern floodplains. Terrace soils are generally good for agricultural purposes although some droughty soils can benefit from irrigation and some heavier terrace soils have a drainage problem. Floodplain soils also may be fertile, but because of the threat of flooding, much of this land is in trees or permanent pasture. Drainage problems on the terrace and bottomland soils are severe if the subsoil is compact and impermeable. However, if the subsoil is sandy, excessive drainage may cause the soils to be droughty.

CLIMATE

The Supporting Document presents a general climatic discussion of the entire state of Iowa.

Since rainfall is variable over the years and within each year, its distribution is of vital importance to water quality management. Further, climate factors such as temperature, humidity, sunshine and cloudiness, which govern evaporation, are also of vital importance since they, too, vary over the years and within the year.

The key factor that influences the climate of the Northeastern Iowa Basin is its location not far from the center of the North American Continent. This positioning midway between the equator and the pole gives the state a definite warm and definite cold season, both of which are enhanced by the state's remoteness from the tempering effects of the oceans. During the summer and winter months, there is not a great deal of variation in temperatures, while spring and fall are times of strong transition of temperature. By comparison, the onset of the wet time of the year is rather sudden, as is the ceasing of the wet season. Some variables, such as water content of the air, (absolute humidity), dew point, density, and barometric pressure vary similar to temperature with regard to season.

However, other key variable of Iowa weather do not follow such a regular curve. Sunshine, cloudiness, wind velocity, relative humidity, fog, sleet, freezing rain, hail, and chance of precipitation on a given day follow curves that reach maximum and minimum values at times other than summer and winter. Changes in these variables result in enhancement of temperature and rainfall influences at some times of the year.

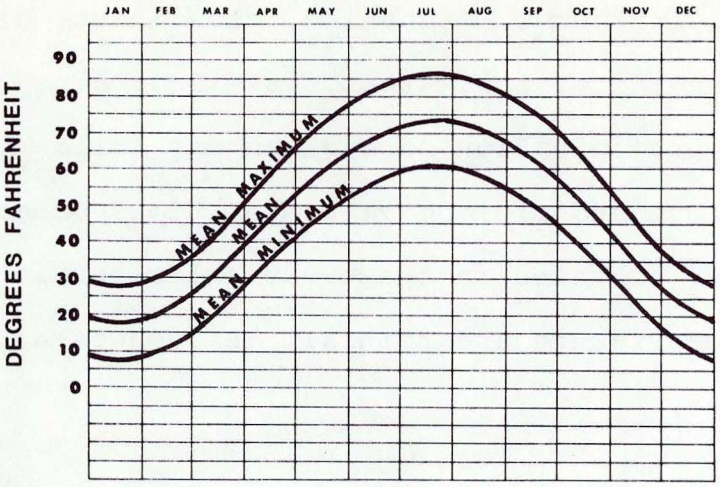
Temperature

The average temperature (based on maps by Shaw and Waite) (4) over the basin ranges from 45 degrees in the north along the Minnesota border to nearly 52 degrees in the south. In the small scale, actual averages are enhanced about 1 or 2 degrees along the deep floodplain of the Mississippi River, and slightly decreased averages prevail over local areas in air drainage areas of the rugged eastern hill-and-valley portion of the basin.

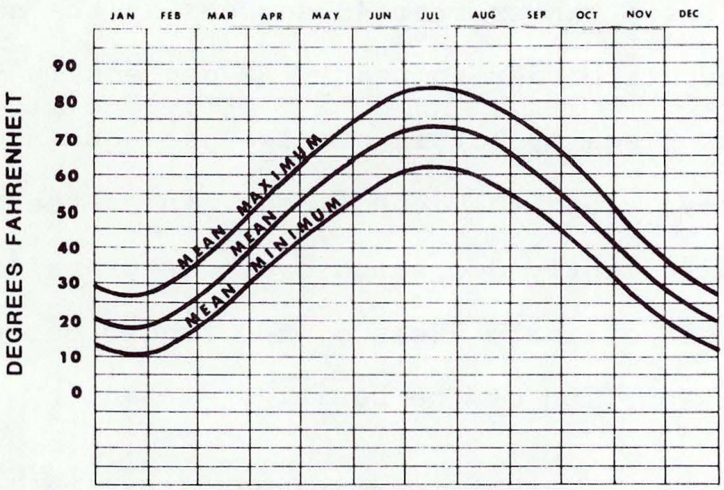
Deeper insight into the temperature distribution can be obtained from Figure III-3 which gives curves, derived from National Weather Service Climatological Summaries, (5) of the mean maximum, mean; and minimum temperatures over the year at Decorah, Dubuque and Davenport. Apparent is the relative coolness of the north of the basin as represented by Decorah as compared to the relative warmth of the south as by Davenport. However, there is little

FIGURE III-3

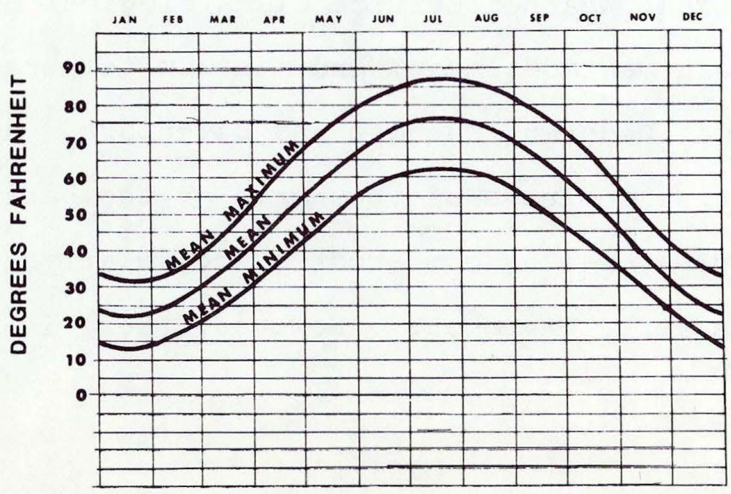
TEMPERATURE DISTRIBUTION AT SELECTED STATIONS



DECORAH



DUBUQUE



DAVENPORT

difference between Decorah and Dubuque since the latter data are from the Dubuque airport at 1065 feet, in a central location, while the Decorah data are from a station in the north at an altitude of 859 feet. Elevation lowers temperature readings, so the Dubuque airport, south of Decorah, is just as cool as Decorah because it is 200 feet higher.

Throughout the basin the temperature is warmest the second and third weeks of July, and coolest in the latter part of January. Temperature increase is greatest in March and April, and decrease the greatest in November.

The average length of the freeze-free season in the basin varies from around 135 days in the north to 170 days in the south. The season is slightly longer along the Mississippi floodplain and shorter on the higher elevations and in local air drainage regions in the rolling eastern part of the basin.

Temperatures as high as 111 degrees have been observed in Davenport, Decorah, and Muscatine, and it has been as cold as 43 degrees below zero in Cresco.

Precipitation

The mean annual precipitation over Iowa is shown in the Supporting Document. The Northeastern Iowa Basin represents the wettest part of the state, with the maximum over the east-central portion. The northwest part of the basin is the driest.

Based on long-term records derived from National Weather Service Climatological Summaries, the general feature of precipitation over the basin is that June is the wettest month, with May, July, August and September being roughly equal in rainfall. Indeed, the second wettest month at the various stations over the basin includes every month from May to September.

The wet season lasts from about April 20th to September 25th over the basin. The peak of the precipitation occurs slightly before the middle of June, when invasions of Gulf of Mexico air make their greatest penetration to the interior.

A general dry period exists from mid-July to a few days after mid-August, interrupted by a wet period that often occurs between July 28th and August 9th. The period from August 20th to September 25th yields more rain than any time of the year except for the late-April to mid-July precipitation maximum. The peak of this second rainfall maximum occurs about September 14th. These patterns clearly and strongly show up in stations having 60 to 155 years of record. They can be masked in 30-year normalizing periods by a few unusual heavy rains at intermediate times.

There are minor variations in precipitation patterns during the transitional months, but they are of no major significance here.

In an earlier work (An Inventory of Water Resources and Water Problems in Northeastern Iowa River Basin, Bulletin No. 7, prepared by the Iowa Natural Resources Council, 1958), an excellent table of extremes of recorded annual precipitation was presented. This table considered all of the historic records dating back as far as 1851, and deserves to be updated here. TableIII-3 presents these data, updated through 1974, based on National Weather Service Climatological Summaries.

Table III-3 reveals that the annual precipitation can vary between at least 15 to 63 inches at stations over the basin, assuming validity of the observations (Elma, Iowa had only 13.65 inches in 1910). Generally, as might be expected, stations within the basin will experience dryness or wetness simultaneously. Further, wet years tend to prevail for extended periods of time, as do dry years. However, certain stations tend to run wetter than others over the years due to local topographical influences, which create favored locations for heavier rainfall. A much denser rain gauge network than that maintained by the National Weather Service is needed to identify such locations.

Table III-3 also presents the heaviest rainfalls ever observed in a single day. Values of heaviest rains range from around 4½ to nearly 9 inches. It is perhaps noteworthy to observe that Independence has never had a one-day rain in excess of 4.83 inches, despite the long data record.

TABLE III-3

PRECIPITATION DATA FOR LONG-TERM STATIONS

NORTHEASTERN IOWA BASIN

	Annual Normal Inches	Maximum Annual Inches	Recorded Date	Minimum Annual Inches	Recorded Date	Maximum 24 Hr. Rainfall Amount Inches	Date
Clinton	34.85	52.78	1961	22.07	1901	8.71	9/9/27
Davenport	33.88	49.61	1951	17.33	1901	6.57	8/11/49
Decorah	32.33	45.80	1938	18.51	1910	7.70	5/30/41
Delaware	33.04	47.84	1951	18.68	1901	6.34	7/8/51
Dubuque	35.71	63.39	1961	19.35	1894	8.85	9/14/67
Elkader	32.84	50.01	1902	21.91	1958	6.67	7/26/40
Independence	32.45	51.01	1876	15.02	1910	4.83	6/23/40
Maquoketa	33.20	46.67	1973	20.81	1897	4.57	9/8/41
New Hampton	31.26	48.67	1902	16.69	1910	6.36	7/26/40
Oelwein	32.87	48.46	1961	23.70	1952	4.63	7/19/63

Periods of Record

Clinton 1865-1871; 1878-1974
Davenport 1871-1974
Decorah 1844-1846; 1878-1883; 1892-1940; 1948-1952; 1952-1974
Delaware 1854-1856; 1858, 1875-1921; 1930-1974
Dubuque 1951-1974
Elkader 1872-1920; 1935-1974
Independence 1854-1885; 1862-1974
Maquoketa 1876; 1878-1890; 1892-1893; 1896-1906; 1914-1920; 1925-1974
New Hampton 1897-1974
Oelwein 1923-1974

Possibly, it is a relatively dry location. The dry year, 1910, was especially dry in Independence, adding to the argument that it is in a dry spot. Maquoketa also appears to be relatively dry, while the Dubuque airport and Clinton appear to be relatively wet.

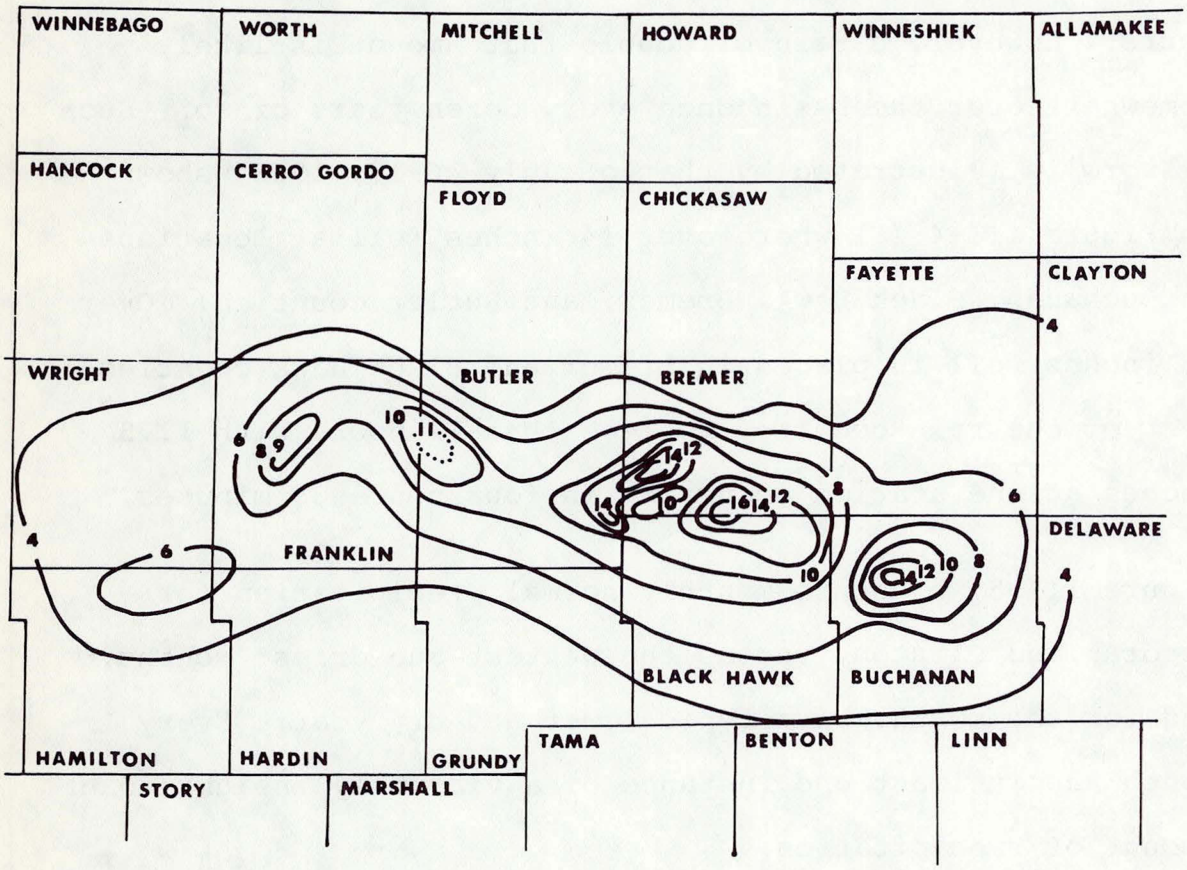
About only once in 100 years will a given station in the basin experience a rain in excess of seven inches in 24 hours. However, a rain of double that amount is likely somewhere over the basin once every dozen years or so. Such a storm is illustrated by that of July 16-17, 1968, shown on Figure III-4 (6) where over 14 inches fell at locations in Buchanan, Black Hawk, Bremer, and Butler counties. Over 16 inches fell in places in Bremer and Black Hawk counties. Most of the rain occurred in less than 12 hours with 11.5 inches at one station occurring in four hours 35 minutes.

Figure III-5, presents monthly normal precipitation for Decorah and Clinton, versus the wettest and driest months, and for the months of a typical wet and dry year. Every month has at least one instance of a virtually insignificant amount of precipitation.

Figures III-6 and III-7 present monthly normal values of precipitation at eight stations in the basin.

FIGURE III-4

PRECIPITATION DISTRIBUTION OF A RARE STORM

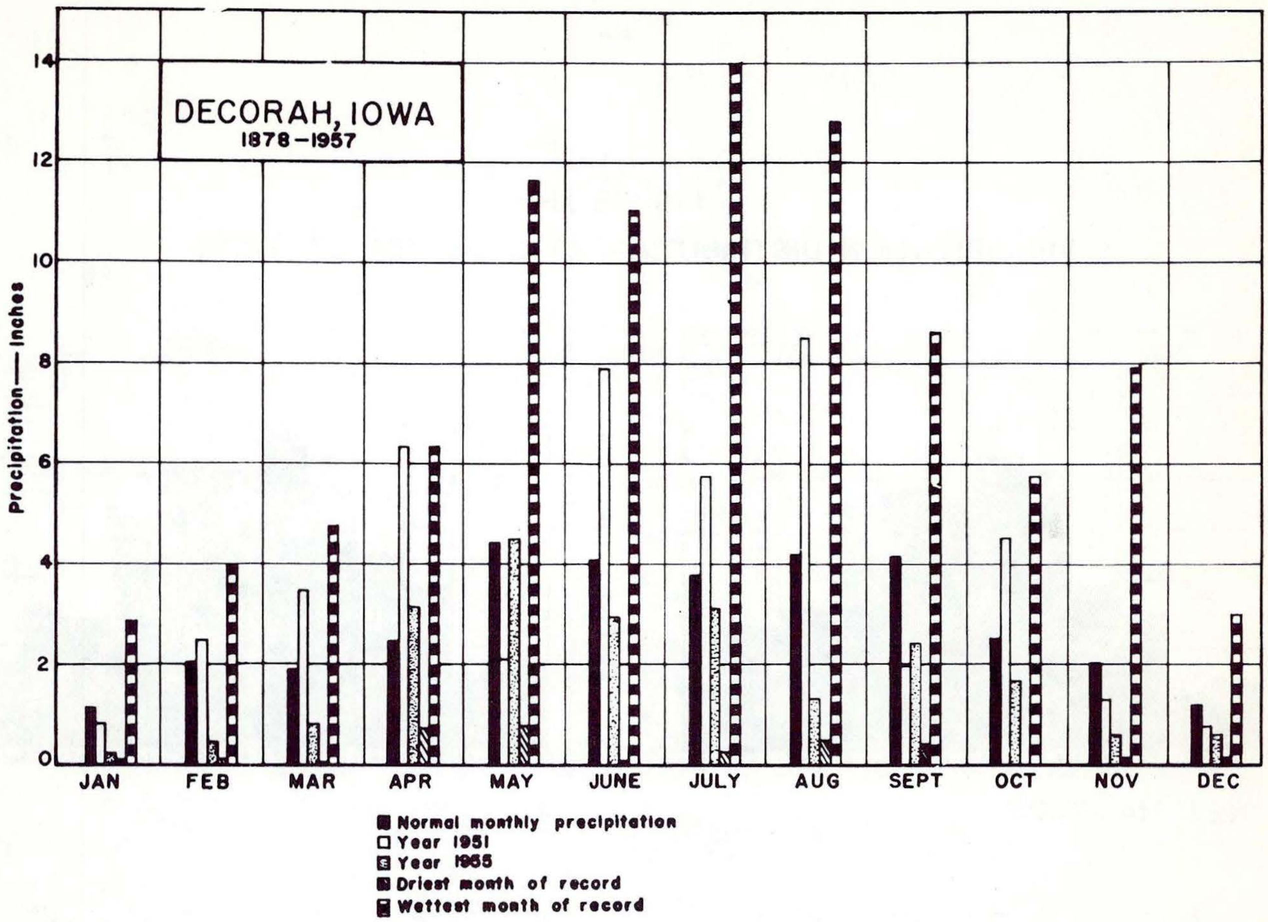


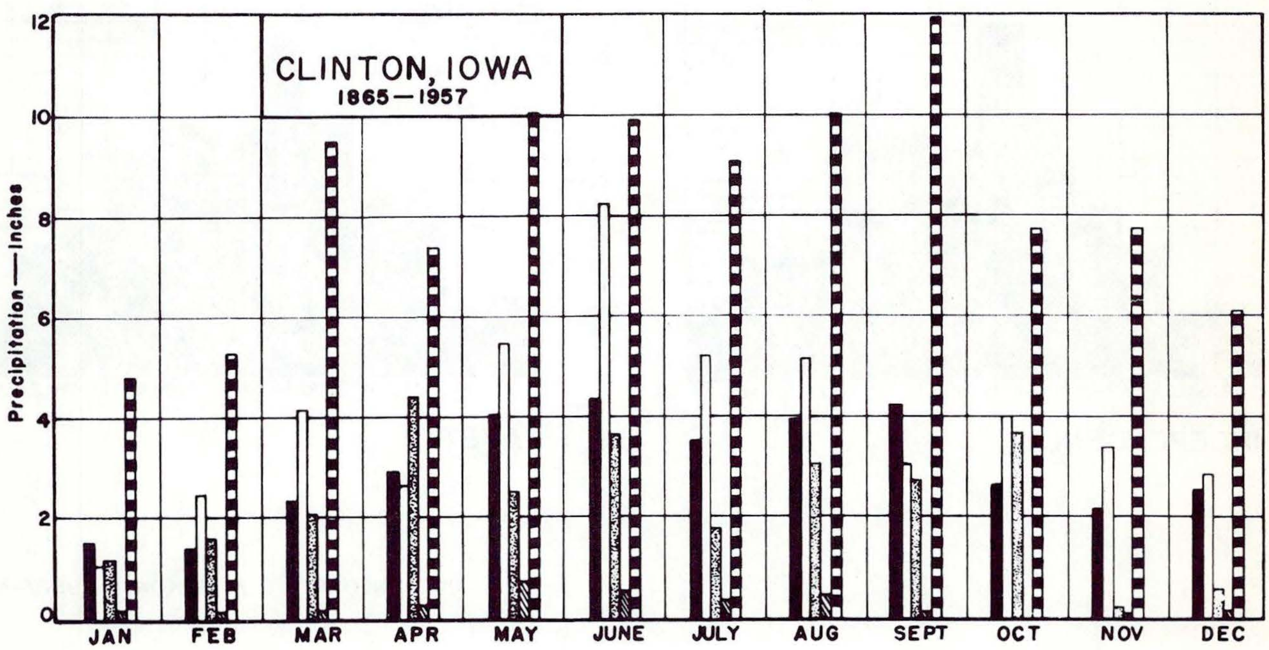
RAINFALL OCCURED DURING A 24 HOUR PERIOD JULY 16-17,1968

PREPARED BY E A HICKOK & ASSOCIATES

FIGURE III-5

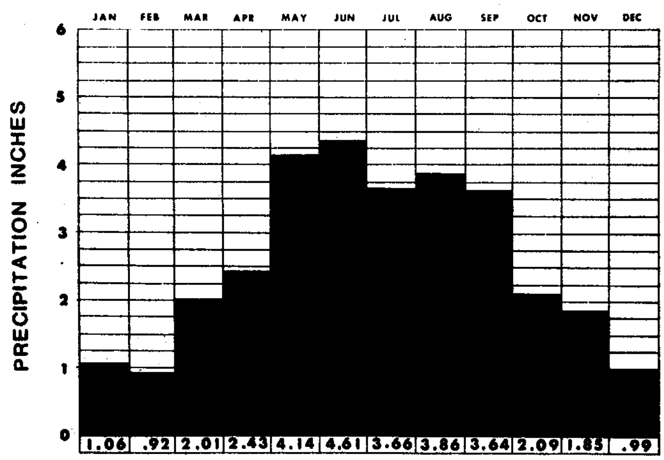
PRECIPATATION EXTREMES AT SELECTED STATIONS



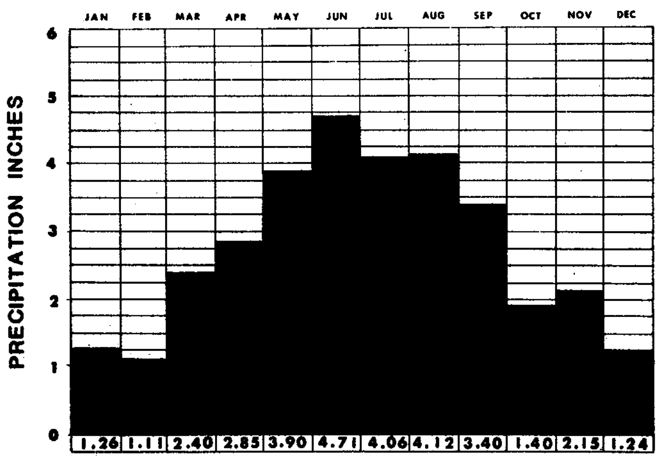


U. S. Weather Bureau Data

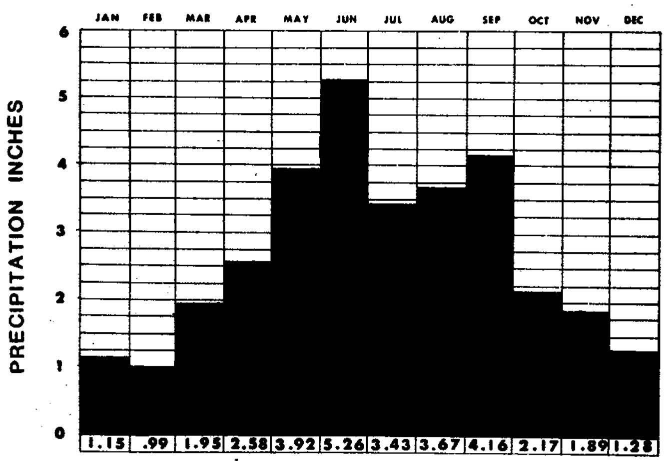
FIGURE III-6
PRECIPITATION DISTRIBUTION AT SELECTED STATIONS



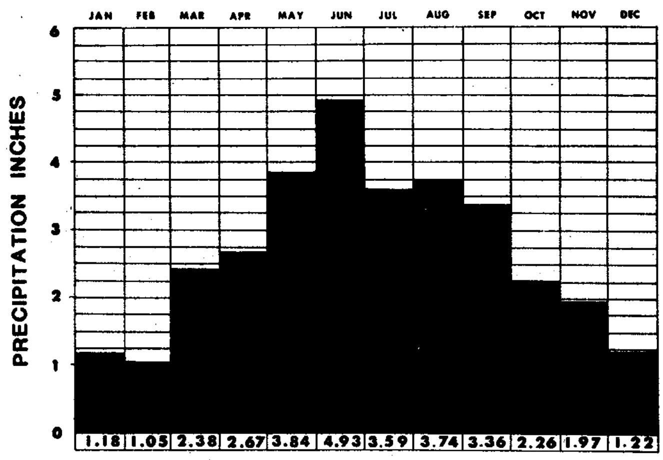
NEW HAMPTON



LANSING



INDEPENDENCE



FAYETTE

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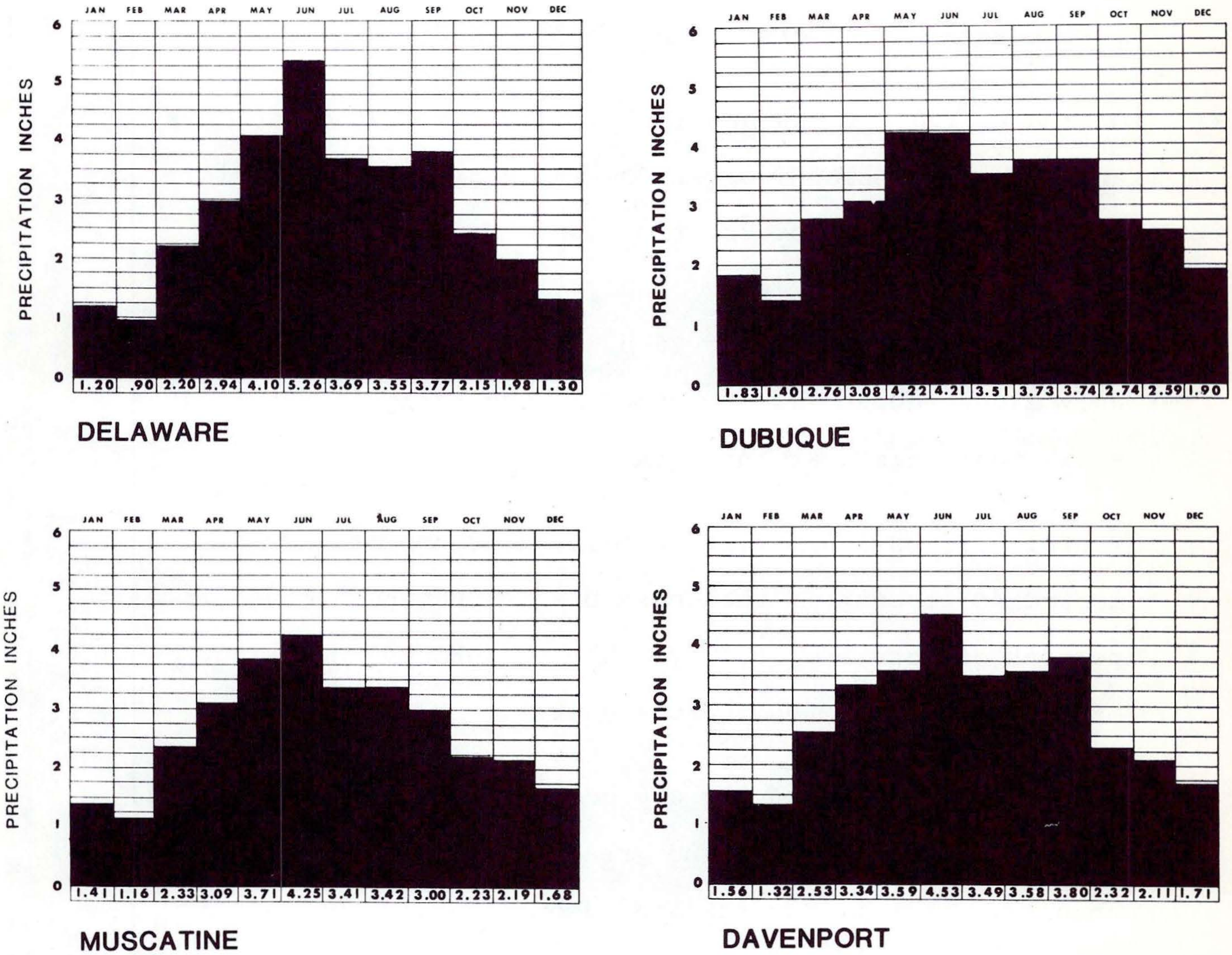
FIGURE III-7
PRECIPITATION DISTRIBUTION AT SELECTED STATIONS



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Sunshine and Cloudiness

Based on information from Local Climatological Data summaries prepared by the National Weather Service (7) and the Worldwide Airfield Summaries prepared by the U.S. Air Force (8), the basin is in a center of relative cloudiness which extends into southeastern Minnesota and southwestern Wisconsin.

On the average, there are 130 cloudy days, 120 clear days and 115 partly cloudy days. On an absolute value basis, maximum cloudiness occurs from about November 20th to December 20th. The least cloudy time of the year is from mid-July to around August 20th, with an interruption from July 28, to about August 10th, corresponding to the rainy spell that exists at that time.

Monthly values of percent of possible sunshine vary from around 40 percent of that possible in December to 74 percent of possible in July. The sun shines an average of approximately 2600 hours a year.

The cloudiest part of the day occurs around noon, which is, ironically, the time of the greatest chance of the sun shining. This is due to cloud geometry relationships -- cloud sides block out the sun in addition to the cloud tops. The average daily increasing solar radiation for the basin is around 350 langleys.

Evaporation

Average pan evaporation over the Northeastern Iowa Basin is 45 inches per year. The basin occupies that part of Iowa with the lowest rate of evaporation.

Snowfall

Snowfall over the basin varies from about 28 inches per year in the south to over 40 inches per year in the north. The snowiest months are January and March.

Humidity

Relative humidity (which is the ratio of the amount of water the air holds to the amount it could hold) varies from a maximum in December to nearly equal minima in May and October. In the Northeastern Iowa Basin, during the May minimum, relative humidity is lower to the north while during the October minimum, it is higher to the north. These data are based on the local Climatological Data publication of the National Weather Service and U.S. Air Force Worldwide Airfield summaries.

Absolute humidity, the actual amount of water in the air, varies over the year similar to temperature, with a minimum in late January and a maximum in July. Average monthly values vary from 2.5 grams per cubic meter in January to 15 grams per cubic meter in July.

Southerly winds prevail from April to October, with northwesterlies prevailing from November to March. Average wind speed varies from 12 miles per hour over the higher elevations of the basin to 9 miles per hour along the Mississippi floodplain in the north of the basin. The reduced values along the floodplain result from the protective effects of the high bluffs.

STREAM FLOW

That portion of the original precipitation which flows across the land surface and escapes into artificial and natural drainage channels is often referred to as storm runoff. It is the runoff supplemented by discharge from groundwater sources that constitutes the flow observed in streams. Obviously, streamflow is highly correlated to precipitation, which varies from year to year and from area to area. Precipitation and streamflow also vary with time. While some years are in the normal range, others can be either wet or dry.

The average annual runoff in the basin ranges from less than six inches in the northwest to more than eight inches in the east (1). Runoff follows, in general, the pattern of the mean annual precipitation which ranges from less than 26 to more than 35 inches from the northwestern to the eastern part of the state, and from less than 31 inches in the northwestern part of the Northeastern Iowa Basin to over 35 inches in the east-central portions.

The longest stream flow period on the Cedar River at Cedar Rapids when runoff was above average were the two six-year periods 1915-20 and 1942-47. Also at the same site, the longest below average period was the seven years from 1953 to 1959. Statistics on the extremes of annual runoff at selected stations in the basin are listed in Table III-4, based on an article by S. W. Wiitala in the 1970 Water

Resources of Iowa publication, and Low Flow Characteristics of Iowa Streams by Heinitz (9).

The stations included in Table III-4 are predominantly those measuring the flow from drainage areas of moderate size, and those whose records included the drought of the mid-1950's. The smallest drainage areas are too sensitive to indicate hydrologic conditions; whereas large drainage areas, which integrate widespread meteorologic and physical regimes, are too insensitive to be truly representative of areal conditions.

Streamflow is characteristically variable. Knowledge of average flow alone, is insufficient for careful planning and management. In Iowa, it is common for peak flows to be 10,000 or more times the minimum flows. As an indicator of the variability of high flows, the ratio of the mean annual flood to the mean discharge for selected stations in the basin is listed in Table III-4. The mean annual flood is a fairly stable statistic which is unaffected, for the most part, by the chance occurrence of a very large flood. It is the peak flow that is equaled or exceeded once on an average of about every other year (recurrence interval, 2.33 years). The values for the ratio of the mean annual flood to the mean flow, for stations listed in Table III-4, varied from 15.6 to 166.0.

TABLE III - 4

ANNUAL RUNOFF AND INDICATORS OF FLOW VARIABILITY FOR SELECTED STATIONS IN NORTHEASTERN IOWA BASINS

Station Name	Period of Record	Drainage area sq. mi.	Mean flow cfs.	Annual runoff in inches					Q2.33*	Q90**
				Mean	Max.	Year	Min.	Year	Qmean	Qmean
Upper Iowa River at Decorah	1951-67	511	265	7.06	13.13	1945	2.58	1958	30.5	0.20
Paint Creek at Waterville	1952-67	42.8	14.9	4.75	7.24	1962	1.30	1958	166.0	.17
Maquoketa River near Manchester	1933-67	305	192	8.55	22.72	1962	1.91	1934	32.1	.20
Bear Creek near Monmouth	1957-67	61.3	39.3	8.69	17.49	1962	2.28	1958	50.9	.11
Wapsipinicon R. at Independence	1933-67	1,048	523	6.79	15.58	1951	.95	1934	15.6	.07

Note: Minimum annual runoff for period through 1968.

* Q2.33 is mean annual flood; Qmean is mean flow.
** Q90 is flow equaled or exceeded 90 percent of time; Qmean is mean flow.

As an index of the variability of low flows, the ratio of the flow at the 90 percent duration level (Q90) to the mean flow is also listed in Table III-4. The variation of this ratio, from near .07 to .20, is much less than that for the ratio defining high flows. From this brief analysis, it is obvious that streamflow is highly variable. On the average, every other year a peak flow is reached that is about 30 or more times the mean flow. During 10 percent of the time, low flows are at or lower than about 15 percent of the mean flow.

Low Flow Characteristics

Water quality criteria of the State of Iowa must be met at all times when the flow of the stream equals or exceeds the statistical 7-day, 1-in-10 year low flow. Information on this flow and the physical characteristics of the stream is needed if the assimilative capacity is to be analyzed and allowable discharges determined.

The United States Geological Survey (USGS) maintains an extensive statewide network of stream gaging stations. Stream flow is monitored continuously at some stations and periodically at others. By extrapolation of data from this established gage network and review of partial-record stations, additional flow information may be determined for streams where continuously recording gaging stations are not provided. Not all gages in a river basin are of the same period of record; therefore, published values of statistical flows such as Q90 (the flow equaled or exceeded 90% of the time) or the 7-day, 1-in-10 year low flow cannot be expected to correlate exactly at different gages. Specific USGS gaging station locations are shown on Figure III-8. Both partial-record and continuous recording gaging stations are identified. Table III-5, lists the specific station number, tributary drainage areas above the station, and the 7-day, 1-in-10 year low flow, where available, for each station.

As indicated in the tables, insufficient data are available for identification of low flow at each gaging station. In order to conduct waste load allocation analyses, determination of 7-day, 1-in-10 year low flows was conducted using the same procedure utilized by the USGS, but based upon less than 10 years of recorded data. For these reasons, verification of these values, as additional flow information is collected, is required.

Due to the climatological and geological characteristics of the basin, low flows tend to occur either during August and September or during January and February of any given year. For this reason, analyses of critical conditions for defining waste load allocations must be conducted for both warm and cold water temperatures.

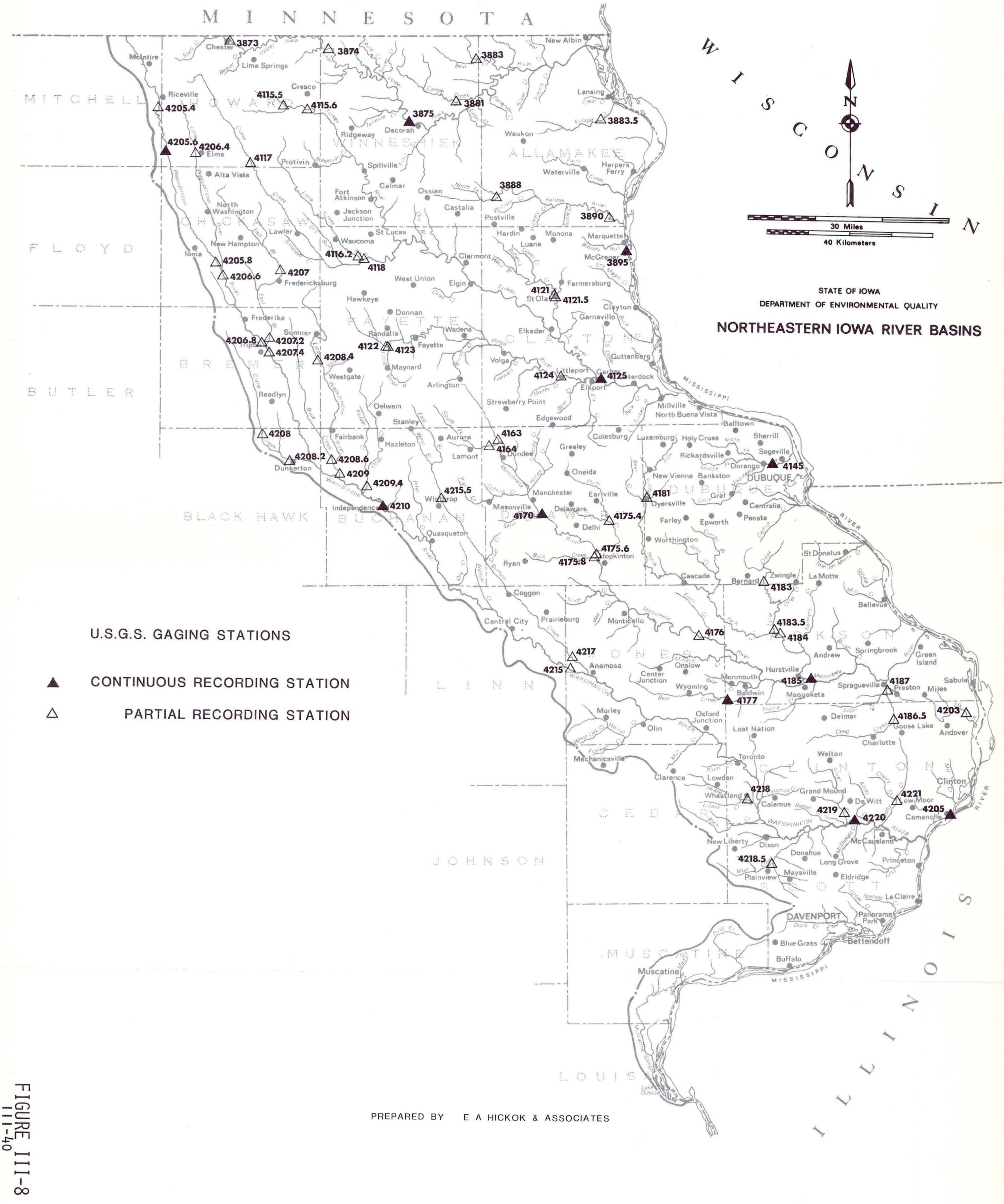
STATE OF IOWA
DEPARTMENT OF ENVIRONMENTAL QUALITY
NORTHEASTERN IOWA RIVER BASINS
U.S.G.S. GAGING STATIONS
CONTINUOUS RECORDING STATION
PARTIAL RECORDING STATION
30 Miles
40 Kilometers
MINNESOTA
WISCONSIN
ILLINOIS
MITCHELL
HOWARD
WINNESHIEK
ALLAMAKEE
FLOYD
CHICKASAW
FAYETTE
CLAYTON
BUTLER
BREMER
BLACK HAWK
BUCHANAN
DELAWARE
DUBUQUE
LINN
JONES
JACKSON
CEDAR
CLINTON
JOHNSON
SCOTT
MUSCATINE
LOUISA
MISSISSIPPI RIVER
PREPARED BY E A HICKOK & ASSOCIATES

FIGURE III-8

TABLE III-5

U.S.G.S. GAGING STATION INFORMATION (9)
NORTHEASTERN IOWA BASIN

Station No.	Stream	Location	Drainage Area (Mi^2)	7Q10 cfs	7Q10 (cfs/mi^2)
3873	Upper Iowa River	Chester	141	3.6	0.03
3874	Upper Iowa River	Near Kendallville	273	10	0.04
3875	Upper Iowa River	Decorah	511	27	0.05
3881	Canoe Creek	Near Decorah	58.9	--	--
3883	Bear Creek	Near Highlandville	53.4	11	0.21
3883.5	Village Creek	Village Creek	58.5	16	0.27
3885	Paint Creek	Waterville	42.8	1.4	0.03
3886	Paint Creek	Near Waterville	56	--	--
3887	Little Paint Creek	Near Waterville	1	--	--
3888	Yellow River	Myron	59.5	2.5	0.04
3890	Yellow River	Ion	221	15	.068
3895	Mississippi River	McGregor	67,500		
4115.3	N.B. Turkey River	Near Cresco	19.5	--	--
4115.6	Turkey River	Near Vernon Springs	87	.6	.007
4116	Turkey River	Spillville	177		
4116.2	Turkey River	Near Waucoma	102	5.6	.055
4117	Crane Creek	Near Lourdes	75.8		
4118	Turkey River	Near Alpha	319	13	.041
4121	Roberts Creek	St. Olaf	70.7	0	--
4121.5	Roberts Creek	St. Olaf	101	0	--
4122	Volga River	Near Fayette	53	1.1	.021

TABLE III-5

U.S.G.S. GAGING STATION INFORMATION (9)
NORTHEASTERN IOWA BASIN

Station No.	Stream	Location	Drainage Area (Mi^2)	7Q10 cfs	7Q10 (cfs/mi^2)
4123	Volga River	Near Fayette	31	.4	.013
4124	Volga River	Littleport	348	17	.049
4125	Turkey River	Barber	1,545	75	0.05
4144	M.F.L. Maquoketa	Near Richardsville	30.2		
4144.5	N.F.L. Maquoketa	Near Richardsville	21.6		
4145	Little Maquoketa R.	Near Durango	130	6.9	0.05
4146	Little Maquoketa R.	Dubuque	1.5		
4163	Maquoketa River	Near Dundee	61.1	4.2	.069
4164	S.F. Maquoketa R.	Near Dundee	54.8	1.5	.027
4170	Maquoketa River	Near Manchester	305	21	0.07
4175.4	Plum Creek	Near Earlville	65.7	4.5	.068
4175.6	Maquoketa River	Near Hopkinton	454	24	.053
4175.8	Buck Creek	Near Hopkinton	50.7	2.5	.049
4176	Maquoketa River	Near Scotch Grove	704	66	.094
4177	Bear Creek	Near Monmouth	61.3	2.0	0.03
4181	N.F. Maquoketa R.	Dyersville	80.2	5.0	.062
4182	Whitewater Cr.	Near Fillmore	91.9	6.5	.071
4183	Lytle Creek	Near Bernard	62.7	2.9	.046
4183.5	Lytle Creek	Near Fulton	114	9.8	.086
4184	No. Fork Maquoketa R.	Near Fulton	499	52	
4185	Maquoketa River	Near Maquoketa	1,553	138	0.09

TABLE III-5

U.S.G.S. GAGING STATION INFORMATION (9)
NORTHEASTERN IOWA BASIN

Station No.	Stream	Location	Drainage Area (Mi^2)	7Q10 cfs	7Q10 (cfs/mi^2)
4186.5	Deep Creek	Near Charlotte	67.7	1.8	.027
4187	Deep Creek	Near Preston	91.9	2.8	.030
4203	Elk River	Near Almont	55.9	2.7	.048
4205	Mississippi River	Clinton	85,600		
4205.4	Wapsipinicon River	Near Riceville	72.3		
4205.6	Wapsipinicon River	Near Elma	95.2		
4205.8	Wapsipinicon River	Near Ionia	161		
4206.2	L. Wapsipinicon R.	Near Acme	7.8		
4206.4	L. Wapsipinicon R.	Elma	37.3		
4206.5	L. Wapsipinicon R.	Near New Hampton	95		
4206.6	Wapsipinicon River	Near New Hampton	291		
4206.8	Wapsipinicon River	Near Tripoli	343		
4207	E.F. Wapsipinicon	Near Fredericksburg	62.2		
4207.2	E.F. Wapsipinicon	Near Tripoli	144		
4207.4	Wapsipinicon River	Tripoli	498		
4208	Crane Creek	Near Denver	63.6		
4208.2	Crane Creek	Dunkerton	101		
4208.4	Wapsipinicon River	Near Westgate	57.4		
4208.55	Buck Creek	Near Oran	37.9		
4208.6	Buck Creek	Near Littleton	57		
4209	L. Wapsipinicon R.	Littleton	205		

TABLE III-5

U.S.G.S. GAGING STATION INFORMATION (9)
NORTHEASTERN IOWA BASIN

Station No.	Stream	Location	Drainage Area (Mi^2)	7Q10 cfs	7Q10 (cfs/mi^2)
4209.4	Otter Creek	Near Otterville	101		
4210	Wapsipinicon R.	Independence	1,048	14	0.013
4212	Pine Creek	Near Winthrop	28.3		
4213	Pine Creek	Winthrop	.7		
4215	Wapsipinicon River	Stone City	1,324	45	.034
4215.5	Buffalo Creek	Above Winthrop	68.2	1.1	.016
4217	Buffalo Creek	Near Stone City	217	4.7	.022
4218	Yankee Run	Wheatland	52.2		
4218.5	Mud Creek	Near Plainview	109		
4219	Silver Creek	De Witt	60.8		
4220	Wapsipinicon River	Near De Witt	2,330	92	0.04
4221	Brophys Creek	Near Low Moor	72.8		

In general, low flows in the Northeastern Iowa Basin are considerably greater than the State average when reduced to the common basis of discharge per square mile. This is true for all of the rivers in the basins in the northeast of Iowa.

Table III-6 gives a comparison of averages from longer-term means derived from continuous-recording gaging stations within the Northeastern Basin to the average for over 80 stations in Iowa.

TABLE III-6

FLOW COMPARISONS (9)*

Flow, in cfs/sq. mi., Equalled or Exceeded,

for Percent of Time Indicated in Column Headings

	50	90	95	98	99
State of Iowa Average	.150	.033	.024	.018	.015
Upper Iowa near Decorah	.254	.101	.084	.068	.053
Yellow at Ion	.290	.127	.109	.100	.095
Turkey at Elkader	.245	.075	.057	.044	.038
Turkey at Garber	.282	.097	.076	.059	.051
Little Maquoketa near Durango	.254	.100	.085	.066	.057
Maquoketa near Manchester	.295	.125	.105	.085	.022
Maquoketa near Maquoketa	.373	.174	.142	.116	.101
Wapsipinicon at Independence	.196	.036	.022	.012	.009
Wapsipinicon at DeWitt	.318	.085	.065	.052	.045

*Based on records through 1966

HYDROGEOLOGY

Important aquifers in the Northeastern Iowa Basin are the surficial aquifers; the limestones and dolomites of the Silurian and Devonian Age, the Cambrian and Ordovician sandstones and dolomites, and the Dresbach sandstone of the Cambrian Age. The Supporting Document describes these along with the rest of the aquifers on a broader scope.

The surficial alluvial aquifers are those directly underlying the basin in hydrologic connection with the principal streams. These aquifers have a close time-and-space connection to the streams. Therefore, under certain conditions, most of the water withdrawn from them is induced surface water.

All the bedrock aquifers, except the Dresbach, are exposed or covered only by thin veneer of till in northeastern Iowa. These are recharged locally. Because the rocks dip to the southwest, the aquifers become more deeply buried to the western part of the basin. However, the Silurian-Devonian aquifer is near-surface throughout the basin, and therefore, is recharged locally.

The Supporting Document carries detailed discussions of the hydrogeology of Iowa, including all of the aquifers and aquicludes of the Northeastern Iowa Basin, and a number of important features need elaboration.

Several sections in the Northeastern Iowa Basin have areas of karst or sinkhole topography. The word sink is applied to vertical holes in the ground which lead downward into subterranean passages and chambers that have been formed by the solution of a soluble rock. Sinks are generally limited to areas where limestone underlies the soils and the climate is humid. They are of two kinds: some are produced by the caving in of the roofs of subterranean chambers, and others are channels which were opened up along joints which have been enlarged through solution by descending surface waters. The cave-in type of sink reveals signs of fracture on the edges of the hole, generally increasing in diameter downward from the surface. Solution sinks often flare, funnel-like, at the surface, the edges and walls of the hole bear marks of corrosion, not fracture. By gradual solution of the upper layer, or layers, a sink may expand into a broad, shallow nearly circular depression. A land surface that consists of many sinks, with irregular divides between them, is called karst topography.

Landscapes exhibiting these karst features, or those associated with solution of underlying carbonate rock units (sinkholes, caverns, springs, etc.), are common in northeastern Iowa. Those counties where karst terrain features are actively forming include Clayton, Floyd, Mitchell, Howard, Chickasaw, Winneshiek and Allamakee. Sinkhole development is less common in the remainder of the area, particularly south of Dubuque, Delaware, and Buchanan counties. Sinkholes may be present in these areas but the increased thickness of the glacial drift prevents their expression at the land's surface. Also, the older sinkholes in these counties contain much in-filling with Pleistocene or older sediments, thus making their expression in the surface topography. Despite these factors, the potential for sinkhole development is still present in these counties. (10)

At the present time, detailed mapping of the karst areas has not been completed. Consequently, detailed subsurface investigation should precede the site selection of any lagoon treatment facilities in the above mentioned counties.

Surficial Aquifers

Of special importance are the alluvial deposits underlying the flood plains and terraces of the Mississippi River and its tributaries in the basin. This alluvium constitutes a vital surficial aquifer, whose waters are recharged by local precipitation and seepage from adjacent streams. The usefulness of this aquifer is therefore dependent upon surface water quality.

The water-bearing materials underlying the Mississippi Valley consist mainly of fine to coarse sand. The coarser deposits occur along the major valleys, where stream velocities were the highest. The thickness of the alluvial deposits is from 100 to 160 feet at most places along the Mississippi River, and from 30 to 70 feet along the principal interior streams.

The deposits thin out and grade into colluvium near the river bluffs. Locally, the thickness of alluvium is appreciably greater wherever present river valleys coincide with pre-glacial valleys. Appreciable decreases in thickness occur in areas where local bedrock highs underlie the present valleys.

Substantial quantities of water are stored in the porous alluvial deposits of the Mississippi Valley.

The thinner and narrower alluvial aquifers along the interior streams contain smaller, but significant amounts of water in storage. Of more importance than storage, however, is the induced infiltration of river water that sustains the yield from these aquifers when they are developed for water supplies. Sustained yields, many of them high, have been developed at some localities. A number of well fields supplying municipalities and industries along the Mississippi River develop more than 15 million gallons per day, each on a sustained basis.

Individual wells tapping the alluvium along the Mississippi River are capable of pumping large quantities of water. Industrial, irrigation and municipal wells in the Mississippi Valley pump 1,000 to 2,000 gallons per minute. Wells developed in the alluvium of the interior streams commonly yield 200 to 300 gallons per minute.

Glacial drift is a source of water in much of the basin for stock and domestic supply and for small towns. The drift consists principally of silt, sand, clay, and boulder clay containing lenticular or shoestring bodies of sorted sand and some poorly sorted sand and gravel. The producing zones are the sand bodies within or at the base of the drift. Wells may range from 15 to more than 400 feet deep. Generally, these wells yield only a few gallons per minute, but with favorable conditions and proper well design as much as 10 to 20 gpm may be obtained.

Bedrock Aquifers

Major portions of the Northeast Iowa Basin are underlain by bedrock formations that can be depended upon to yield large amounts of water to wells. Much of the area is underlain by more than one of these aquifers, separated by relatively impermeable aquicludes. In such areas, the developer of ground water may choose between the aquifers on the basis of depth, yield, pumping lift, water quality, or other considerations.

The Silurian-Devonian aquifer, comprising the Niagran and Alexandrian series of Silurian Age, underlie the entire Northeastern Basin except for the extreme northeastern corner. This aquifer subcrops immediately beneath the glacial drift in a broad belt through the basin at a depth of zero to 300 feet. Since it is so shallow, it recharges very readily after rains.

The Silurian-Devonian aquifer is composed of relatively dense limestone and dolomite whose porosity and permeability are dependent mainly on secondary rock openings such as fractures, joints, brecciated zones, and solution tubules. The aquifer is of an anisotropic nature, which makes it difficult to predict yields with assurance. However, its porosity and permeability is greater in the Northeastern Basin than elsewhere in Iowa.

The specific capacity of wells drawing on the Silurian-Devonian aquifer is generally at least two gallons per minute per cubic foot of drawdown. Valves of four to six gallons per foot of drawdown are common. Many municipal and industrial wells obtain between 150 and 400 gpm per well. Most domestic wells will deliver from 10 to 30 gpm with small to moderate drawdown.

The Cambrian-Ordivician aquifer, which crops out in the northeastern corner of the basin, consists of three water-bearing formations: St. Peter sandstone and the Prairie du Chien Formation of Ordivician Age, and the Jordan sandstone of Cambrian Age. Its depth in the Northeastern Basin ranges from 0 to about 700 feet, with its thickness ranging from 0 to 600 feet. Recharge is generally by subsurface inflow from the north. The average flow velocity is about 100 feet per year.

The St. Peter sandstone is a friable, medium-grained almost pure quartzose sandstone generally less than 50 feet thick. It is capable of yielding 50 gpm or more to wells in the basin.

The Prairie du Chien Formation consists mainly of dolomite, but it includes some sandstone beds. Its thickness in the basin is as much as several hundred feet. It is believed to yield significant amounts of water to wells penetrating the Cambrian-Ordovician aquifer.

The Jordan sandstone is medium-to-coarse grained, pure quartzose. It is poorly cemented and quite friable in the Northeastern Basin, with an estimated porosity of 10 to 15 percent. The Jordan sandstone is the principal water-producing unit in the basin and is penetrated by nearly all wells drilled into the Cambrian-Ordovician aquifer.

The Cambrian-Ordovician aquifer, as a whole, is used extensively by municipalities and industries in the basin. Yields of up to 1,000 gpm are obtainable in the basin. Specific capacities of wells finished in the aquifer commonly range from five to twenty-five gpm per foot of drawdown, with some reaching values of 30 to 80 gpm per foot of drawdown.

The yields and specific capacities of many wells have been increased by 50 to 100 percent by acidizing or shooting and surging the wells. Most properly developed or stimulated wells in the Northeastern Basin will yield 1,000 gpm or more, and have specific capacities of over 10 gpm per foot.

The Dresbach aquifer consists of a sequence of coarse-to-fine-grained sandstones between the overlying Franconia Formation of Cambrian Age and the underlying crystalline rocks or quartzite of Precambrian Age. The aquifer underlies the entire Northeastern Iowa Basin, but is as close as 50 feet from the surface in the northeastern corner of the basin. However, at Dubuque its depth is 675 feet, and at Clinton 1,600 feet.

The aquifer is composed of three formations: Galesville sandstone, the Eau Claire Formation, and Mount Simon sandstone. The Eau Claire Formation is also sandstone, being fine-grained. The Galesville sandstone, the top formation, is between 150 and 200 feet thick, while the underlying Mount Simon sandstone was measured at 1,325 feet thick at Clinton.

The Dresbach is a significant aquifer in Lansing, Dubuque, Clinton, and Maquoketa counties, where high capacity wells yielding water of acceptable quality for municipal and industrial use have been developed. Some of these wells are capable of delivering 2,000 to 3,000 gallons with specific capacities from 10 to 100 gallons per minute per foot of drawdown.

GROUNDWATER QUALITY

A comparison shows that the groundwaters of the Northeastern Iowa Basin are generally the best in the state. The Silurian-Devonian aquifer, very low in dissolved solids in the Northeastern Iowa Basin, worsens to the south and west parts of Iowa. Waters of the Jordan aquifer, good throughout the state, are lowest in dissolved solids concentration in the Northeastern Iowa Basin.

The three principal aquifers of the Northeastern Iowa Basin; the alluvial source under the streams, the Silurian-Devonian, and the Jordan, all yield water of dissolved solids concentration of generally less than 500 mg/l. In general, the hardness of the water from the Silurian-Devonian aquifer is between 250 and 500 mg/l, while the alluvial aquifers have water as low as 150 mg/l.

The alluvial waters of the Northeastern Iowa Basin are of the calcium bicarbonate or the calcium magnesium bicarbonate type. The bedrock aquifers grade from the calcium or calcium magnesium to the sodium type.

Iron is sometimes troublesome in the waters of all the aquifers of the Northeastern Iowa Basin, being the only mineral that mars to any extent these otherwise fine aquifers. The Supporting Document describes in detail the characteristics of the aquifers underlying Iowa.

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CHAPTER IV

WATER QUALITY

NORTHEASTERN IOWA BASIN

The main objective of water quality management is to protect and enhance the water resources to ensure acceptable conditions for designated uses. Sound management first requires knowledge of the existing water quality.

Existing water quality for the Northeastern Iowa Basin has been identified from available data including State Hygienic Laboratory Reports, STORET data, the DEQ files and the Iowa Water Quality Report (305b). The data indicate some areas of degraded water quality.

It is the purpose of water quality standards to limit waste inputs to streams so that designated water uses will not be impaired. The Iowa Water Quality Commission has classified streams into four classifications; A, B, C, and General. Class A Waters are those which are to be preserved for whole body contact. Class B Waters are those which are to be preserved for wildlife, aquatic life, and non-body contact recreation. Class C Waters are those which must be of a quality to meet requirements for use as a potable water supply. The General classification which applies to all surface waters provides for generally acceptable physical conditions and elimination of toxic substances. The Supporting Document for Iowa Water Quality Management Plans (1) lists the standards in detail for each class.

In addition to material contamination, thermal discharges are important to water quality since many life forms cannot adapt to a wide range of temperature. Temperature variation within a stream can result in different proportions of species and may even result in the disappearance of some forms and the appearance of others. Standards have been set for thermal discharges and streams have been further classified as to being "cold water" or "warm water".

Table IV-1, from the Water Quality Standards, Chapter 16 (2) Iowa Departmental Rules, presents the classifications of the various streams in the Northeastern Iowa Basin and Figure IV-1, shows those streams classified A, B, or C.

EXISTING WATER QUALITY

Information on the water quality of Iowa streams consists mainly of data gathered quarterly by the State Hygienic Laboratory, special surveys made by the laboratory and the DEQ, and data from special samplings and surveys taken by the academic community.

In the Northeastern Iowa Basin, data have been collected in the Mississippi, Upper Iowa, Yellow, Turkey, Maquoketa, and Wapsipinicon basins. Figure IV-2 presents the sampling locations in the Northeastern Iowa Basin.

Many materials are sampled during surveys and special studies, but only four of the key measurements: temperature, dissolved

TABLE IV-1

SURFACE WATER CLASSIFICATION

NORTHEAST IOWA BASIN

Stream Segment	Classification A	Classification B Fresh Warm Water	Classification B Fresh Cold Water	Classification C
A. Mississippi River - Main Stem Mo. State line to Minn. State line				
1. Upper Iowa River				
mouth to Decorah	X	X		
Decorah to Minn. State line above Chester	X		X	
a. Irish Hollow Cr. mouth to Minn. State line			X	
b. French Cr.			X	
c. Clear Cr. mouth to Minn. State line			X	
d. Silver Cr, (mouth in Allamakee Co., Sect. 4, T-99N, R-5W)			X	
e. Bear Cr.			X	
(1) Waterloo Cr. mouth to Minn. State line			X	
(2) North Bear Cr. mouth to Minn. State line			X	
f. Patterson Cr.			X	
g. Canoe Cr.			X	
(1) Spring Run Cr.			X	
(2) N. Canoe Cr.			X	
h. Coon Cr.			X	
i. Trout Cr. (mouth in Winneshiek Co., Sect. 23, T-98N, R-7W)			X	
j. Trout Cr. (mouth in Winneshiek Co., Sect. 23, T-98N, R-8W)			X	
(1) Trout Run			X	
k. Twin Springs Cr.			X	
l. Ten Mile Cr.			X	
(1) Falcon Springs Cr.			X	
(2) Walnut Cr.			X	
m. Casey Spring Cr.			X	

TABLE IV-1 (cont)

SURFACE WATER CLASSIFICATION

NORTHEAST IOWA BASIN

Stream Segment	Classification A	B Fresh Warm Water	B Fresh Cold Water	C
n. Silver Cr. (Mouth in Winneshiek Co., Sect. 10, T-99N, R-9W)			X	
o. Pine Cr.				
mouth to Minn. State line			X	
p. Cold Water Cr.			X	
q. Martha Cr.			X	
r. Silver Cr. (mouth in Winneshiek Co., Sect. 2, T-99N, R-10W)			X	
s. Nichols Cr.			X	
t. Bigalk Cr.			X	
u. Beaver Cr.			X	
v. Staff Cr.			X	
2. Clear Creek			X	
3. Village Creek			X	
4. Wexford Creek			X	
5. Paint Creek				
mouth to confl. with Little Paint Cr.		X		
confl. to road crossing NW 1/4 Sect. 16 97N4W			X	
a. Little Paint Cr.			X	
6. Yellow River				
mouth to Teeple Cr.		X		
Teeple Cr. to Old Hwy. 51			X	
a. Dousman Cr.			X	
b. Bear Cr.			X	
c. Suttle Cr.			X	
d. Little Bear Cr.			X	
e. Hickory Cr.			X	
f. Penny Springs		X		

TABLE IV-1 (cont)

SURFACE WATER CLASSIFICATION

NORTHEAST IOWA BASIN

Stream Segment	Classification A	B Fresh Warm Water	B Fresh Cold Water	C
g. Teeple Cr.			X	
h. N. Fork Yellow R.		X		
7. Bloody Run Cr.			X	
8. Sny Magill Cr. (aka Magill Cr.)			X	
a. N. Cedar Cr.			X	
9. Buck Creek			X	
10. Miners Creek			X	
11. Turkey River				
mouth to 2 miles downstream Big Springs		X		
2 miles downstream Big Springs to Big Springs			X	
Big Springs to confl. with S. Br. Turkey R.		X		
a. Little Turkey R. (mouth in Clayton Co.)				
mouth to Delaware Co. line		X		
Delaware Co. line to source			X	
b. Peck Cr.		X		
c. S. Cedar Cr.			X	
d. Elk Cr.		X		
(1) Steel Cr.			X	
(2) Pine Cr. (mouth in Clayton Co., Sect. 26, T-91N, R-4W)			X	
(3) Odell Br.			X	
(4) Schechtman Br.			X	
e. Volga R.		X		
(1) Bear Cr. (mouth in Clayton Co.)		X		
(2) Doe Cr.		X		

TABLE IV-1 (cont)

SURFACE WATER CLASSIFICATION

NORTHEAST IOWA BASIN

Stream Segment	Classification A	B Fresh Warm Water	B Fresh Cold Water	C
(3) Honey Cr.		X		
(4) Cox Cr.		X		
(a) Spring Cr.			X	
(5) Hewitt Cr.			X	
(6) Pine Cr. (mouth in Clayton Co. Sect. 2, T-92N, R-6W)		X		
(7) Nagle Cr.		X		
(8) Mink Cr.			X	
(9) Deep Cr.		X		
(10) Brush Cr.			X	
(a) Bear Cr. (mouth in Fayette Co.)			X	
(11) Frog Hollow		X		
(12) Alexander Cr.		X		
(13) Coulee Cr.		X		
(14) Little Volga R.		X		
(15) N. Br. Volga R.		X		
f. Panther Cr.		X		
g. Roberts Cr.		X		
(1) Dry Mill Cr.		X		
(2) Howard Cr.		X		
(3) Silver Cr.		X		
(4) West Br. Roberts Cr.		X		
h. Beaver Cr.		X		
i. Otter Cr.		X		
(1) Glovers Cr.			X	
j. Bell Cr.			X	
k. Sandy Cr.		X		
l. Dibble Cr.		X		
m. Fitzgerald Cr.		X		
n. Nutting Cr.		X		
(1) Quinn Cr.		X		
o. Dry Dr.		X		
p. Little Turkey R. (mouth in Fayette Co.) mouth to Chickasaw Co. Road V56				

TABLE IV-1 (cont)

SURFACE WATER CLASSIFICATION

NORTHEAST IOWA BASIN

Stream Segment	Classification A	B Fresh Warm Water	B Fresh Cold Water	C
(1) Turner Cr.		X		
(2) Crane Cr.				
mouth to Hwy. 9		X		
(a) Dry Run		X		
(b) Simpson Cr.		X		
q. Bohemian Cr.				
mouth to Howard Co. line			X	
12. Panther Hollow		X		
13. Plum Creek			X	
14. Little Maquoketa River		X		
a. Bloody Run		X		
b. Cloie Br.		X		
c. N. Fork				
mouth to confl. with Middle Fork		X		
above Confl. with Middle Fork			X	
d. Hogans Br.		X		
15. Catfish Creek				
mouth to Dubuque Co. Road W. of Key West		X		
Dubuque Co. Road W. of Key West to source			X	
a. Granger Cr.		X		
b. North Fork Catfish Cr.		X		
(1) Middle Fork Catfish Cr.		X		
c. South Fork Catfish Cr.		X		
16. Tete des Morts River (aka Tete des Morts Cr.)		X		
a. Lux Cr.		X		
17. Spruce Creek		X		

TABLE IV-1 (cont)

SURFACE WATER CLASSIFICATION

NORTHEAST IOWA BASIN

Stream Segment	Classification A	B Fresh Warm Water	B Fresh Cold Water	C
18. Mill Creek (mouth in Jackson Co.)				
mouth to confl. with Little Mill Cr.		X		
confl. with Little Mill Cr. to source			X	
a. Little Mill Cr.		X		
19. Duck Creek		X		
20. Pleasant Creek		X		
21. Maquoketa River				
mouth to Hartwick Lake		X		
Hartwick Lake Impoundment	X	X		
Hartwick Lake Impoundment to Quaker Mills Impoundment		X		
Quaker Mills Impoundment	X	X		
Quaker Mills Impoundment to Backbone Lake	X	X		
Backbone Lake	X	X		
Backbone Lake to confl. with S. Fork Maquoketa R.		X		
Confl. with S. Fork Maquoketa R. to Highway 3			X	
a. Deep Cr.		X		
(1) Copper Cr.		X		
(a) S. Copper Cr.		X		
(2) Sugar Cr.		X		
(3) Simmons Cr.		X		
(4) Baird Cr.		X		
(5) Williams Cr.		X		
b. Rock Cr.		X		
c. Brush Cr.				
mouth to confl. with Jess Br.		X		
confl. with Jess Br. to source			X	
(1) Jess Br.		X		

TABLE IV-1 (cont)

SURFACE WATER CLASSIFICATION

NORTHEAST IOWA BASIN

Stream Segment	A Fresh Warm Water	B Fresh Cold Water	C
d. Prairie Cr. (mouth in Jackson Co.)	X		
e. N. Fork Maquoketa R.	X		
(1) Hurstville Br.	X		
(2) Cedar Cr.	X		
(3) Farmers Cr.	X		
(a) Tarecod Cr.	X		
(4) Lytle Cr.	X		
(a) Spring Br. (mouth in Jackson Co.)	X		
(b) Otter Cr.	X		
(c) Buncombe Cr.	X		
(d) Prairie Cr. (mouth in Dubuque Co.)	X		
f. Pumpkin Run	X		
g. Bear Cr.	X		
(1) Beers Cr.	X		
(2) Rat Run	X		
h. Mineral Cr.	X		
i. Farm Cr.	X		
j. Vordan Cr.	X		
k. Tibetts Cr.	X		
l. Kitty Cr.	X		
(1) W. Kitty Cr.	X		
m. Wet Cr.	X		
n. Cline Cr.	X		
o. Silver Cr.	X		
(1) Grove Cr.	X		
p. Buck Cr.	X		
(1) Lime Cr.	X		
(2) Golden Br.	X		
q. Plum Cr.	X		
(1) Penns Br.	X		
(2) Garretts Br.	X		
(3) Almoral Br.	X		

TABLE IV-1 (cont)

SURFACE WATER CLASSIFICATION

NORTHEAST IOWA BASIN

Stream Segment	Classification A	B Fresh Warm Water	B Fresh Cold Water	C
r. Allison Cr.		X		
s. Spring Br. (mouth in Delaware Co.) mouth to Hwy. 20			X	
t. Sand Cr.		X		
(1) Todds Cr.		X		
u. Coffins Cr.		X		
v. Honey Cr.		X		
(1) Little York Br. (aka Lindsey Cr., mouth in Delaware Co., Sect. 3 T-89N, R-5W)		X		
(2) Rutherford Br.		X		
w. Rieger Cr.		X		
x. Lindsey Cr. (mouth in Delaware Co., Sect. 1 T-89N, R-6W)		X		
y. Sand Hagen Cr.		X		
z. S. Fork Maquoketa R.		X		
aa. Fenchel Cr. (Richmond Springs)			X	
22. Beaver Cr. (mouth in Jackson Co.)		X		
23. Elk River mouth to Jackson Co. line		X		
24. Mill Creek (mouth in Clinton Co.) mouth to confl. with Harts Mill Cr.		X		
25. Wapsipinicon River mouth to dam at Anamosa		X		
Anamosa Impoundment	X	X		
Anamosa Impoundment to dam at Central City		X		
Central City Impoundment	X	X		
Central City Impoundment to dam at Quasqueton		X		

TABLE IV-1 (cont)

SURFACE WATER CLASSIFICATION

NORTHEAST IOWA BASIN

Stream Segment	Classification A	B Fresh Warm Water	B Fresh Cold Water	C
Quasqueton Impoundment	X	X		
Quasqueton Impoundment to dam at Independence		X		
Independence Impoundment	X	X		
Independence Impoundment to McIntire		X		
McIntire to Minn. State line			X	
a. Buffalo Cr. mouth to confl. of E. & W. Branch Buffalo Cr.		X		
(1) Helmer Cr.		X		
(2) Roberts Cr.		X		
(3) Silver Cr.		X		
(4) E. Branch Buffalo Cr. mouth to Fayette Co. line		X		
(5) W. Branch Buffalo Cr. mouth to Fayette Co. line		X		
b. Heatons Cr.		X		
c. Walton Cr.		X		
d. Dry Cr. (mouth in Buchanan Co. Sect. 31, T-78N, R-7W)		X		
e. Honey Cr.		X		
f. Sand Cr.		X		
g. Smith Cr.		X		
h. Nash Cr.		X		
i. Pine Cr.		X		
(1) Dry Cr. (mouth in Buchanan Co., Sect. 21, T-88N, R-8W)		X		
j. Harter Cr.		X		
k. Otter Cr.		X		
mouth to Lake Oelwein		X		
Lake Oelwein	X	X		
Lake Oelwein to Hwy. 3		X		

TABLE IV-1 (cont)

SURFACE WATER CLASSIFICATION

NORTHEAST IOWA BASIN

Stream Segment	Classification A	Classification B Fresh Warm Water	Classification B Fresh Cold Water	Classification C
l. Little Wapsipinicon R. (mouth in Buchanan Co.) mouth to Highway 93		X		
(1) Buck Cr.		X		
(2) Stoe Cr.		X		
m. Crane Cr. mouth to Highway 3		X		
n. E. Fork Wapsipinicon R. (aka E. Br. Wapsipinicon R.) mouth to Howard Co. line		X		
(1) Plum Cr.		X		
o. Spring Br.		X		
p. Little Wapsipinicon R. (mouth in Chickasaw Co.) mouth to Highway 9		X		
Highway 9 to source			X	

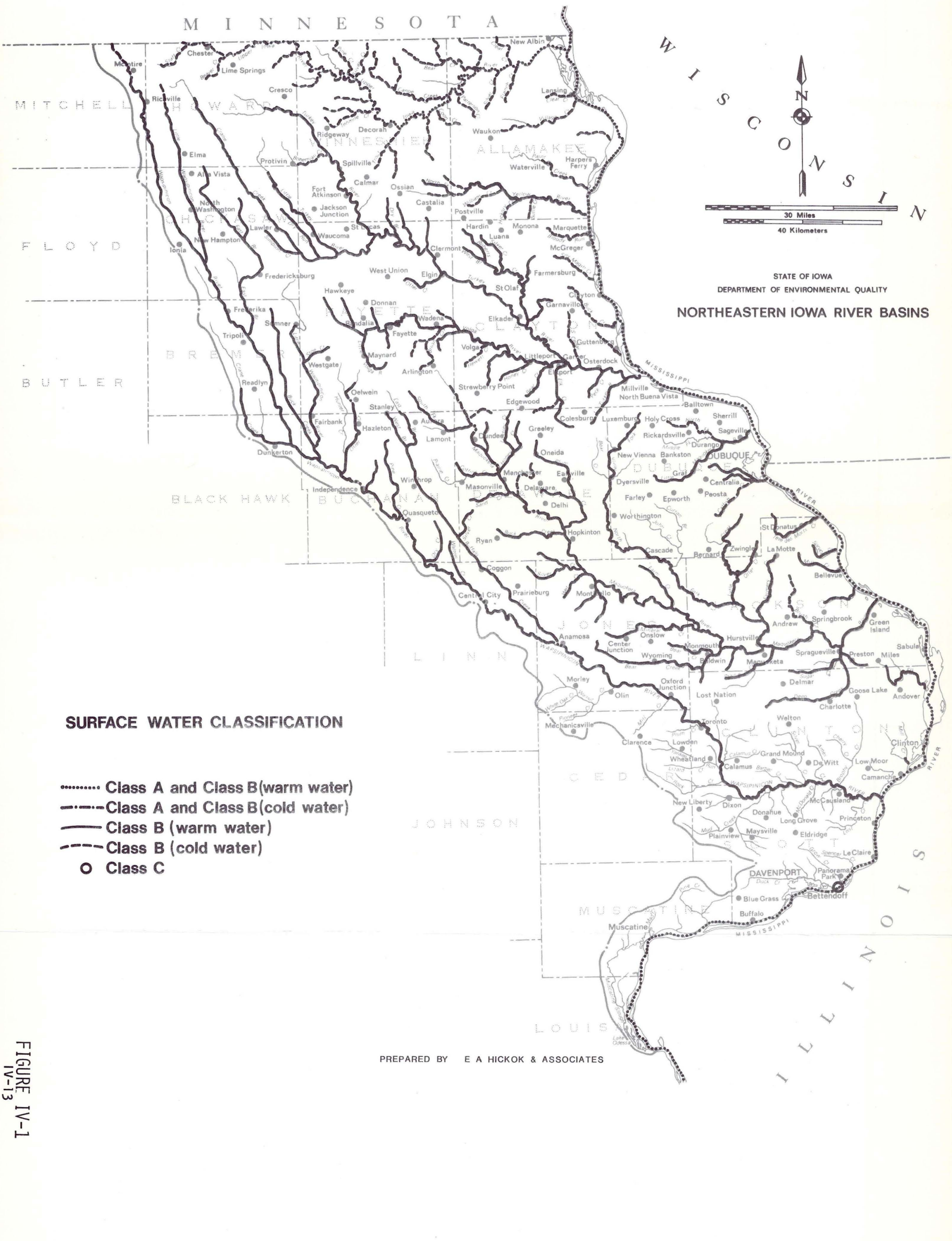

STATE OF IOWA
DEPARTMENT OF ENVIRONMENTAL QUALITY
NORTHEASTERN IOWA RIVER BASINS
30 Miles
40 Kilometers
SURFACE WATER CLASSIFICATION
Class A and Class B (warm water)
Class A and Class B (cold water)
Class B (warm water)
Class B (cold water)
Class C
PREPARED BY E A HICKOK & ASSOCIATES
MINNESOTA
WISCONSIN
ILLINOIS
MISSISSIPPI RIVER

FIGURE IV-1

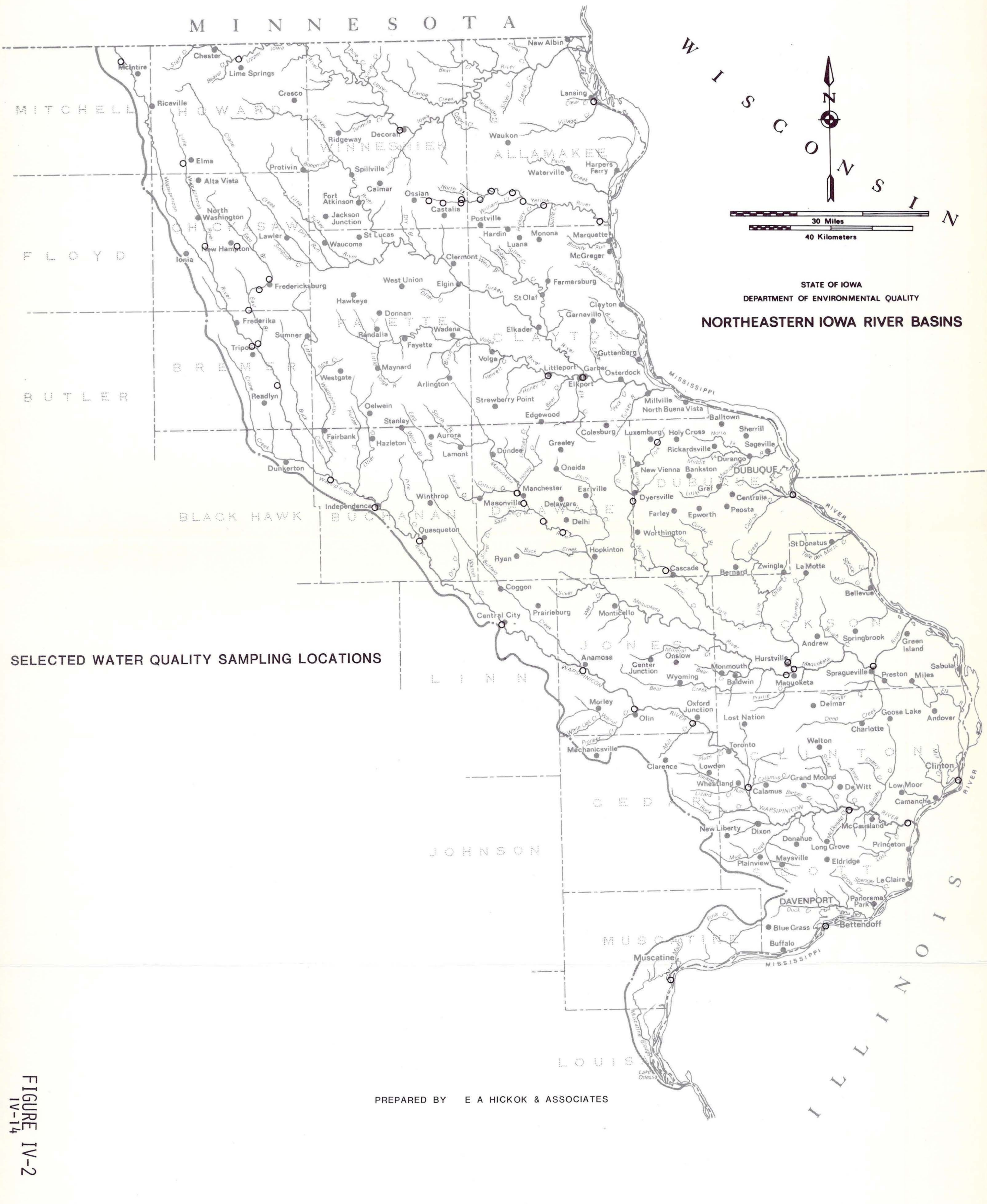

STATE OF IOWA
DEPARTMENT OF ENVIRONMENTAL QUALITY
NORTHEASTERN IOWA RIVER BASINS
SELECTED WATER QUALITY SAMPLING LOCATIONS
PREPARED BY E A HICKOK & ASSOCIATES
MINNESOTA
WISCONSIN
ILLINOIS
N
30 Miles
40 Kilometers
MITCHELL
HOWARD
WINNESHIEK
ALLAMAKEE
FLOYD
CHICKASAW
FAYETTE
CLAYTON
BUTLER
BREMER
BLACK HAWK
BUCHANAN
DELAWARE
DUBUQUE
LINN
JONES
JACKSON
CEDAR
CLINTON
JOHNSON
SCOTT
MUSCATINE
LOUISA
MISSISSIPPI RIVER
WAPSIPINICON RIVER
DUBUQUE
DAVENPORT
Clinton
Bettendoff
Muscatine

FIGURE IV-2

oxygen, ammonia nitrogen, and fecal coliforms are geographically presented by river basins. Data from the last five years was used and assumed to be representative of existing conditions, however, changes over even such a short period can and have occurred due to the installation of new sources and/or control systems.

Of the many variables sampled during the quarterly surveys and special surveys, the key parameters; temperature, dissolved oxygen, ammonia nitrogen, and fecal coliform count are presented in this report. As discussed in Chapter I, these standards are among the most difficult to meet. Further, along with temperature, they provide an index to general water quality.

Temperature is especially important to the percentage distribution of the various life forms. Ambient water temperatures of Class B "warm water" lakes, streams or reservoirs may not exceed 90° F (32.2°C) while it may not exceed 68° F (20°C) in Class B "cold water" streams. There is no limit for Class A or C waters.

Dissolved oxygen is an index of the capacity of the water to sustain fish and other aquatic life forms. Values of less than 4.0 mg/l at any time violate the DEQ Class B standard, while a value of at least 5.0 mg/l must be met for at least 16 hours of a 24-hour period. If the stream is designated as a cold water stream, the dissolved oxygen level must never drop below 5.0 mg/l, and must be 7.0 mg/l for at least 16 hours of a

24-hour period.

Ammonia nitrogen values over 2.0 mg/l violate Iowa standards for Class B streams. (There is no ammonia standard for Class A or C streams.) The level for ammonia, and other chemical constituents specified under Class B criteria, may be exceeded if the flow is so low that it is less than the seven day - ten year low flow, or if these materials come from uncontrollable nonpoint sources.

Increases in fecal coliforms of greater than 200 organisms per 100 milliliters (ml) in the receiving waters violate Iowa standards for Class A streams, between April 1 and October 31. Concentrations higher than 2000 per 100 ml violate Iowa standards for Class B streams. However, if the waters are "materially affected by surface runoff", the value of 2000 per 100 ml may be exceeded. There is no limit to fecal coliform concentration in Class C waters.

Quality of Specific Waters

Each major stream in the basin is sampled quarterly. Special surveys are made on these streams and on minor streams as needs arise. Following is a discussion of the information from these samples and surveys.

UPPER IOWA RIVER

The Upper Iowa River originates in Mower County, Minnesota. Although it is mostly in Iowa, it makes several minor incursions into Minnesota before permanently entering Iowa in extreme northeast Howard County.

Water quality of the Upper Iowa River is considered by many as the best in the State. Dissolved oxygen levels are high throughout the river and pollution parameters have not been found in violation of Iowa Water Quality Standards. Eutrophication is not a significant problem in the Upper Iowa River.

Pollution Problems and Sources

Point sources and nonpoint sources both contribute to the pollution of the Upper Iowa River. It should be noted, however, that the magnitude of pollution on the Upper Iowa River is considerably less than any other major river in the State.

Nonpoint sources account for the major portion of pollution, including elevated BOD, fecal coliform, nitrates and turbidity during storm runoff. Data available show direct correlation between these parameters and flow. Dissolved oxygen data has an inverse relationship with flow, as seen from the lower dissolved oxygen values at higher flows.

Point sources also contribute significantly to the total and fecal coliform concentrations. The impact of these parameters below waste treatment plants is noticed only during relatively low flow conditions. Runoff obscures point source fecal coliform during rainfall periods. The lack of correlation between flow and phosphate concentration suggests that this nutrient is also largely contributed by point sources, however, the low levels found in the Upper Iowa River make this difficult to verify.

The two largest point sources in the Upper Iowa River Basin are the cities of Decorah and Cresco. Decorah lies along the river near the center of the basin. Cresco lies off the river at the divide of the Turkey and Upper Iowa basins. The wastes from Cresco are diluted significantly prior to entering the Upper Iowa River itself. There are several smaller communities and creameries which also discharge into the Upper Iowa. The only discharge which produced noticeable effects was Decorah. Fecal coliform, particularly in the winter, could be traced several miles downstream from the city. Samples collected by McMuller (1972) (3) from the various point sources indicated that Decorah contributed nearly 50% of the orthophosphate, ammonia, BOD, nitrate, and chloride from all point sources along the river.

Data and Methods

All data, except metals and pesticides, used in this study were collected during the one year period of 1971. The data were collected and analyzed by the University of Iowa in Iowa City. Methods of analysis were in strict accordance with Standard Methods for the Examination of Water and Wastewater.

Water Quality Conditions

Harmful Substances - Limited analysis has been done for metals in the Upper Iowa River. See Table IV-2. Only lead has been found in excess of Iowa water quality limitations. Heavy metals may result from land runoff or from industrial discharges to the river. The only industry discharging metal to the Upper Iowa River is in Decorah.

Pesticide data show the infrequent presence of DDT and dieldrin (Table IV-3). Concentrations of the pollutants have been found near the maximum levels recommended by the National Academy of Science.

Physical Modification - Perhaps the most serious pollution problem on the Upper Iowa River is the high turbidity associated with heavy runoff from the agricultural lands. While turbidity rapidly decreases after runoff it contributes to the nutrient and organic loading and detracts from the clear waters present during normal flows.

Eutrophication Potential - As discussed previously, phosphorous appears to be the limiting nutrient to algal growth. In addition, all of the nitrogen compound concentrations were directly to flow, indicating agricultural origin. Algal studies conducted by McMullen (1972) indicate diatoms are the predominant form. The diatoms are found in high concentrations, but are still considerably below concentrations found in other Iowa streams during the same period of time (McMullen, 1972).

Salinity, Acidity, and Alkalinity - pH in the river is between 7.0 and 8.2. Chlorides range from 4 to 11 mg/l.

TABLE IV-2

HEAVY METALS IN THE UPPER IOWA RIVER

PARAMETER	TOTAL SAMPLES	NUMBER OF SAMPLES WITH DETECTABLE LEVELS	MEAN OF THOSE WITH DETECTABLE LEVELS (µg/l)	MAXIMUM (µg/l)
As	9	0		
Ba	13	10	230	900
Cd	13	0		
Cr	15	0		
Cu	13	0		
Pb	13	2	220	420
Mn	9	4	23	50
Hg	5	0		
Ni	11	0		
Ag	7	0		
Zn	13	7	113	210

TABLE IV-3

PESTICIDES IN THE UPPER IOWA RIVER

PARAMETER	TOTAL SAMPLES	NUMBER OF SAMPLES WITH DETECTABLE LEVELS	MEAN OF THOSE WITH DETECTABLE LEVELS (ng/l)	MAXIMUM (ng/l)
DDE	9	0	-	-
DDT	12	1	7	7
Dieldrin	12	2	6	6

Alkalinity levels range from 80 to 260 mg/l.

Oxygen Depletion - Dissolved oxygen levels were near or above saturation throughout the sampling periods. Daytime dissolved oxygen concentrations exhibit supersaturation during algal blooms following nutrient inputs from runoff. The dissolved oxygen concentrations decrease to equilibrium during the night. The minimum dissolved oxygen found by McMullen (1972) was 6.3 mg/l.

Health Hazards and Aesthetic Degradation - Total and fecal coliform concentrations are generally above Federal criteria established for contact recreational waters. Violations of Iowa Water Quality Standards for recreational water were exceeded for only short stretches below Decorah.

Tributaries

Because of the classification of many of the tributaries of the Upper Iowa River as B Cold Water streams, a separate section was devoted to them. There is little data on tributaries of any of Iowa's main rivers. What data are available on the Upper Iowa came from studies conducted by the University of Iowa.

Most of the tributaries of the Upper Iowa River originate as springs in rock outcroppings. A total of 20 tributaries have been sampled (Table IV-4). Significant variation in water quality in the Upper Iowa River was noted regarding temperature, pH, alkalinity, hardness, orthophosphate, nitrate, turbidity, and total coliform. See Figures IV-3

TABLE IV-4

UPPER IOWA RIVER TRIBUTARY WATER QUALITY

STREAM	ORTHOPHOSPHATE (mg/l)	NITRATE NO_3-N (mg/l)	CHLORIDE Cl (mg/l)
French Creek	0.0	1.37	1.70
Silver Creek (Allamakee Co.)	0.1	0.95	2.0
Patterson Creek	0.0	0.90	3.87
Trout Creek (Sec 9, T98N, R7W)	0.8	1.95	4.70
Trout Creek (Sec 23, T98N, R8W)	0.8	1.73	4.00
Dry Creek	0.4	3.03	5.83
Ten Mile Creek	0.4	1.13	6.33
Silver Creek (Winneshiek Co.)	4.87	3.67	25.16
Beaver Creek (So. of Upper Iowa)	0.8	1.80	9.17
Staff Creek	0.0	1.47	10.30
Little Iowa River	0.0	1.73	10.83
Beaver Creek (Minnesota)	0.0	1.73	8.50
Bigalk Creek	0.2	2.90	5.33
Coldwater Creek	0.3	2.97	6.5
Pine Creek	0.3	0.93	6.17
Silver Creek (Winneshiek Co.)	0.3	1.30	6.33
Canoe Creek	0.4	1.40	3.0
Bear Creek	0.1	1.98	3.2
Clear Creek	0.2	1.07	4.33

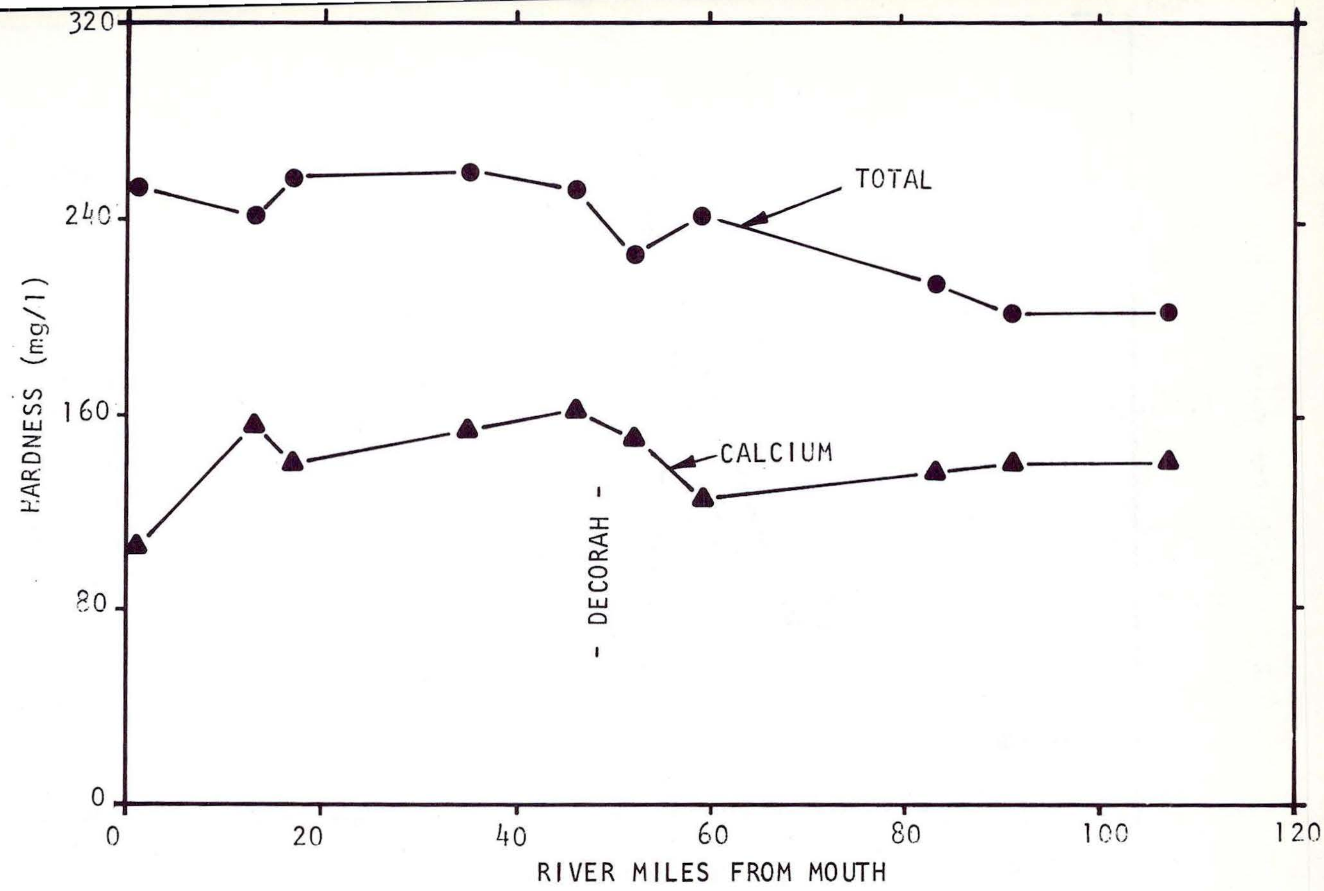


FIGURE IV-3 UPPER IOWA RIVER[1] 1970-1974 MEAN HARDNESS
[1](McMULLEN, 1972)

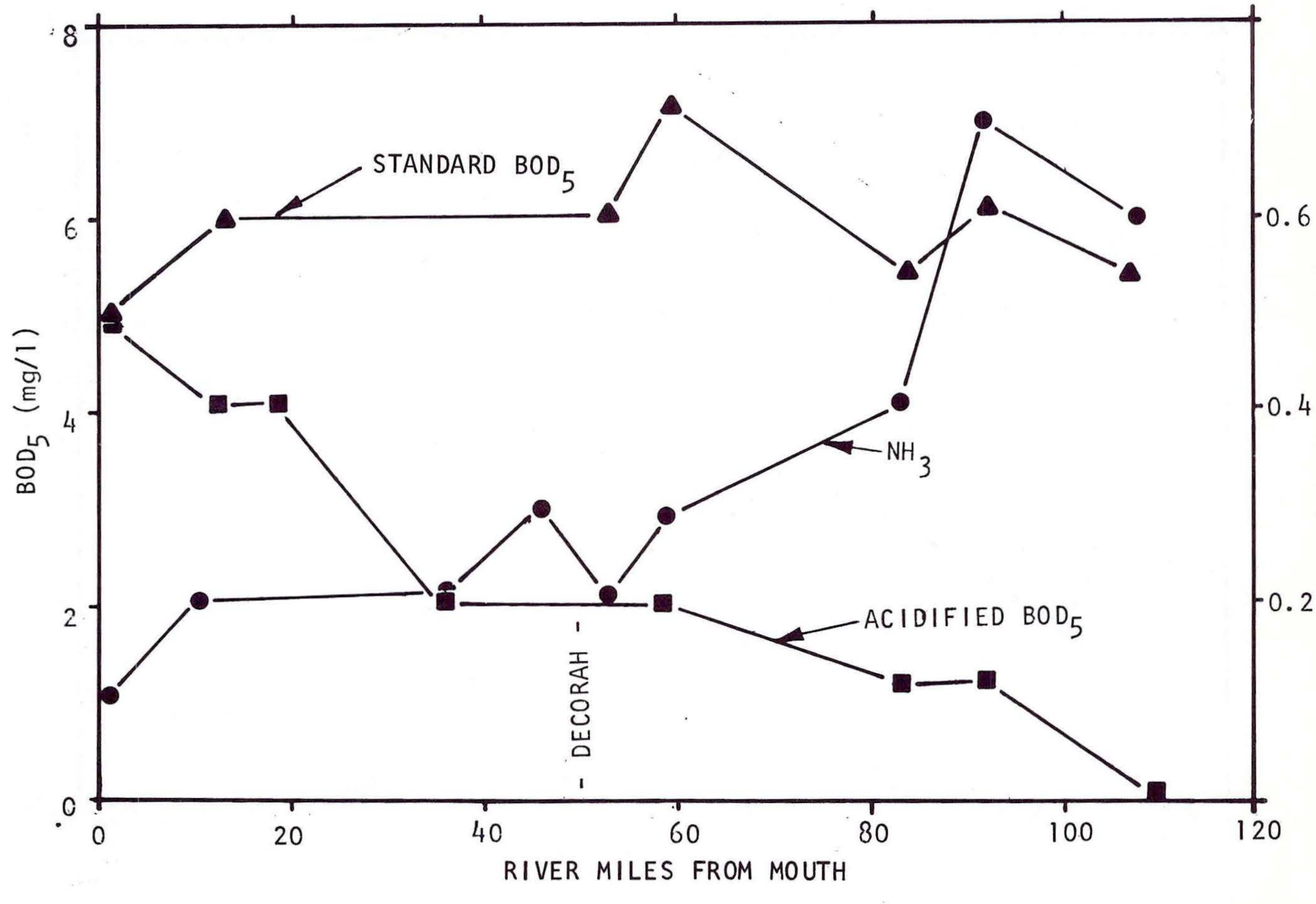


FIGURE IV-4 UPPER IOWA RIVER[1] 1970-1974 AMMONIA AND BOD_5 CONCENTRATION [1](McMULLEN, 1972)

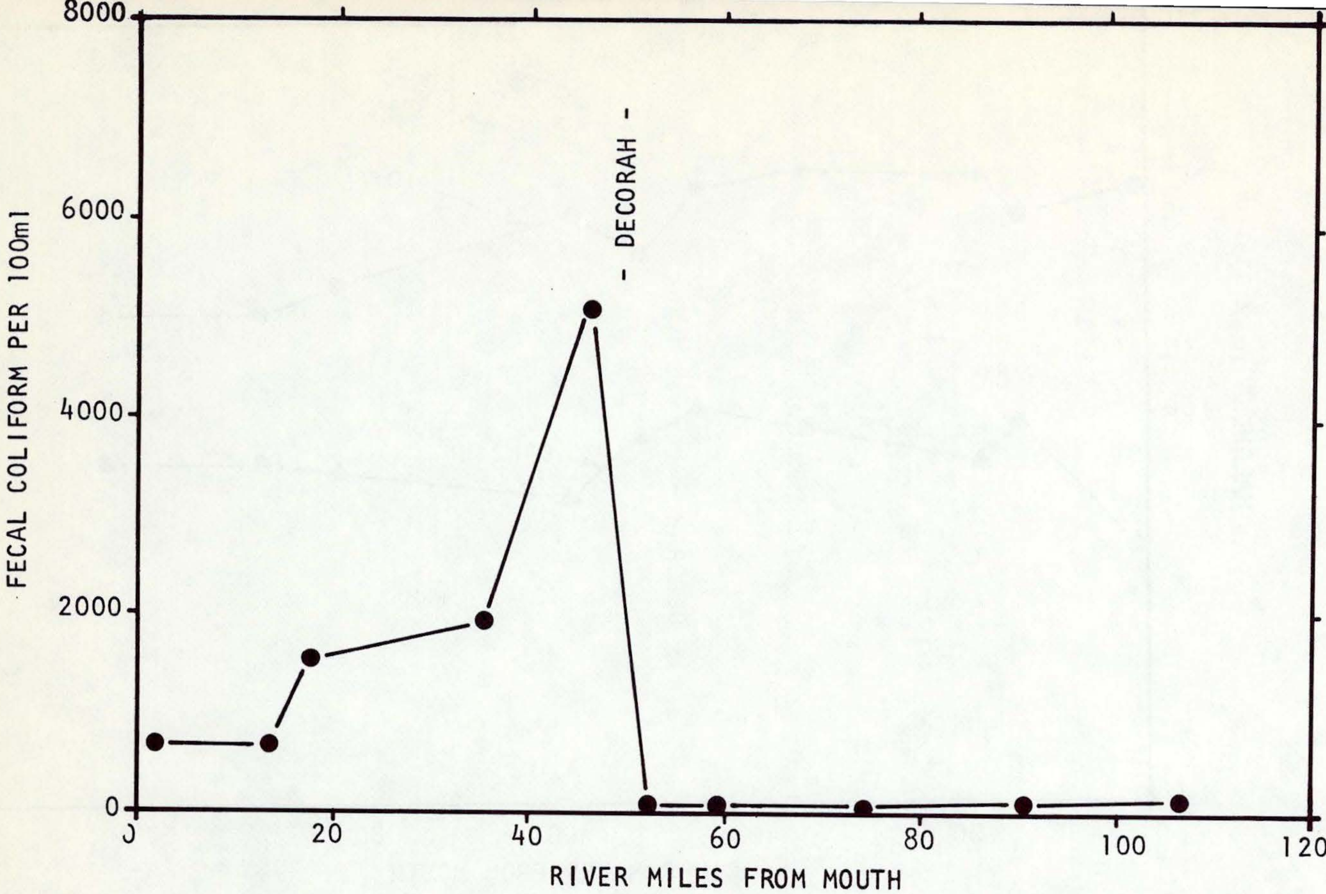


FIGURE IV-5 MEAN FECAL COLIFORM CONCENTRATIONS IN THE UPPER IOWA RIVER 1970-1974 [1] (McMULLEN, 1972)

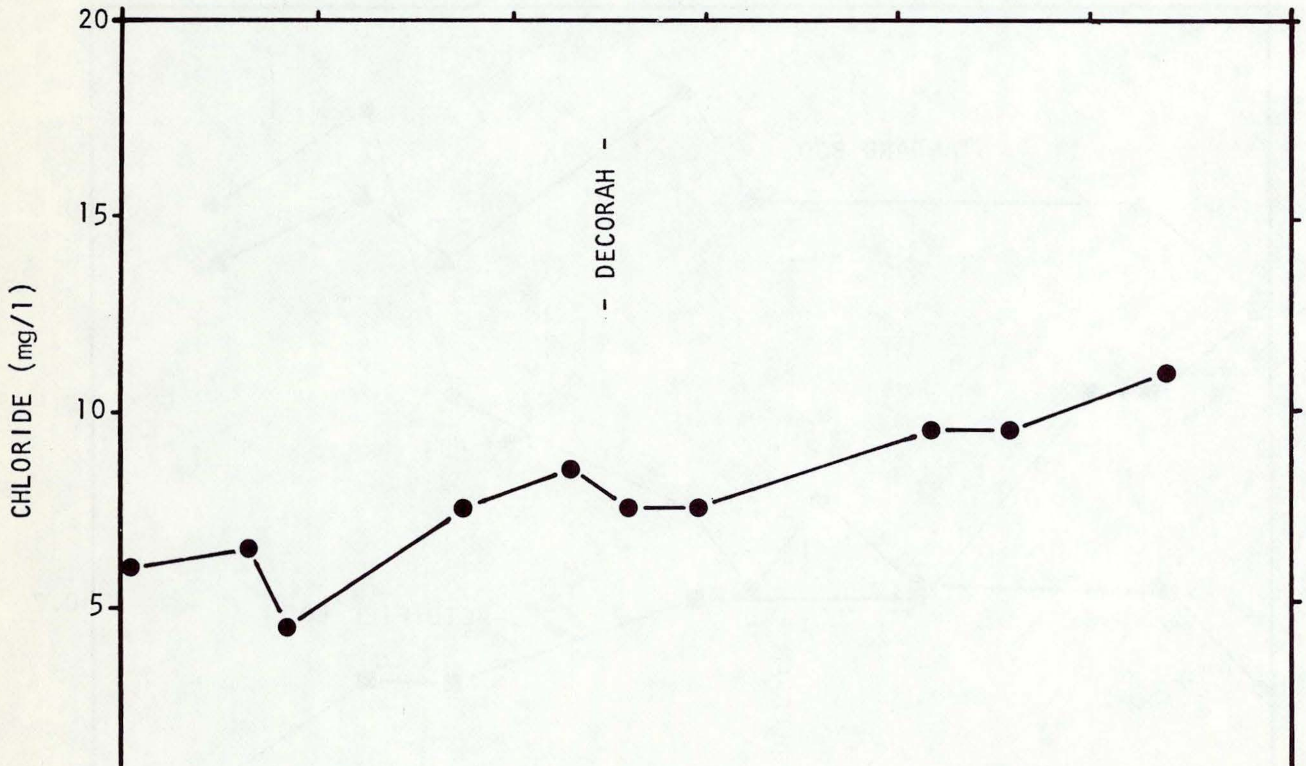


FIGURE IV-6 MEAN CHLORIDE CONCENTRATIONS IN THE UPPER IOWA RIVER 1970-1974 [1] (McMULLEN, 1972)

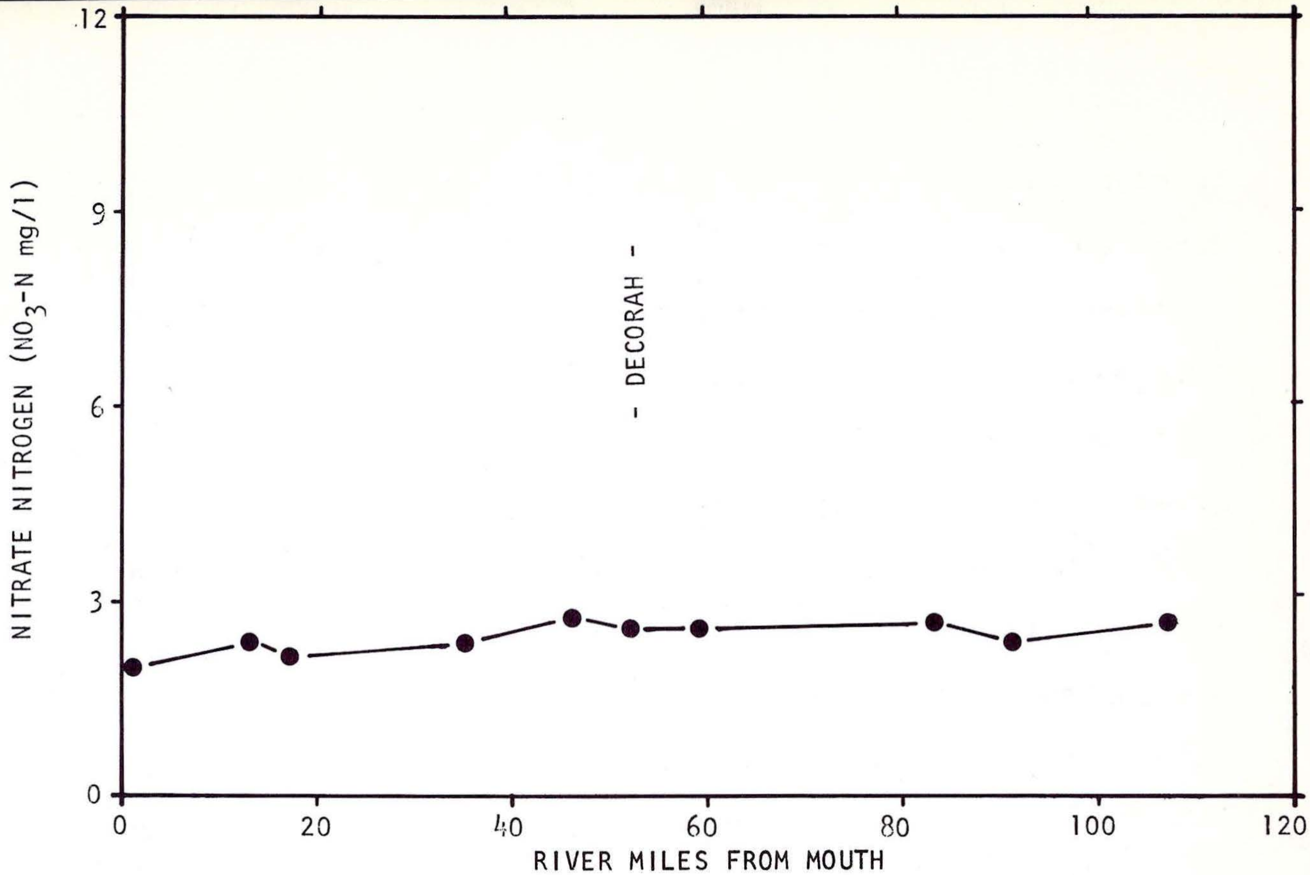


FIGURE IV-7 MEAN NITRATE NITROGEN CONCENTRATIONS IN THE UPPER IOWA RIVER 1970-1974 [1] (McMULLEN, 1972)

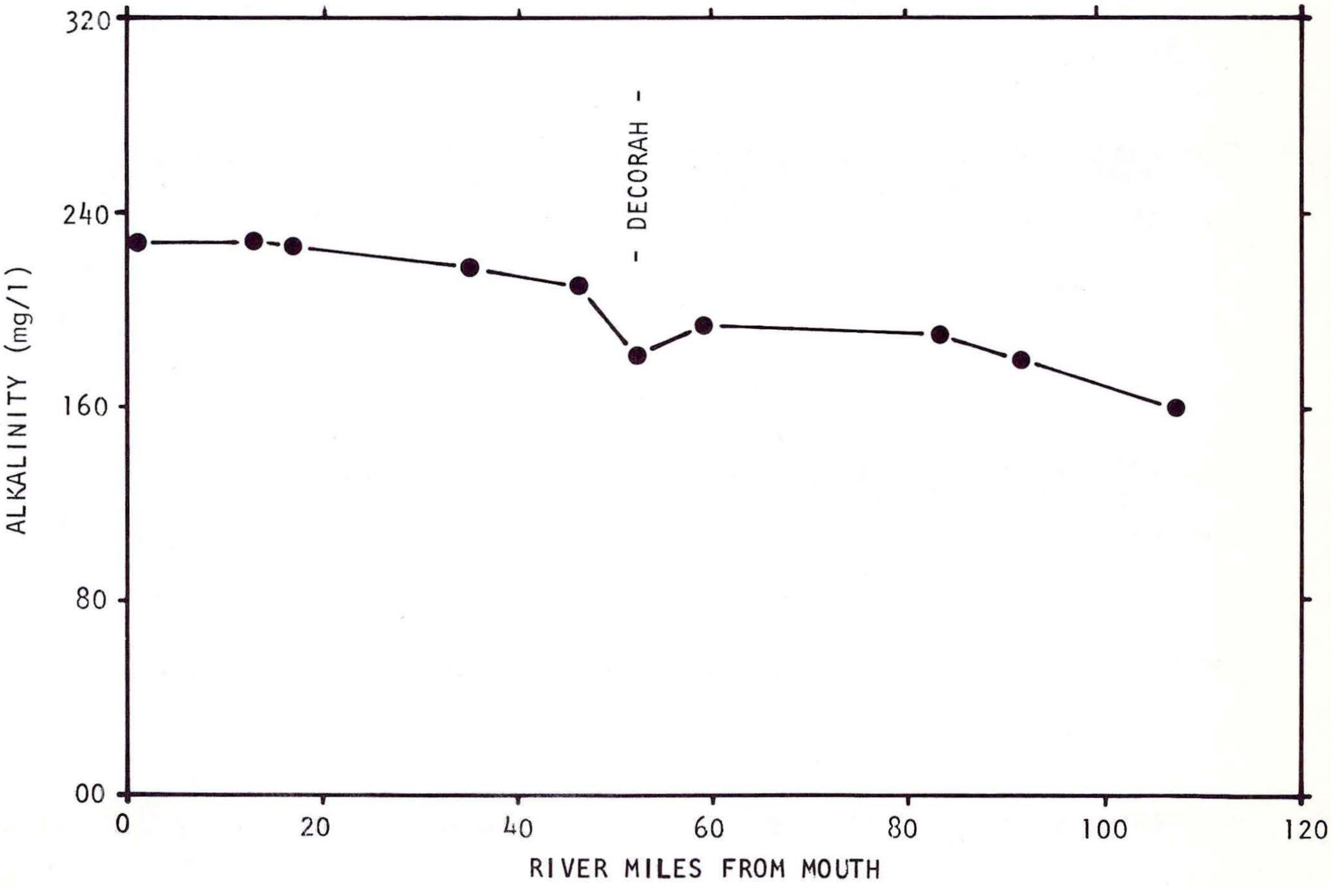


FIGURE IV-8 MEAN ALKALINITY CONCENTRATIONS IN THE UPPER IOWA RIVER 1970-1974 [1] (McMULLEN, 1972) through IV-8. Many of the tributaries showed little or no detectable orthophosphate. These included Staff Creek, Patterson Creek, French Creek, Silver Creek and Deer Creek. Orthophosphate concentrations from 0.2 to 0.4 mg/l were found on Clear Creek, Canoe Creek, Silver Creek, Coldwater Creek, Pine Creek, Ten Mile Creek, Dry Creek and Bigalk Creek. Orthophosphate concentrations of 0.8 mg/l were found in Trout Creek. In Silver Creek near Kendallville 4.87 mg/l orthophosphate was present. Due to the generally short length of these streams the orthophosphate levels may represent groundwater concentrations instead of pollution (McMullen, 1972). Nitrate concentrations tended to follow orthophosphate levels. Nitrate levels ranged from 0.90 mg/l to 3.67 mg/l (Table IV-4). Chloride concentrations ranged from 1.7 mg/l to 25.16 mg/l (Table IV-4).

The water quality data for the Upper Iowa River has been summarized and presented on Figure IV-9 (Upper Iowa River Water Quality).

YELLOW RIVER

The Yellow River originates in southeastern Winneshiek County near Ossian at an elevation of about 1200 feet. It is a tiny river, flowing through only Winneshiek and Allamakee Counties, although a few of its tributaries drain extreme northern Clayton County.

The length of the river from source to mouth is about 45

FIGURE IV-9

UPPER IOWA RIVER WATER QUALITY

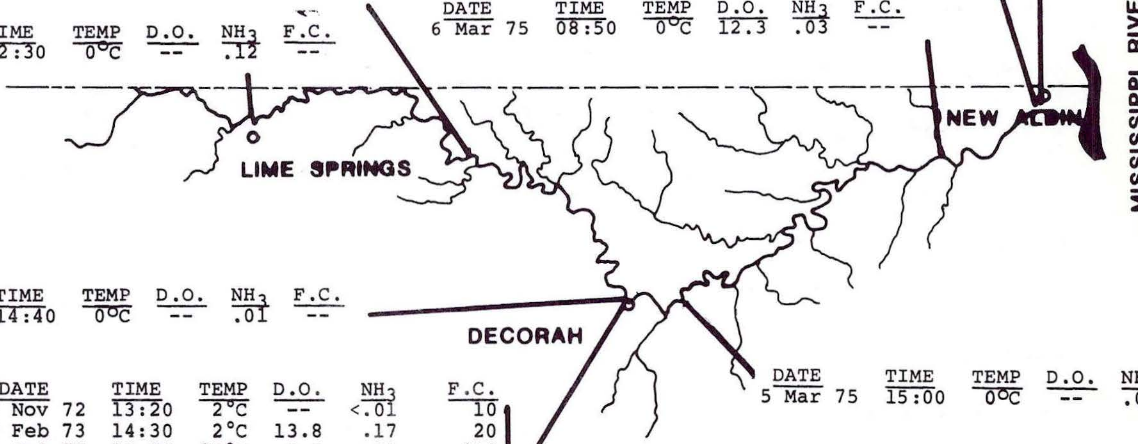
DATE	TIME	TEMP	D.O.	NH_3	F.C.
27 Aug 73	19:30	27°C	9.6	.28	210
24 Sep 73	17:55	19°C	10.1	.29	130
22 Oct 73	12:00	12°C	10.1	.10	130
26 Nov 73	17:10	5°C	11.3	.42	400

DATE	TIME	TEMP	D.O.	NH_3	F.C.
5 Mar 75	13:40	0°C	--	.03	--

DATE	TIME	TEMP	D.O.	NH_3	F.C.
6 Mar 75	09:30	0°C	13.3	.03	--

DATE	TIME	TEMP	D.O.	NH_3	F.C.
6 Mar 75	08:50	0°C	12.3	.03	--

DATE	TIME	TEMP	D.O.	NH_3	F.C.
5 Mar 75	12:30	0°C	--	.12	--



DATE	TIME	TEMP	D.O.	NH_3	F.C.
5 Mar 75	14:40	0°C	--	.01	--

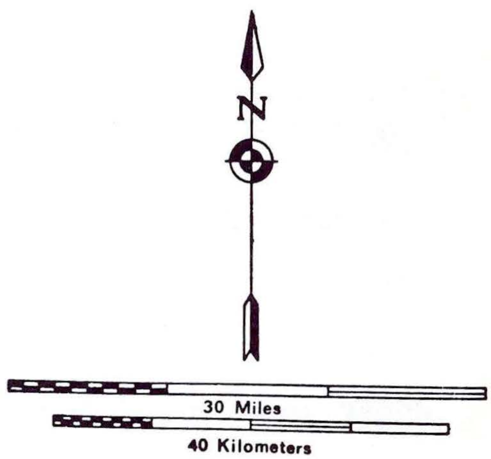
DATE	TIME	TEMP	D.O.	NH_3	F.C.
5 Mar 75	15:00	0°C	--	.01	--

DATE	TIME	TEMP	D.O.	NH_3	F.C.
28 Nov 72	13:20	2°C	--	<.01	10
27 Feb 73	14:30	2°C	13.8	.17	20
10 Jul 73	13:50	25°C	8.0	.01	400
28 Aug 73	08:45	25°C	7.1	<.01	20
27 Nov 73	08:45	6°C	11.1	<.01	180
4 Feb 74	18:00	0°C	13.8	<.01	<10
14 May 74	13:30	10°C	10.0	.38	31000
13 Aug 74	16:00	23°C	9.0	<.01	800
5 Nov 74	09:15	6°C	11.9	.09	30

DEQ WATER QUALITY STANDARDS

	CLASS A&B WATERS COLD	CLASS A&B WATERS WARM	CLASS C WATERS
TEMPERATURE degrees celsius	20	32.2	...
DISSOLVED OXYGEN milligrams per liter	5.0(1)	4.0(2)	...
AMMONIA NITROGEN milligrams per liter	2.0(3)	2.0(3)	...
	CLASS A	CLASS B	
FECAL COLIFORMS colonies per 100 milliliters	200(4)	2000	...

(1) Must be at least 7.0 for 16 hours of a 24-hour period
(2) Must be at least 5.0 for 16 hours of a 24-hour period
(3) Except if flow equals or exceeds the 7-day/10-year low flow or if material is from uncontrollable non-point sources
(4) Between April 1st and October 31st only



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river miles. All of its tributaries are small creeks, under 10 miles in length. The Yellow River is a Class B (warm water) stream for most of its length. Several of the tributaries are Class B (cold water) streams. Such streams include Dousman Creek, Suttle Creek, Bear Creek, Little Bear Creek, Hickory Creek, and Teeple Creek.

Postville (pop. 1526) is the only community of significant size on the Yellow River or in its basin. All of the available water quality data has been summarized and is shown on Figure IV-10 (Yellow River Water Quality).

Fecal coliforms ran very high during the survey taken on June 15, 1971. Values of over 9400 per 100 ml were found on the Class A section of the stream above the fork at Myron, and values of 230,000 per 100 ml were found about halfway between the source and mouth. Ammonia nitrogen and dissolved oxygen were satisfactory.

Although there are no gaging stations on the Yellow River the June 15, 1971, survey was apparently conducted at a time of near-to-normal flow, judging from the record on the Upper Iowa River at Decorah (about 12 miles from the source of the Yellow) on that date.

There are no quarterly survey sampling stations on the Yellow River.

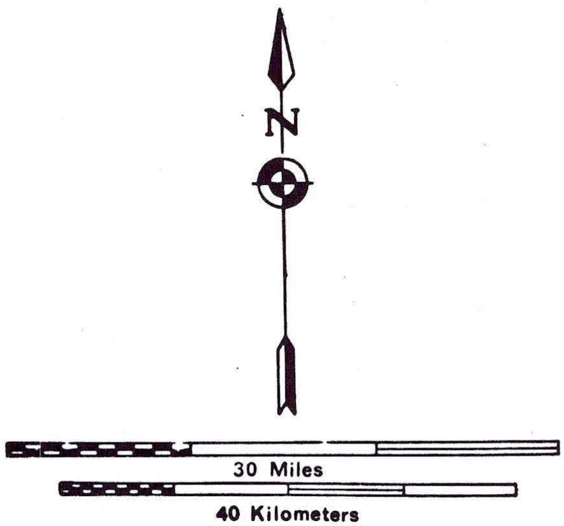
FIGURE IV-10

YELLOW RIVER WATER QUALITY

DEQ WATER QUALITY STANDARDS

	CLASS A&B WATERS COLD	CLASS A&B WATERS WARM	CLASS C WATERS
TEMPERATURE degrees celsius	20	32.2	...
DISSOLVED OXYGEN milligrams per liter	5.0(1)	4.0(2)	...
AMMONIA NITROGEN milligrams per liter	2.0(3)	2.0(3)	...
	CLASS A	CLASS B	
FECAL COLIFORMS colonies per 100 milliliters	200(4)	2000	...

(1) Must be at least 7.0 for 16 hours of a 24-hour period
(2) Must be at least 5.0 for 16 hours of a 24-hour period
(3) Except if flow equals or exceeds the 7-day/10-year low flow or if material is from uncontrollable non-point sources
(4) Between April 1st and October 31st only



DATE	TIME	TEMP	D.O.	NH_3	F.C.
27 Aug 73	17:45	26°C	6.3	.36	300
24 Sep 73	16:50	12°C	9.0	.17	70
22 Oct 73	11:15	13°C	10.0	.40	90
26 Nov 73	16:10	7°C	11.2	.38	30

DATE	TIME	TEMP	D.O.	NH_3	F.C.
15 Jun 71	15:00	21°C	7.1	.13	1900
15 Jun 71	15:30	22°C	8.4	.07	4300
15 Jun 71	16:00	22°C	8.0	.11	1600
15 Jun 71	16:10	23°C	8.6	.09	9400
15 Jun 71	16:30	24°C	8.5	.09	2300
15 Jun 71	16:50	23°C	9.8	.11	20000
15 Jun 71	17:30	21°C	9.0	.05	230000
15 Jun 71	17:50	21°C	8.6	.11	4400
28 Feb 72	05:30	----	15.2	.04	<10
15 Jun 71	18:30	21°C	8.7	.05	4300

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TURKEY RIVER

The source of the Turkey River is in central Howard County, as are those of two of its larger tributaries, Crane Creek and the Little Turkey River. The main tributary to the Turkey River is the Volga River, which originates in west-central Fayette County. The length of the Turkey River is 137 miles from its source to the mouth near Millville in southeastern Clayton County.

There are a number of communities of significant size in the basin. These include: Elkader (pop. 1592) on the Turkey River, and Fayette (pop. 1947) on the Volga River. West Union (pop 2624) is also in the basin on high ground between the Turkey River and the Volga River. Strawberry Point (pop. 1281) is on the divide between Turkey and the Maquoketa basins.

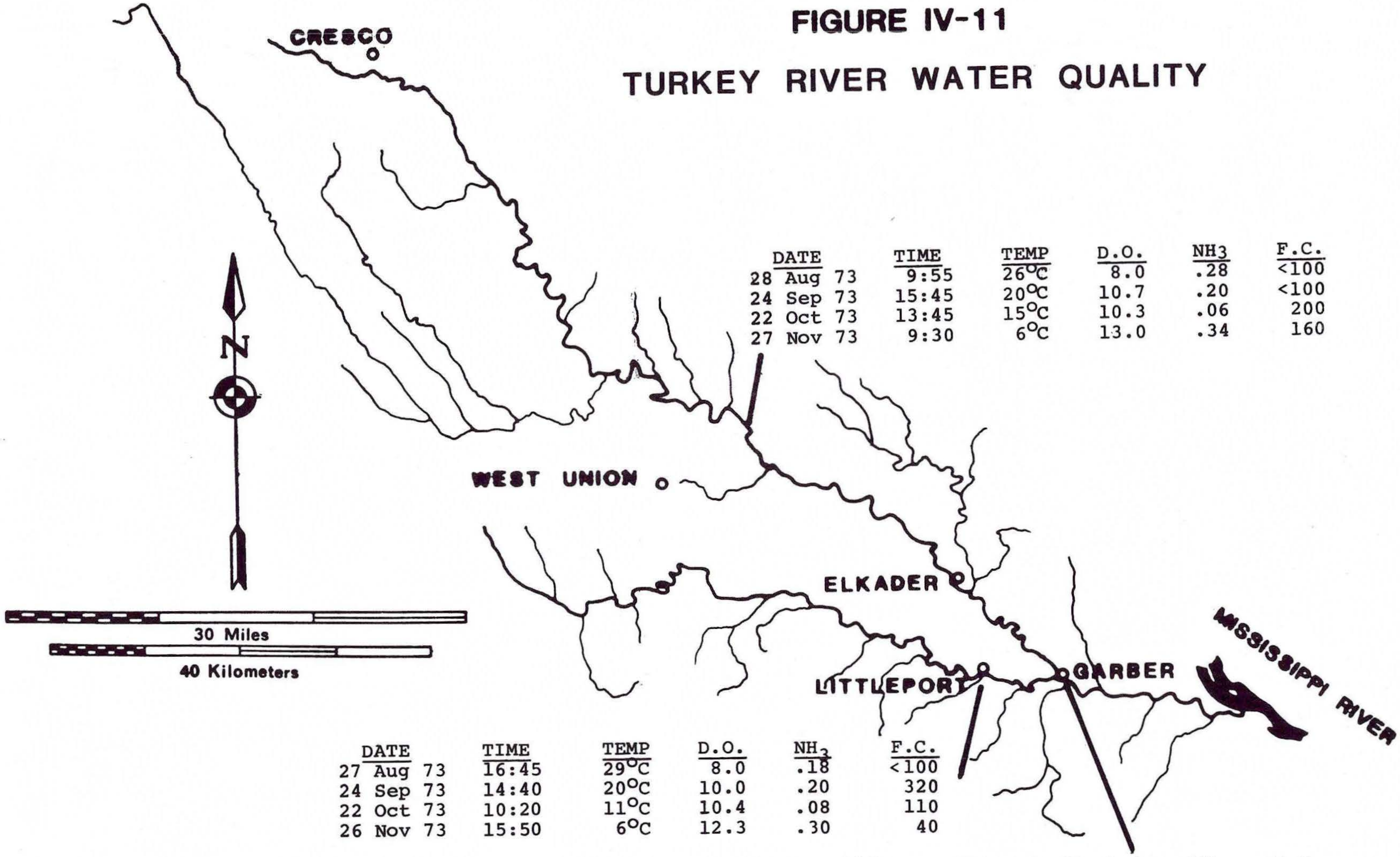
Nearly all of the Turkey River and its tributaries are Class B (warm water) streams. However, fourteen of the creeks in the system are Class B (cold water) streams. They include South Cedar Creek, Hemett Creek, and Brush Creek, as well as the Little Turkey River in southeastern Clayton County.

Water quality data for the Turkey River has been summarized as shown on Figure IV-11.

No surveys have been taken along the length of the Turkey River or its tributaries. However, a sampling station at the County Road C-7x bridge at Garber (at the confluence of the Turkey and the Volga) is part of the quarterly survey.

FIGURE IV-11

TURKEY RIVER WATER QUALITY



DATE	TIME	TEMP	D.O.	NH_3	F.C.
28 Aug 73	9:55	26°C	8.0	.28	<100
24 Sep 73	15:45	20°C	10.7	.20	<100
22 Oct 73	13:45	15°C	10.3	.06	200
27 Nov 73	9:30	6°C	13.0	.34	160

DATE	TIME	TEMP	D.O.	NH_3	F.C.
27 Aug 73	16:45	29°C	8.0	.18	<100
24 Sep 73	14:40	20°C	10.0	.20	320
22 Oct 73	10:20	11°C	10.4	.08	110
26 Nov 73	15:50	6°C	12.3	.30	40

DATE	TIME	TEMP	D.O.	NH_3	F.C.
29 Feb 72	09:30	--	11.6	1.20	3300
28 Nov 72	09:15	1°C	13.6	<.01	500
27 Feb 73	12:00	2°C	12.2	.48	200
10 Jul 73	15:15	27°C	8.9	.07	500
27 Aug 73	16:20	29°C	10.8	.03	<100
5 Feb 74	10:30	0°C	14.2	.29	30
14 May 74	11:00	11°C	10.0	.08	4900
13 Aug 74	13:30	24°C	7.9	.01	12000
5 Nov 74	11:40	7°C	11.8	.03	430

DEQ WATER QUALITY STANDARDS

	CLASS A&B WATERS COLD	CLASS A&B WATERS WARM	CLASS C WATERS
TEMPERATURE degrees celsius	20	32.2	...
DISSOLVED OXYGEN milligrams per liter	5.0(1)	4.0(2)	...
AMMONIA NITROGEN milligrams per liter	2.0(3)	2.0(3)	...
	CLASS A	CLASS B	
FECAL COLIFORMS colonies per 100 milliliters	200(4)	2000	...

(1) Must be at least 7.0 for 16 hours of a 24-hour period
(2) Must be at least 5.0 for 16 hours of a 24-hour period
(3) Except if flow equals or exceeds the 7-day/10-year low flow or if material is from uncontrollable non-point sources
(4) Between April 1st and October 31st only

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Garber is located in southeastern Clayton County, not far from the mouth of the Turkey River.

High fecal coliform values have been observed over the year. Although most samplings have resulted in values that meet standards, fecal coliform counts of 12,000 (August 13, 1973), 4,900 and 3,300 per 100 ml have been observed at certain times, summer and winter included. Some of these (such as the 3,300 value) are associated with runoff. Ammonia nitrogen values as high as .48 mg/l have been observed in February, with generally low levels in the summer (.08 mg/l or less).

Dissolved oxygen values have been within standards during all of the samples taken quarterly. However, a value of 7.9 mg/l was observed at 1:30 p.m. on August 13, 1974, which is relatively low for such a time of day and time of year.

Fecal coliforms must be regarded as a problem on the Turkey, while dissolved oxygen levels occasionally drop to levels almost violating standards.

MAQUOKETA RIVER

The Maquoketa River (the main South Fork) has its source in Fayette County some 140 river miles from its confluence with the Mississippi. The main stem forms at the confluence of the South and North Forks just east of the City of Maquoketa. The two forks contribute about the same amount of water, although the South Fork drains a somewhat larger area. Nearly all of the river and its main tributaries have been designated Class B (warm water), except for the upper reaches of Brush Creek and Spring Creek, which are Class B (cold water). The river currently displays some problems with regard to ammonia nitrogen and fecal coliform, which tends to run high (occasionally violating standards) below the Manchester (pop. 4641) and Maquoketa (pop. 5677) sewage treatment plants. Currently, the Maquoketa plant (below which the problem is most severe) does not have secondary treatment facilities, but is scheduled to have such by the end of 1975. Manchester has secondary treatment, but the plant was not operated very well, according to a 1973 report by the Iowa State Hygienic Laboratory.

In spite of several significant point sources, water quality on the Maquoketa River is quite good. Nutrients in some areas appear limiting, and adequate dissolved oxygen is available. Water quality below the cities of Manchester and Maquoketa is adversely affected but, except under ice cover or low flow, appears to quickly recover. Nonpoint sources are a somewhat smaller problem than on many rivers of the state.

Water Quality Conditions

Harmful Substances - Considerable concern has been expressed over lead pollution in the Maquoketa River below Manchester. The recent addition of a battery manufacturer with heavy metal wastes to the community has prompted a considerable amount of study on heavy metals in the river in the last two years. Data collected to date, have shown only copper to have violated standards. Concentrations of most heavy metals including lead, have been at or near the limits of detection. Other metals that have been detected, but have not been shown to violate standards, include barium, chromium, manganese and zinc. Information concerning heavy metal data on the Maquoketa River is given in Table IV-5.

<u>Physical Modification</u> - Turbidity in the Maquoketa River is the main type of physical modification. The turbidity is primarily a result of nonpoint source runoff. While a problem on both forks, turbidity appears somewhat more severe on the North Fork. Maximum turbidity found to date is slightly below 400 JTU. No studies have been directed specifically at determining the magnitude of nonpoint source problems on the Maquoketa and samples have not been collected during critical high flow runoff periods.

<u>Salinity, Acidity, and Alkalinity</u> - Salinity problems below Manchester are potentially among the most significant in the State. Hide curing operations at Manchester create large volumes of saline waste which is discharged to the municipal treatment plant and hence to the river. Conventional treatment processes are not designed to remove chlorides and other dissolved solids which cause the salinity. Total dissolved solids levels above Manchester have been found to be from 150-300 mg/l. Total dissolved solids in the Manchester effluent sometimes exceed 5,000 mg/l. At high stream flows

TABLE IV-5

HEAVY METALS IN THE MAQUOKETA RIVER

PARAMETER	TOTAL SAMPLES	NUMBER OF SAMPLES WITH DETECTABLE LEVELS	MEAN OF THOSE WITH DETECTABLE LEVELS (μg/l)	MAXIMUM (μg/l)
As	11	0		
Ba	29	18	183	700
Cd	29	0		
Cr	33	1	20	20
Cu	29	3	23	30
Pb	32	2	50	70
Mn	9	5	38	50
Hg	19	0		
Ni	25	0		
Ag	23	0		
Zn	29	22	183	710

rapid dilution makes the increase to the river undetectable. At low stream flows, however, dilution may be only about five times the volume of waste.

Alkalinity on the South Fork averages about 175 mg/l and that on the North Fork, somewhat higher, near 275 mg/l.

Eutrophication Potential - Where water quality is not influenced by point sources nutrient concentrations show similar patterns in both the North Fork and South Fork. Nitrates are abundant, usually 2.5 - 4.0 mg/l. Phosphate concentrations are quite low, usually near 0.1 mg/l or less total phosphate. Nutrient levels increase with flow indicating their probable nonpoint source origin.

Nitrate levels below Manchester and Maquoketa, remain adequate for algal growth. Phosphate concentrations are also found near the discharges, but remain elevated for several miles downstream. Below Maquoketa, Iowa the North Fork dilutes out much of the impact of the discharge, but below Manchester there is little dilution above the Lake Delhi impoundment. The nutrient input from the river combined with inputs from individual dwellings around the lake and nonpoint source runoff, have caused serious algal blooms in the past within the reservoir.

In spite of some localized problems, nutrient levels in the Maquoketa River are lower than most Iowa rivers. This is due partly to the smaller drainage area, and the smaller number of point sources.

Oxygen Depletion - No dissolved oxygen violations have been found in the samples analyzed since 1970. While several point sources add substantial waste loads to the river, little effect has been seen. Flows in recent years, however, have been well above minimum flow levels which would be critical for dissolved oxygen. Numerous riffle areas, kept ice free by turbulence, have provided reaeration necessary for maintenance of adequate dissolved oxygen.

Ammonia nitrogen concentrations may better reflect the problems resulting from point sources. Nine percent of all ammonia nitrogen samples violated the Iowa Water Quality Standard of 2.0 mg/l. Ammonia is toxic to fish near this level. Ammonia also creates an additional oxygen demand in its conversion to nitrate. Improved treatment efficiency and advanced treatment at several of the more significant point sources should assure adequate oxygen and lower ammonia concentration on the Maquoketa River.

Health Hazards and Aesthetic Degradation - Fecal coliform levels from point sources and nonpoint sources keep concentrations above 200/100 ml much of the time. Fecal coliform concentrations are high throughout the river during runoff.

Concentrations, at other times, are relatively low except below point source discharges. In spite of high concentrations immediately below Manchester, concentrations are at normal background levels before entering the Delhi impoundment. Body contact recreation in this area makes fecal coliform concentrations a concern. Limited sampling at Delhi indicates that concentrations may exceed 100/100 ml at times.

Maquoketa River Tributaries

Over fifty tributaries and branches of tributaries to the North and South Fork Maquoketa River are classified by the Iowa Department of Environmental Quality; three are cold water fisheries, the rest are warm water fisheries. Sampling data since 1970 is not available on any of them. Surveys were conducted on two of them in the late 1950's and early 1960's concerning pollution problems.

Pollution studies on Farmer's Creek, tributary to the North Fork Maquoketa River, were conducted in 1957, 1958, and 1959. Pollution caused by creamery and sawmill discharges near La Motte, Iowa seriously degraded the stream at the time. Sludge deposits, sawdust, odor, and color problems were documented. Solids, fungus and odor appeared to be predominant in the stream. While no recent problems have been documented, there are no data available to indicate the current water quality of this stream.

Pollution was caused by the discharge of creamery wastes near

Ryan.

Again sludge deposits, fungus growth, coliform bacteria and odor were problems. Data indicated, however, that the stream recovered prior to discharge into the Maquoketa River (Figures IV-12 and 13). The creamery and the town of Ryan are currently served by a roughing trickling filter and lagoon. Current discharges, while below early 1960's levels, are still inadequate to protect the stream and continued pollution probably exists. No current water quality data is available for comparison.

Water quality data for the North Fork of the Maquoketa River is shown on Figures IV-14 and 15.

No data has been collected by the DEQ, the State Hygienic Laboratory, or any university, as far as is known on the other tributaries of the Maquoketa River.

Water quality data for the Maquoketa River has been summarized as shown on Figure IV-16.

WAPSIPINICON RIVER

The Wapsipinicon basin, despite its great length of over 250 rivermiles (from Minnesota to the Mississippi about 15 miles northeast of Davenport), has no large communities within its confines. Oelwein is the most populous, with 7,775 in 1970, followed by these communities in the 1970 census; Independence 5,910; Anamosa 4,389; New Hampton

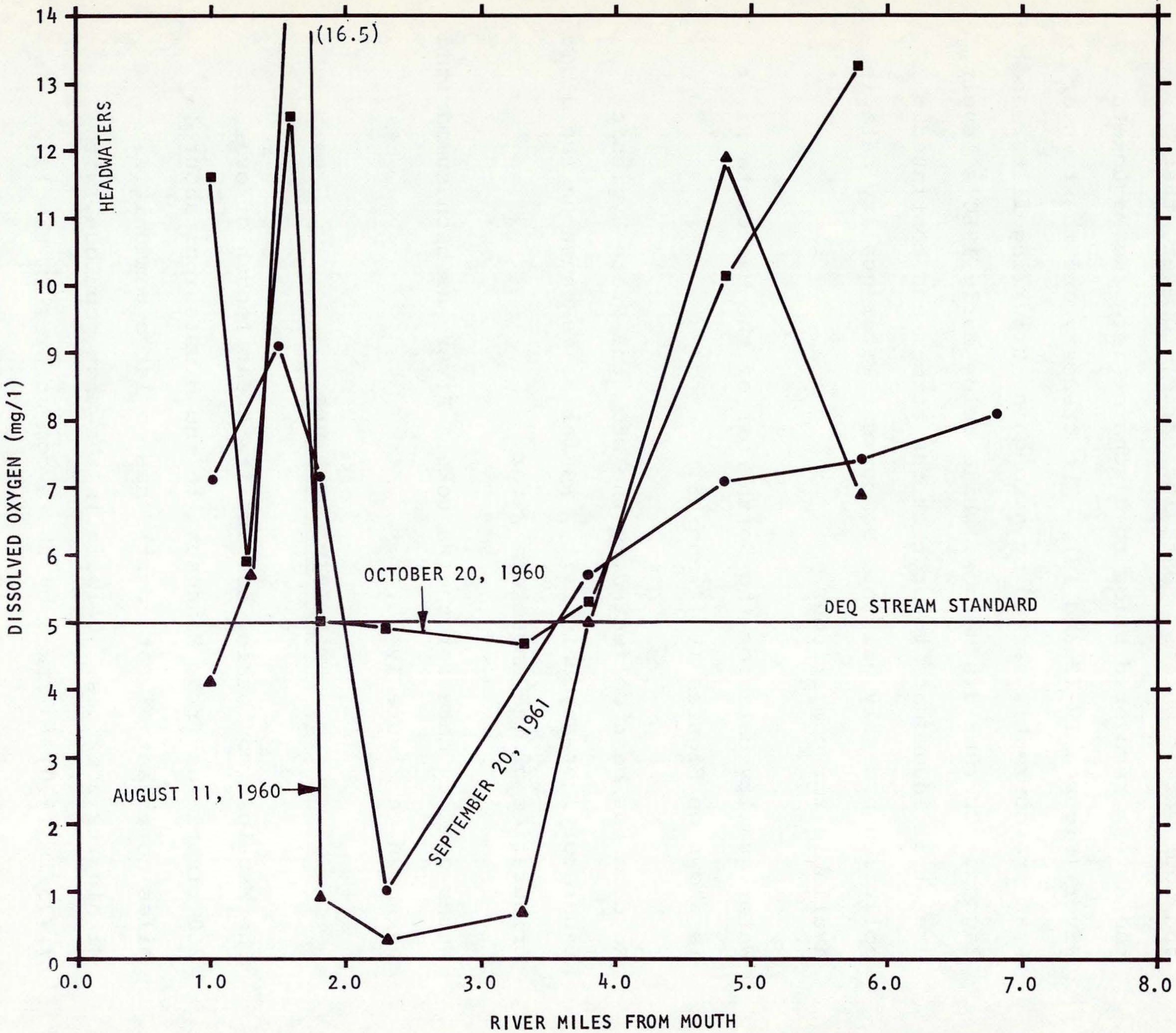


FIGURE IV-12 COMPARISON OF DISSOLVED OXYGEN CONCENTRATIONS IN BUCK CREEK, 1960-1961

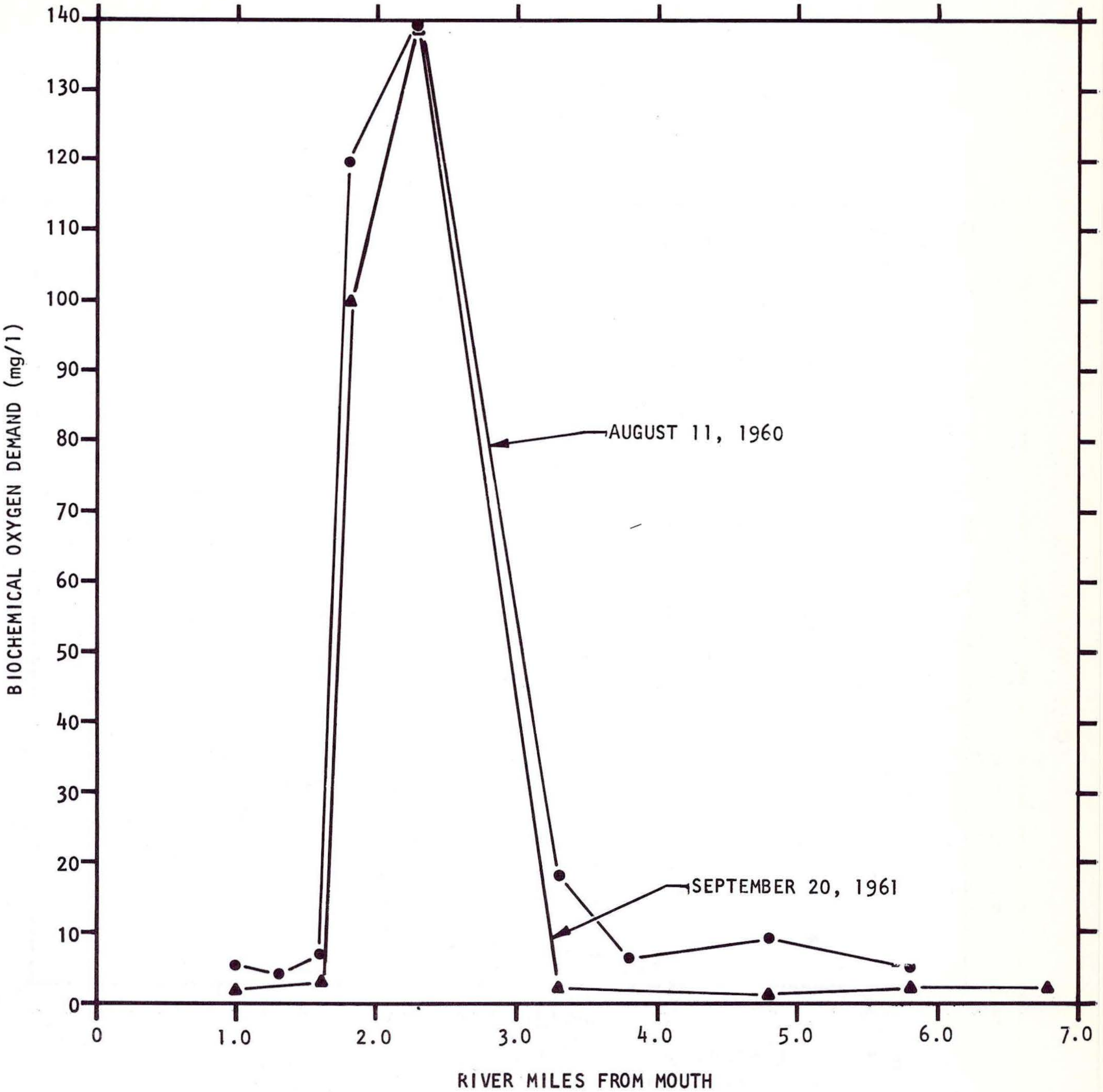


FIGURE IV-13 BIOCHEMICAL OXYGEN DEMAND IN BUCK CREEK, 1960 and 1961

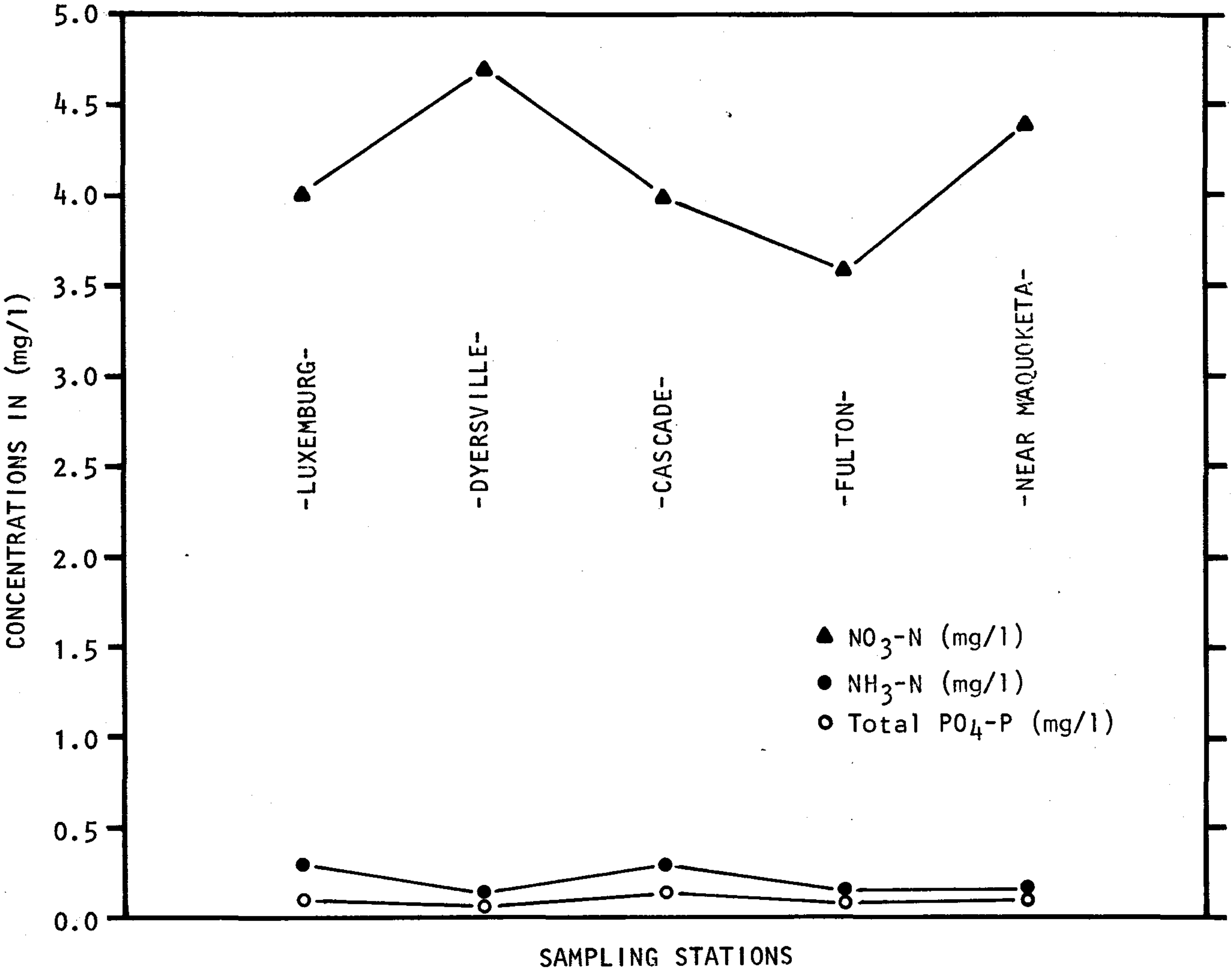


FIGURE IV-14 COMPARISON OF AMMONIA, PHOSPHATE, AND NITRATE CONCENTRATIONS IN THE NORTH FORK MAQUOKETA RIVER, FEBRUARY 10, 1975

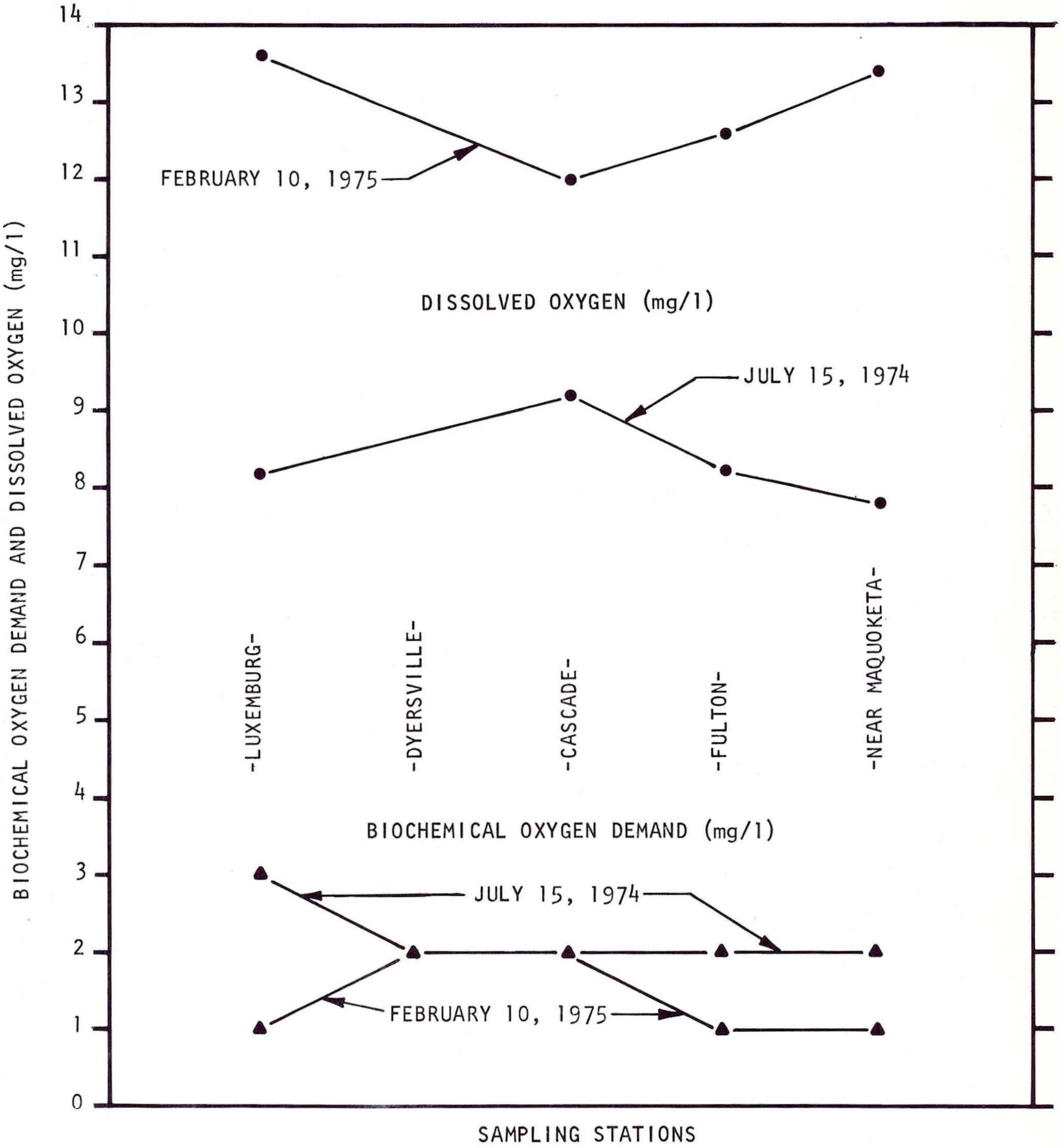


FIGURE IV-15 DISSOLVED OXYGEN AND BOD CONCENTRATIONS IN THE NORTH FORK MAQUOKETA RIVER, JULY 15, 1974 AND FEBRUARY 10, 1975

FIGURE IV-16

MAQUOKETA RIVER WATER QUALITY

DATE	TIME	TEMP	D.O.	NH_3	F.C.
07 Aug 73	12:00	24°C	7.7	.05	420
07 Aug 73	12:45	24°C	7.9	.01	540
07 Aug 73	13:15	24°C	7.6	.03	1,000
07 Aug 73	13:45	24°C	8.7	.28	11,000
07 Aug 73	14:25	24°C	7.7	.24	< 100
07 Aug 73	15:00	24°C	8.0	.16	1,400
19 Feb 74	--	1°C	13.8	1.50	1,200
19 Feb 74	11:30	1°C	11.9	1.50	2,200
19 Feb 74	11:45	1°C	12.4	1.40	1,800
23 Apr 74	12:20	8°C	11.9	<.01	700

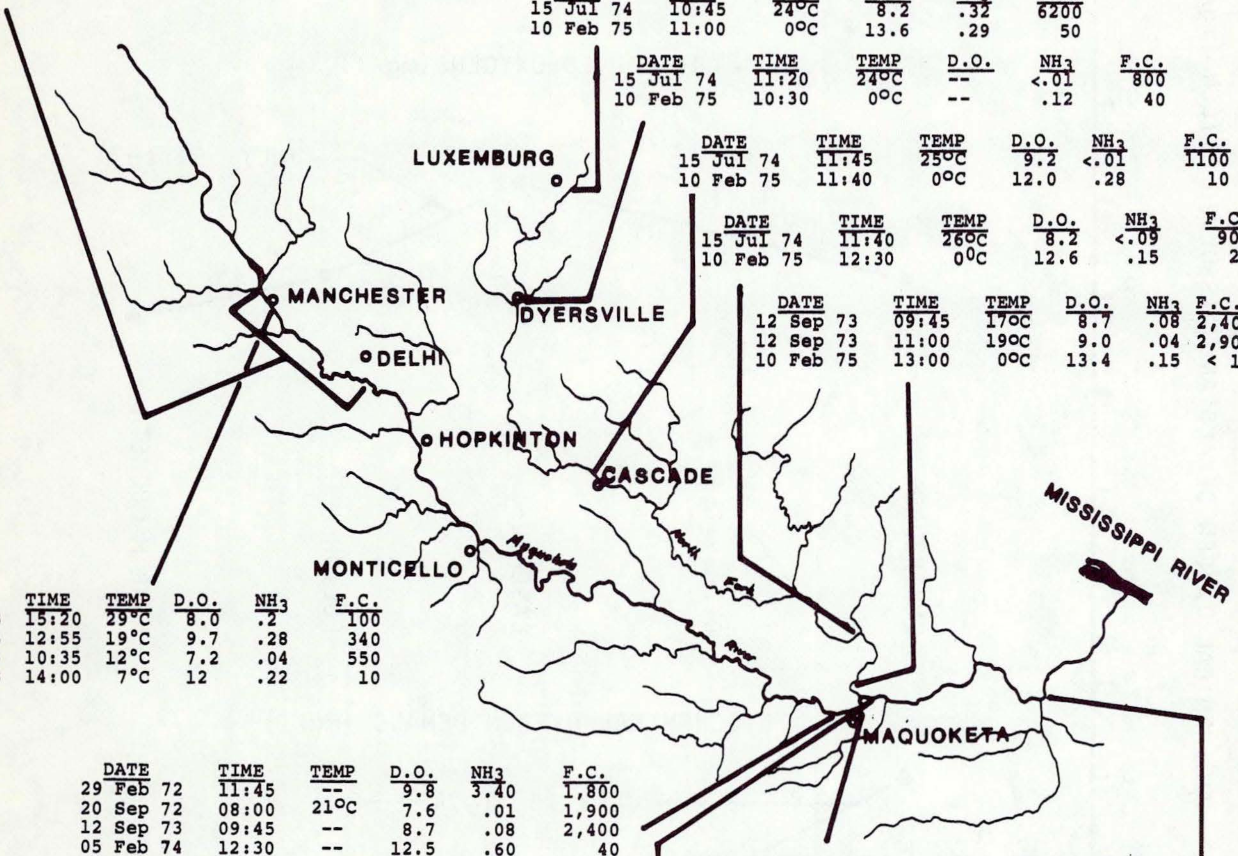
DATE	TIME	TEMP	D.O.	NH_3	F.C.
15 Jul 74	10:45	24°C	8.2	.32	6200
10 Feb 75	11:00	0°C	13.6	.29	50

DATE	TIME	TEMP	D.O.	NH_3	F.C.
15 Jul 74	11:20	24°C	--	<.01	800
10 Feb 75	10:30	0°C	--	.12	40

DATE	TIME	TEMP	D.O.	NH_3	F.C.
15 Jul 74	11:45	25°C	9.2	<.01	1100
10 Feb 75	11:40	0°C	12.0	.28	10

DATE	TIME	TEMP	D.O.	NH_3	F.C.
15 Jul 74	11:40	26°C	8.2	<.09	900
10 Feb 75	12:30	0°C	12.6	.15	20

DATE	TIME	TEMP	D.O.	NH_3	F.C.
12 Sep 73	09:45	17°C	8.7	.08	2,400
12 Sep 73	11:00	19°C	9.0	.04	2,900
10 Feb 75	13:00	0°C	13.4	.15	< 10



DATE	TIME	TEMP	D.O.	NH_3	F.C.
27 Aug 73	15:20	29°C	8.0	.2	100
24 Sep 73	12:55	19°C	9.7	.28	340
8 Oct 73	10:35	12°C	7.2	.04	550
26 Nov 73	14:00	7°C	12	.22	10

DATE	TIME	TEMP	D.O.	NH_3	F.C.
29 Feb 72	11:45	--	9.8	3.40	1,800
20 Sep 72	08:00	21°C	7.6	.01	1,900
12 Sep 73	09:45	--	8.7	.08	2,400
05 Feb 74	12:30	--	12.5	.60	40
15 Jul 74	--	--	7.8	--	--
25 Nov 74	--	3°C	--	.05	--

DATE	TIME	TEMP	D.O.	NH_3	F.C.
5 Feb 74	13:30	1°C	11.5	1.20	1,000,000

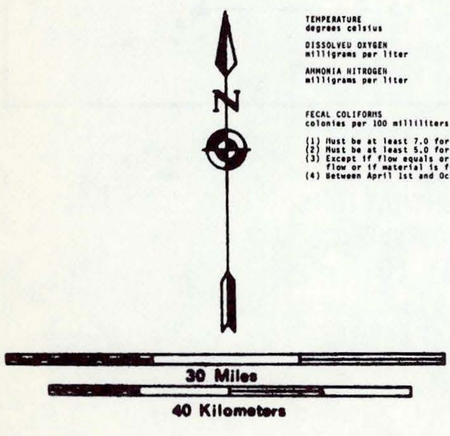
DEQ WATER QUALITY STANDARDS

	CLASS A&B WATERS COLD	CLASS A&B WATERS WARM	CLASS C WATERS
TEMPERATURE degrees celsius	20	32.2	...
DISSOLVED OXYGEN milligrams per liter	5.0(1)	4.0(2)	...
AMMONIA NITROGEN milligrams per liter	2.0(3)	2.0(3)	...
	CLASS A	CLASS B	
FECAL COLIFORMS colonies per 100 milliliters	200(4)	2000	...

(1) Must be at least 7.0 for 16 hours of a 24-hour period
(2) Must be at least 5.0 for 16 hours of a 24-hour period
(3) Except if flow equals or exceeds the 7-day/10-year low flow or if material is from uncontrollable non-point sources
(4) Between April 1st and October 31st only

DATE	TIME	TEMP	D.O.	NH_3	F.C.
20 Sep 72	7:40	21°C	7.7	.04	1500
8 Nov 72	11:15	7°C	11.4	.05	600
13 Feb 73	11:45	1°C	12.2	.20	2100
11 Jul 73	10:30	25°C	7.9	<.01	1800
27 Aug 73	11:10	26°C	8.5	.04	3600
12 Sep 73	11:30	19°C	9.0	.15	32000
26 Nov 73	11:30	6°C	11.6	.21	3600
5 Feb 74	13:20	0°C	12.4	.72	8200
30 Apr 74	14:15	17°C	9.6	.23	61000
13 Aug 74	11:30	23°C	8.6	<.10	1100
5 Nov 74	13:30	8°C	10.9	.09	3600
10 Feb 75	13:20	0°C	13.5	.16	940

DATE	TIME	TEMP	D.O.	NH_3	F.C.
27 Aug 73	10:50	26°C	8.7	.02	420
24 Sep 73	10:55	17°C	8.2	.4	1800
8 Oct 73	12:10	17°C	8.8	.66	2000
26 Nov 73	11:50	6°C	11.0	.7	4900



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3,621; Tripoli 1,345; and Central City 1,116. All other communities have populations under 1,000. The lack of more populous communities on the river results in a higher relative impact from agricultrual wastes for the Wapsipinicon.

Water quality in the Wapsipinicon River is generally good (6). Very few violations of Iowa Water Quality Standards have been found. Heavy metal violations have been most common. Isolated violations of dissolved oxygen and ammonia standards have also occurred. Few of the tributaries have had sufficient study to draw any conclusions regarding their overall water quality. The predominant source of pollution, however, is from nonpoint sources.

The water quality of some of the tributary streams, such as the East Branch Wapsipinicon River, is considerably worse than the main stem. Point sources within the segment have caused serious degradation, particularly regarding dissolved oxygen.

Water Quality

Water Quality Harmful Substances - While no pesticide studies have been done directly on the Wapsipinicon, the State Hygienic Laboratory has carried out extensive sampling for pesticides on Jones Creek, a tributary basin in Scott County. Extremely high pesticide levels found in this tributary indicate that nonpoint sources are contributing large amounts of pesticides to the river. Data from other basins suggest that the problem of pesticides in runoff is statewide and not restricted to any one area. Heavy metals data on the

Wapsipinicon River have shown elevated levels on a number of occasions (see Table IV-6). Most of the metals data are derived from the quarterly samples collected by the State Hygienic Laboratory near De Witt. Three metals: barium, lead and zinc, have been found at levels in violation of Iowa Water Quality Standards. Barium has been found at detectable levels in most samples collected. Other metals which have been found in concentrations below standard limitations include copper and manganese.

Physical Modification - Limited data is available on physical modification in the Wapsipinicon River. Surveys conducted to date have shown wide fluctuations in turbidity. This would be expected due to the nature of the source and the occurrence of rainfall and runoff. Maximum concentrations of 990 JTU's have been observed in the upper portion of the river (Figure IV-17).

The pattern of turbidity change going downstream is probably a result of runoff conditions at the time of sampling rather than a reflection of the magnitude of runoff problems within the basin. Studies by the State Hygienic Laboratory and the USGS demonstrate that turbidity and sediment load is common in the lower part of the river also. It is interesting that even within the small drainage area of the upper portion of the Wapsipinicon River these high turbidity values are found. In addition, Figure IV-17 demonstrates the dilut-ional impact the East Branch Wapsipinicon River has on the

TABLE IV-6

HEAVY METALS IN THE WAPSIPINICON RIVER

PARAMETER	TOTAL SAMPLES	NUMBER OF SAMPLES WITH DETECTABLE LEVELS	MEAN OF THOSE WITH DETECTABLE LEVELS (μg/l)	MAXIMUM (μg/l)
As	11	0		
Ba	18	14	243	1100
Cd	18	0		
Cr	18	0		
Cu	18	2	10	10
Pb	18	3	500	1300
Mn	18	9	39	50
Hg	1	0		
Ni	18	0		
Ag	12	0		
Zn	18	14	163	2200

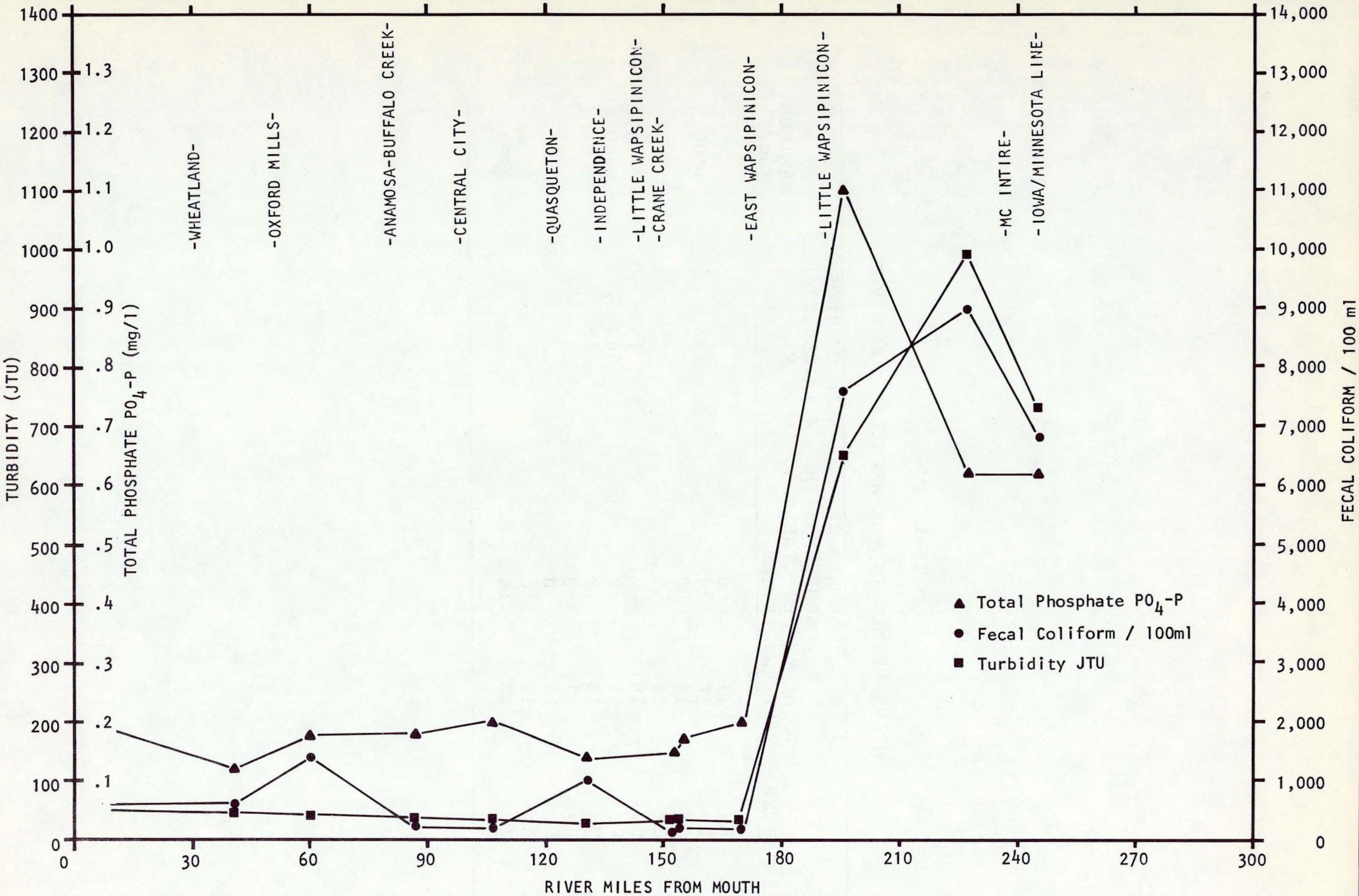


FIGURE IV-17 COMPARISON OF TURBIDITY, FECAL COLIFORM, AND TOTAL PHOSPHATE PROFILES IN THE WAPSIPINICON RIVER, JUNE 5, 1974 main stem near Tripoli.

Salinity, Acidity and Alkalinity - Alkalinity concentrations found to date range from near 50 mg/l to 185 mg/l. Lowest concentrations have been associated with highest turbidity. This is probably the result of complexation of carbonate and bicarbonate with the clay soil particles in the stream and the buffering the soil particles exert. Alkalinity of about 150 mg/l has been average.

Eutrophication Potential - Nitrate concentrations are high throughout the year. Lowest concentrations were found in August 1974 during the period of sampling at lowest flow. This indicates that high nitrate concentrations correlate with high stream flows thus pointing to runoff as a major contributor.

Phosphate concentrations have generally been less than 0.2 mg/l except during periods of runoff (see Figure IV-18). Concentrations reached a high of 1.1 mg/l during runoff periods on the upper Wapsipinicon River, and were associated quite closely with the high turbidity values. The State Hygienic Laboratory, during studies on the Jones Creek basin found similarly high nutrient concentrations in the streams during runoff periods.

Oxygen Depletion - Oxygen deficiencies, as mentioned above, are most critical in the Wapsipinicon River tributaries (see Figure IV-19). While limited information on tributary water quality

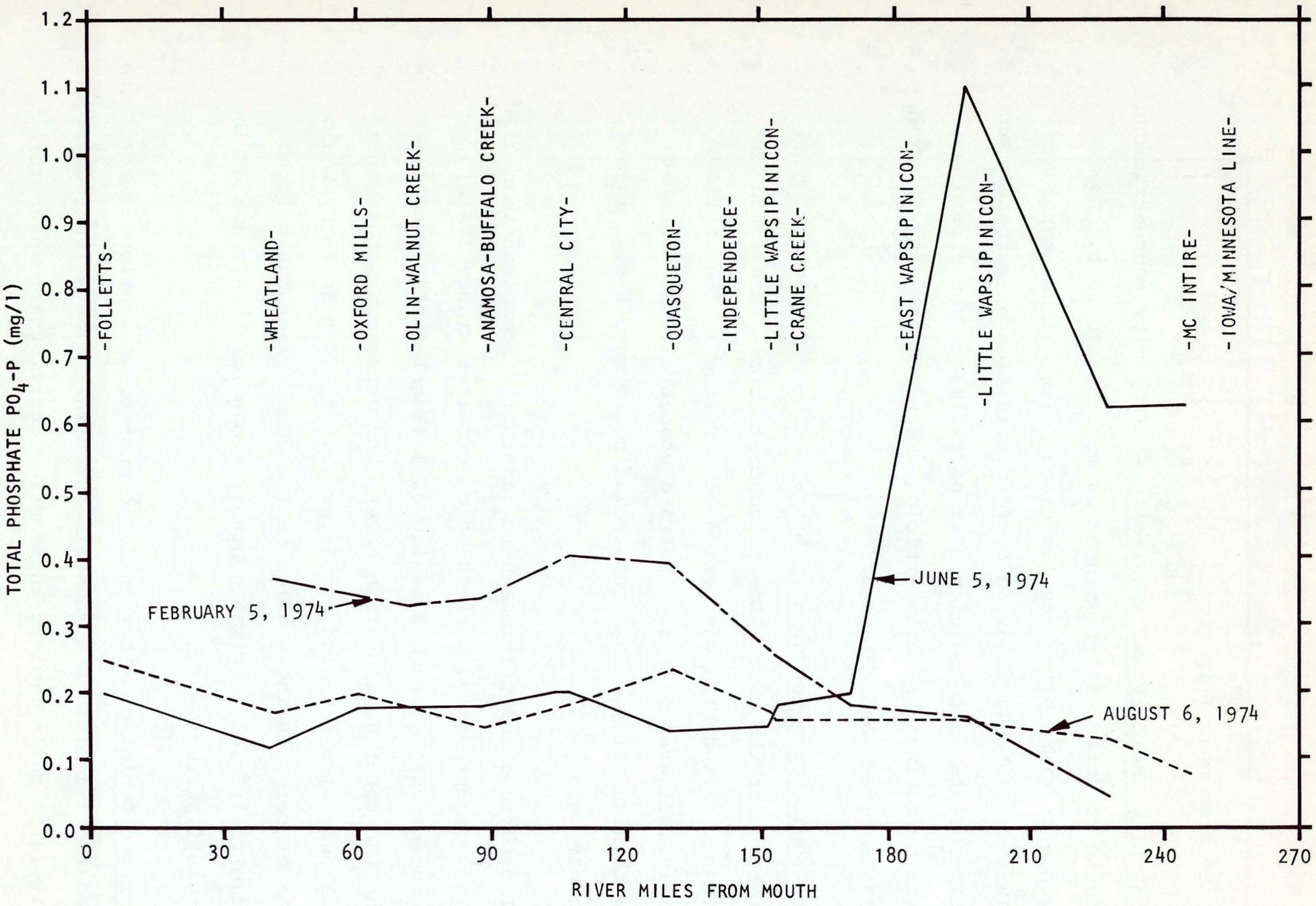


FIGURE IV-18 TOTAL PHOSPHATE CONCENTRATIONS IN THE WAPSIPINICON RIVER, 1974

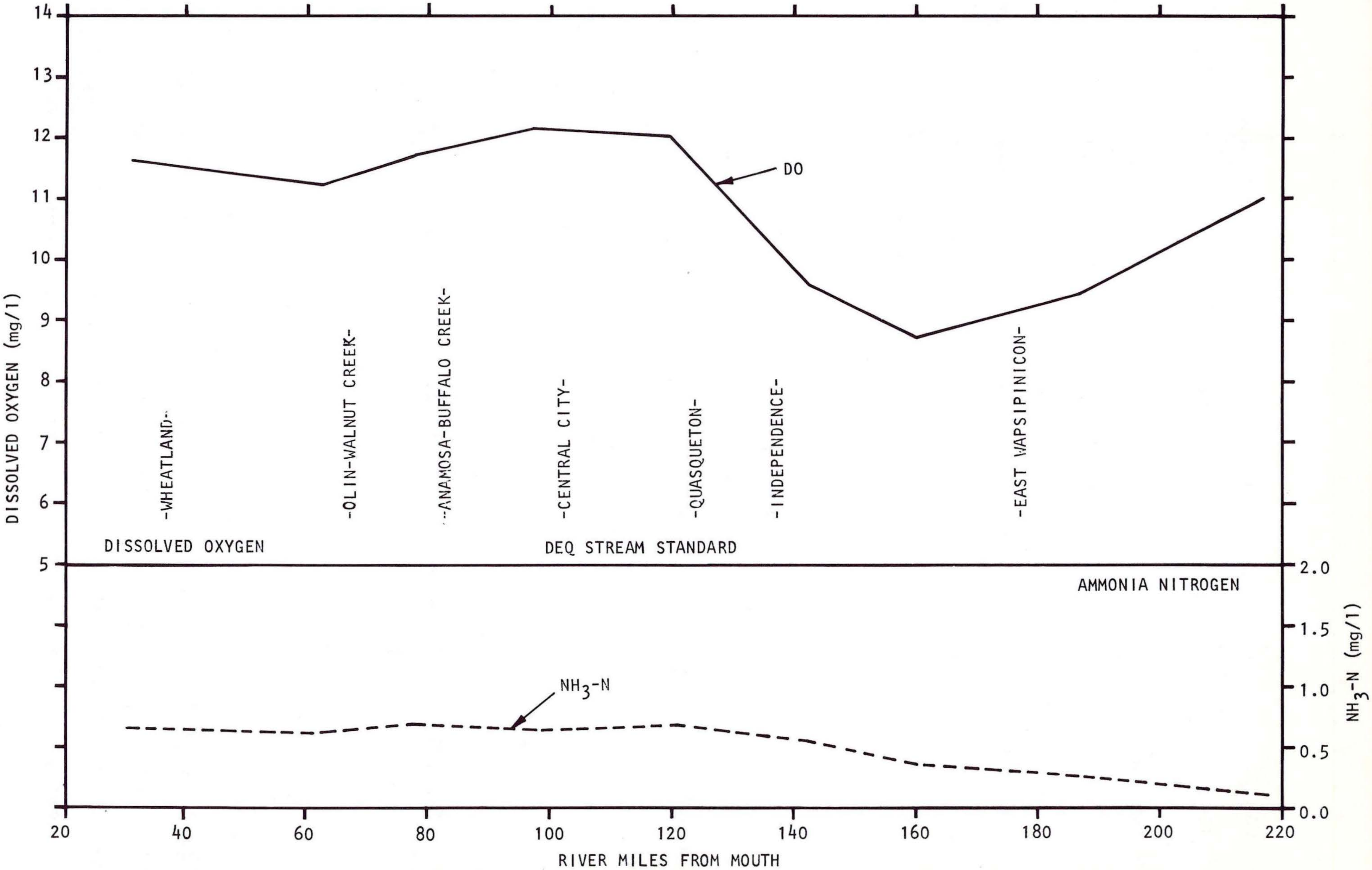


FIGURE IV-19 DISSOLVED OXYGEN AND AMMONIA NITROGEN CONCENTRATIONS IN THE WAPSIPINICON RIVER, FEBRUARY 5, 1974 is available, indications are that oxygen deficiencies are affected by point source pollution problems.

Studies conducted in the early 1960's and again in 1975 indicate serious pollution problems exist at Fredericksburg on the East Branch Wapsipinicon River. Summer and autumn data in 1960 and 1961 showed extremely high bacterial populations, sludge banks in the stream and patches of scum in the river. Recent investigations have found profuse slime growths, discoloration and near anaerobic conditions in the stream up to eight miles below Fredericksburg. This condition, which seems to have existed periodically for at least 15 years, is the result of inadequate treatment of municipal waste and lack of adequate treatment by creameries at Fredericksburg.

Similar conditions were found as the result of the discharge of raw wastes into Walnut Creek by the Town of Olin in 1964. Since that time, Olin has constructed a waste stabilization lagoon to provide secondary treatment of their wastes, however, no recent survey of Walnut Creek has been made to determine present water quality.

Studies were conducted during the 1960's on Otter Creek and Stoe Creek. Discharges by the City of Oelwein and the Westgate Co-op Creamery respectively were causing serious pollution conditions. Since that time the City of Oelwein has constructed an activated sludge secondary treatment plant and the Westgate Co-op Creamery has ceased operation. No data is available to determine the extent of water quality improvement. It is expected that water quality in Stoe Creek, Otter Creek, and Walnut Creek has improved significantly in the last ten years. Substantial improvement is still needed on the East Branch Wapsipinicon River, however.

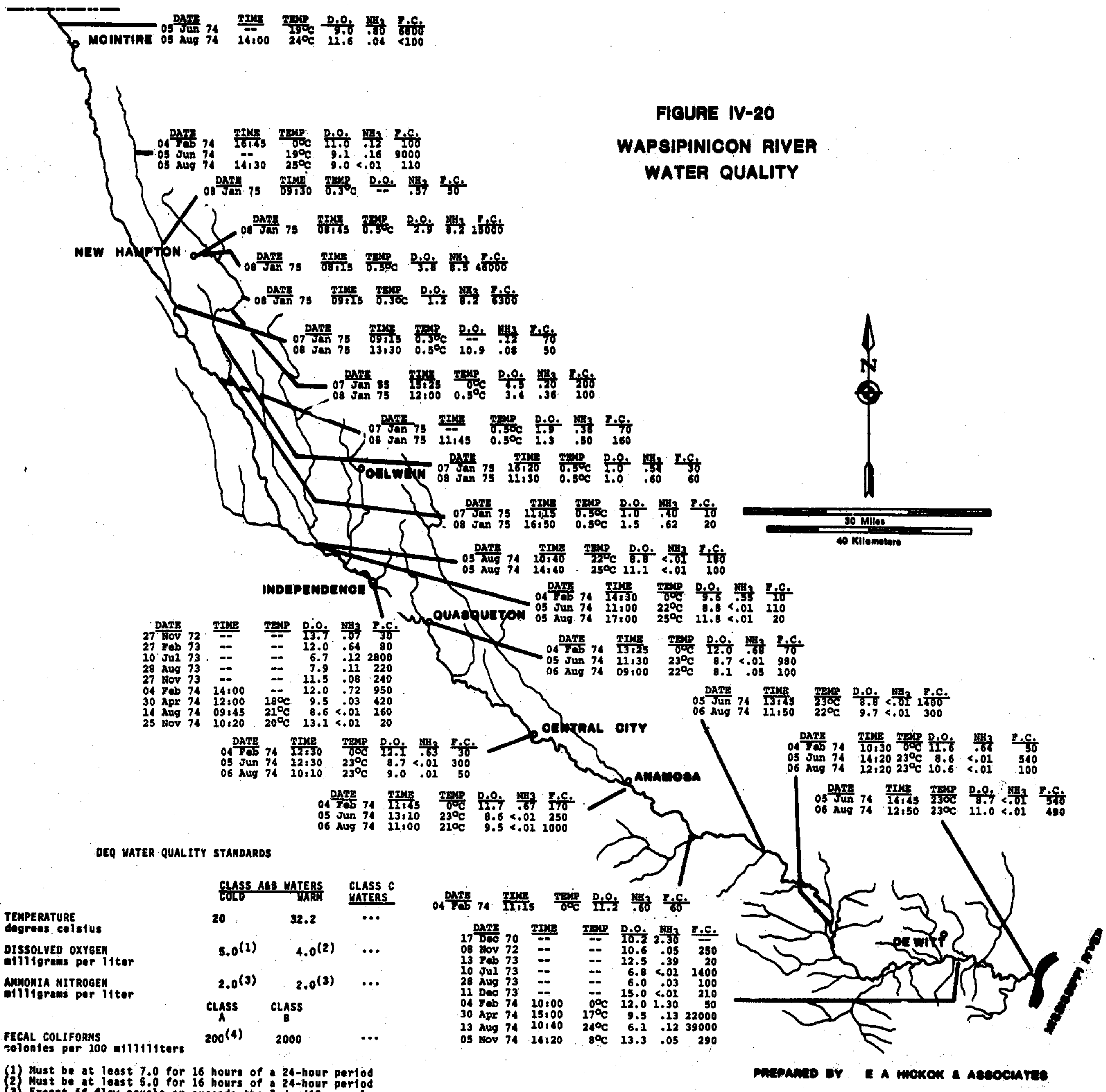
Health Hazards and Aesthetic Degradation - Fecal coliform concentrations are generally low in the Wapsipinicon River. Concentrations are often below 200/100 ml. Exceptions to this are areas below municipal discharges where fecal coliform counts increase and gradually return to background levels further downstream. Nonpoint sources cause the greatest impact on fecal coliform concentrations in the Wapsipinicon River. Fecal coliform levels during runoff have exceeded 1,000/100 ml. Concentrations closely follow the patterns of turbidity and nutrients during runoff (Figure IV-17).

Wapsipinicon River Tributaries

Of the twenty-five tributaries or branches of tributaries to the Wapsipinicon River, one is classified for protection as a cold water fishery and the others for warm water aquatic life. Water quality data are available on only six of these streams. Data collected since 1970 are available on only six of these streams. Data collected since 1970 are available on only two of those six streams. Water quality data has been summarized as shown on Figure IV-20.

In addition, a pilot study for assessing area source contributions was initiated in the upper reaches of a tiny tributary of the Wapsipinicon. This study, of the upper part of the

FIGURE IV-20
WAPSIPINICON RIVER WATER QUALITY



DEQ WATER QUALITY STANDARDS

	CLASS A&B WATERS COLD	WARM	CLASS C WATERS
TEMPERATURE degrees celsius	20	32.2	...
DISSOLVED OXYGEN milligrams per liter	5.0(1)	4.0(2)	...
AMMONIA NITROGEN milligrams per liter	2.0(3)	2.0(3)	...
	CLASS A	CLASS B	
FECAL COLIFORMS colonies per 100 milliliters	200(4)	2000	...

(1) Must be at least 7.0 for 16 hours of a 24-hour period
(2) Must be at least 5.0 for 16 hours of a 24-hour period
(3) Except if flow equals or exceeds the 7-day/10-year low flow or if material is from uncontrollable non-point sources
(4) Between April 1st and October 31st only

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Buffalo Bill Creek watershed, was made to investigate runoff contamination by pesticides from agricultural fields. Deliberately, no effort was directed toward changing the conservation practices of local farmers so that typical conditions could be sampled. The study, which ran for a year, documented rainfall, flow, state and nature of the field and crops, and pesticide data (type, where placed, quantity used). Monitoring was done only at times of heavy rains, when the major contributions of area sources occur. Since the watershed was sampled in the upper reaches, with no point sources upstream, all contributions were from area sources. Because of the short duration of the experiment, however, only a few of the many rainfall/ pesticide circumstances that may occur were monitored. In no case did rain occur at any time soon after pesticide application. Therefore, because of the rapid degradation of pesticides, no high levels of pesticides were observed in the streams.

Several years of study of this (or a similar) watershed would yield most useful information on pesticide contamination -- which could be significant if rain occurs soon after application. Since most pesticide contamination is due to poor conservation practices, it might be well to conduct a pilot conservation project to study contamination reductions possible by sound land management.

In addition, it might be highly fruitful to set up a special experiment in which a pesticide would be deliberately put on fields just prior to a heavy rain. Applicators strive to use pesticides when a spell of dry weather is expected so that the pesticides will have maximum effect in regard to its intended purpose. Occasionally, however, fields are erringly sprayed just prior to an expected rain. Since spraying is expensive, people are rather careful before making pesticide application. Hence, the chance of rain soon after application may not be good, even over several years. Thus, a deliberate pre-rain experiment should be considered.

MISSISSIPPI RIVER

This presentation on the Mississippi River is admittedly brief in relation to other basins that are addressed within this report. It was the decision of staff of the Department of Environmental Quality that this topic would not receive equal attention since there are existing university studies as well as the 1970 report from the Upper Mississippi River Basin Coordinating Committee available for review. In addition, due to the stringent time constraints placed upon this Department for the presentation of this document it was felt that the wiser choice of time expenditure should be devoted to Iowa's interior streams and rivers.

The Mississippi River forms the eastern boundary of Iowa from the northeast corner to the southeast corner. The total length in river miles over the Iowa reach is 241 river miles. Over the Iowa reach of the river, the Mississippi is a Class A and B (warm water) stream.

A number of Iowa's larger cities are on the Mississippi. In order, going downstream, within the boundaries of the Northeastern Iowa Basin, they are: Dubuque (pop. 62,309), Clinton (pop, 34, 719), Bettendorf (pop 22,315), Davenport (pop. 98,469), and Muscatine (pop. 22,405). Numerous other small communities are on the river.

Water Quality Conditions

A summary of the general trends as reported in the 1974 1974 National Water Quality Inventory-Office of Water Planning and Standards, EPA, follows:

Ammonia: For the period 1968-1972 ammonia profiles of the Mississippi River along Iowa's border indicate background levels of 0.1 milligram per liter (mg/l). A peak of 0.5 mg/l was reached at Davenport. Iowa's ammonia impact on the Mississippi River was one-fifth as severe as that of Minneapolis, St. Paul, but was second in significance for the entire river.

Dissolved Oxygen: For the months January-March during the period 1963-1972 dissolved oxygen concentrations along Iowa's border ranged from 10-14 mg/l. For the same years, but during summer months, the range was from 6-7.5 mg/l dissolved oxygen, with the 1969 FWPCA standard for warm water biota at 5 mg/l. During the winter period 1968-1972 the highest observed values along the river were observed at Davenport. For the period 1968-1972 dissolved oxygen ranged from 70-85% of saturation.

Biochemical Oxygen Demand: For the period 1963-1972, BOD ranged from 1.5 mg/l to 6 mg/l. The highest recorded values were during January to March which ranged from 3-6 mg/l.

Fecal Coliform: The 1968-1972 fecal coliform data for Iowa's portion of the Mississippi River ranged from 50/100 ml to 1000/100 ml. As far as secondary treatment standards are concerned Iowa would be in violation downstream from Davenport. The 1968 standard of 1000/100 ml for public water supplies was not exceeded along Iowa's borders.

The 1970 State Hygienic Laboratory Report on the Limnology of The Iowa Reach of The Mississippi River prepared by Dr. Jack H. Gakstatter and Dr. Robert L. Morris (both of the State Hygienic Laboratory, University of Iowa), included analysis of the effects of the wastewater from the six largest municipal dischargers bordering the Mississippi River. All of these cities had primary waste treatment available, and all, except Burlington, had significant industrial contributors. A study of these six major contributors of waste was considered to give a representative look at the pollutant impact being offered by the State of Iowa. The river's large flow masks, by dilution, the effects of smaller municipalities, and nonpoint pollution from runoff is difficult to pin-point for assignment of responsibility and accountability. This report concluded that the Iowa reach of the Mississippi River (about 300 river miles) contained water of excellent quality. The Mississippi River was found to have low nutrient and dissolved solids levels when compared with interior Iowa streams. The typical chemistry of one sample taken in early fall under relatively low flow conditions near Burlington is indicated on Table IV-7.

Water quality data are also available from sampling stations at Lansing, Dubuque and Davenport. The Lansing and Davenport samples are part of the quarterly survey, while the Dubuque information is taken once or twice (or more often) a month over the year.

The 1974 survey data (Figure IV-21) at Lansing revealed a dissolved oxygen value as low as 5.4 mg/l at 3:00 p.m. on August 13th. This is quite low for that time of day, suggesting something of a problem. On the same day at 10:00 a.m., the sample at Davenport was also low, at 6.1 mg/l. Dubuque has recorded low values also, such as samples taken on September 27, 1971, (5.2 mg/l) and October 12, 1971, (4.5 mg/l). Both values were low during times of relatively low discharge.

Fecal coliforms at Dubuque and Davenport chronically run well above 200 per 100 ml. All of the 1974 survey samples at Davenport were in excess of 440 per 100 ml. Lansing values of fecal coliform ranged from less than 10 to 520 per 100 ml in the 1974 survey. Counts at Dubuque include values of 5000 per

TABLE IV-7

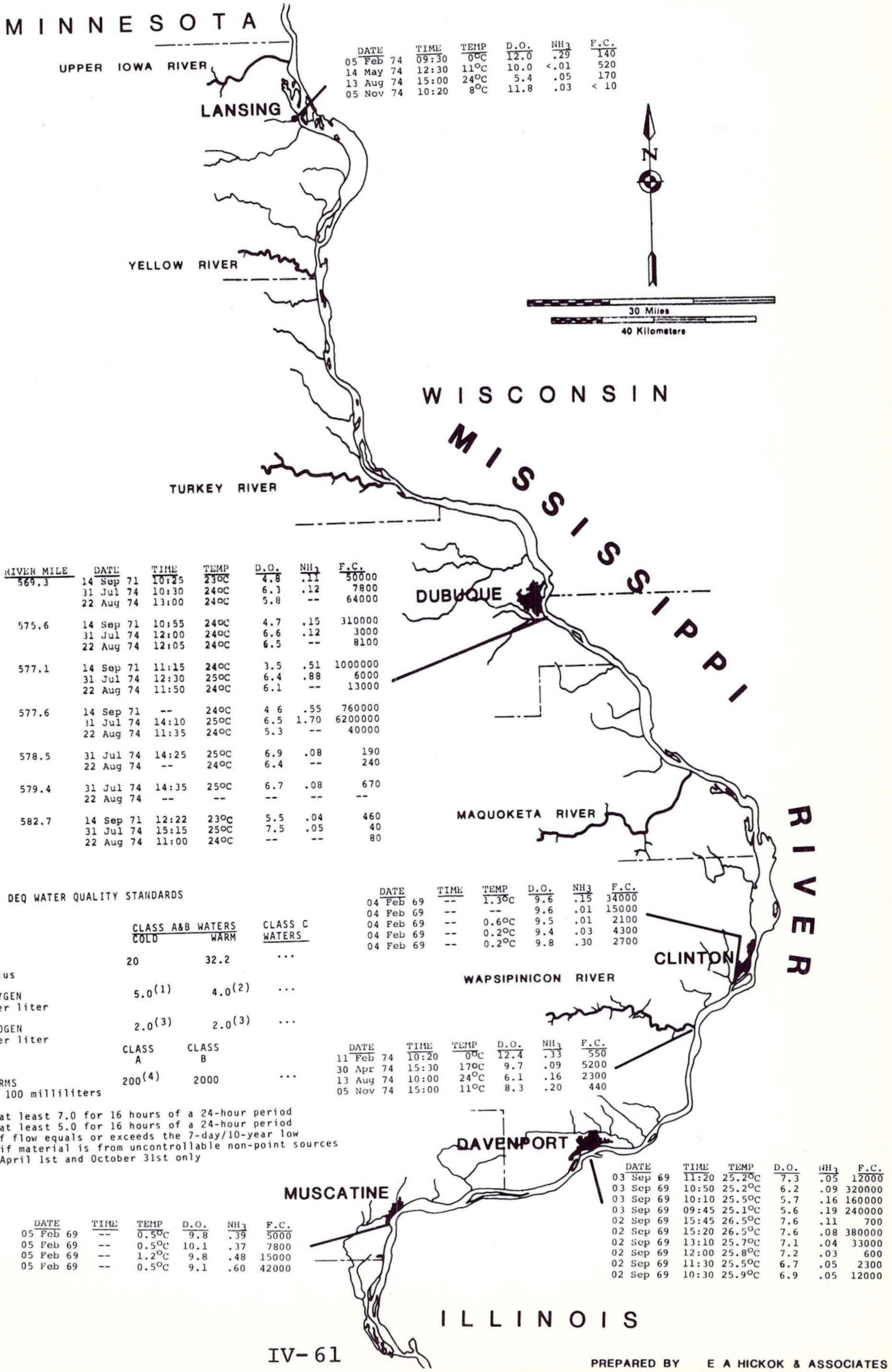
TYPICAL WATER CHEMISTRY OF THE IOWA REACH
OF THE
MISSISSIPPI RIVER[1]
(values in mg/l unless otherwise stated)

Alkalinity:	
Phenolphthalein	2
Total	160
Bicarbonate	190
Biochemical Oxygen Demand (BOD)	4
Calcium	51.2
Carbonate	2.4
Chemical Oxygen Demand (COD)	33.5
Chloride	12
Fluoride	0.2
Hardness as $CaCo_3$	200
Magnesium	17.5
Manganese	0.05
Nitrogen as N:	
Organic	1.1
Ammonia	0.07
Nitrate	0.2
pH	8.2 units
Phosphate as PO_4	
Soluble	0.2
Total	0.5
Potassium	2.6
Silica as SiO_2	1.0
Solids:	
Total	230
Dissolved	178
Suspended	52
Specific Conductance	420 micromhos
Sulphates	52

[1]1970 State Hygienic Laboratory Report #71-21

FIGURE IV-21

MISSISSIPPI RIVER
WATER QUALITY



DATE	TIME	TEMP	D.O.	NH_3	F.C.
05 Feb 74	09:30	0°C	12.0	.29	140
14 May 74	12:30	11°C	10.0	<.01	520
13 Aug 74	15:00	24°C	5.4	.05	170
05 Nov 74	10:20	8°C	11.8	.03	< 10

RIVER MILE	DATE	TIME	TEMP	D.O.	NH_3	F.C.
569.3	14 Sep 71	10:25	23°C	4.8	.11	50000
	31 Jul 74	10:30	24°C	6.3	.12	7800
	22 Aug 74	13:00	24°C	5.8	--	64000
575.6	14 Sep 71	10:55	24°C	4.7	.15	310000
	31 Jul 74	12:00	24°C	6.6	.12	3000
	22 Aug 74	12:05	24°C	6.5	--	8100
577.1	14 Sep 71	11:15	24°C	3.5	.51	1000000
	31 Jul 74	12:30	25°C	6.4	.88	6000
	22 Aug 74	11:50	24°C	6.1	--	13000
577.6	14 Sep 71	--	24°C	4 6	.55	760000
	31 Jul 74	14:10	25°C	6.5	1.70	6200000
	22 Aug 74	11:35	24°C	5.3	--	40000
578.5	31 Jul 74	14:25	25°C	6.9	.08	190
	22 Aug 74	--	24°C	6.4	--	240
579.4	31 Jul 74	14:35	25°C	6.7	.08	670
	22 Aug 74	--	--	--	--	--
582.7	14 Sep 71	12:22	23°C	5.5	.04	460
	31 Jul 74	15:15	25°C	7.5	.05	40
	22 Aug 74	11:00	24°C	--	--	80

DEQ WATER QUALITY STANDARDS

	CLASS A&B WATERS COLD	CLASS A&B WATERS WARM	CLASS C WATERS
TEMPERATURE degrees celsius	20	32.2	...
DISSOLVED OXYGEN milligrams per liter	5.0(1)	4.0(2)	...
AMMONIA NITROGEN milligrams per liter	2.0(3)	2.0(3)	...
	CLASS A	CLASS B	
FECAL COLIFORMS colonies per 100 milliliters	200(4)	2000	...

(1) Must be at least 7.0 for 16 hours of a 24-hour period
(2) Must be at least 5.0 for 16 hours of a 24-hour period
(3) Except if flow equals or exceeds the 7-day/10-year low flow or if material is from uncontrollable non-point sources
(4) Between April 1st and October 31st only

DATE	TIME	TEMP	D.O.	NH_3	F.C.
04 Feb 69	--	1.3°C	9.6	.15	34000
04 Feb 69	--	--	9.6	.01	15000
04 Feb 69	--	0.6°C	9.5	.01	2100
04 Feb 69	--	0.2°C	9.4	.03	4300
04 Feb 69	--	0.2°C	9.8	.30	2700

DATE	TIME	TEMP	D.O.	NH_3	F.C.
11 Feb 74	10:20	0°C	12.4	.33	550
30 Apr 74	15:30	17°C	9.7	.09	5200
13 Aug 74	10:00	24°C	6.1	.16	2300
05 Nov 74	15:00	11°C	8.3	.20	440

DATE	TIME	TEMP	D.O.	NH_3	F.C.
03 Sep 69	11:20	25.2°C	7.3	.05	12000
03 Sep 69	10:50	25.2°C	6.2	.09	320000
03 Sep 69	10:10	25.5°C	5.7	.16	160000
03 Sep 69	09:45	25.1°C	5.6	.19	240000
02 Sep 69	15:45	26.5°C	7.6	.11	700
02 Sep 69	15:20	26.5°C	7.6	.08	380000
02 Sep 69	13:10	25.7°C	7.1	.04	33000
02 Sep 69	12:00	25.8°C	7.2	.03	600
02 Sep 69	11:30	25.5°C	6.7	.05	2300
02 Sep 69	10:30	25.9°C	6.9	.05	12000

DATE	TIME	TEMP	D.O.	NH_3	F.C.
05 Feb 69	--	0.5°C	9.8	.39	5000
05 Feb 69	--	0.5°C	10.1	.37	7800
05 Feb 69	--	1.2°C	9.8	.48	15000
05 Feb 69	--	0.5°C	9.1	.60	42000

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100 ml on October 25, 1972, and many other counts in excess of 1500 during 1971 and 1972. A value of 26,000 per 100 ml was measured on July 24, 1972.

Ammonia nitrogen values appear to be generally satisfactory. At Dubuque, the highest sample from 1970 to 1973 resulted in a reading of .49 mg/l. This occurred on October 24, 1973, during a moderate discharge situation.

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14. Limnology of the Iowa Reach of the Mississippi River, State Hygienic Laboratory Report #71-21, University of Iowa, Iowa City, Iowa, 1970.

15. Mississippi River Water Quality Survey Report Clinton, Iowa Area River Miles 501.2-517.6, State Hygienic Laboratory Report #70-4, University of Iowa, Iowa City, Iowa, 1969.

16. Mississippi River Water Quality Survey Report, Muscatine, Iowa Area River Miles 439.3-456.3, State Hygienic Laboratory Report #70-5, University of Iowa, Iowa City, Iowa, 1969.

17. Mississippi River Water Quality Survey Report, Davenport, Iowa Area River Miles 464-493, State Hygienic Laboratory Report #70-7, University of Iowa, Iowa City, Iowa, 1969.

CHAPTER V

POINT SOURCE DISCHARGE INVENTORY

NORTHEASTERN IOWA BASIN

Point Sources are places where volumes of wastes are discharged to surface waters at a given point or at closely-spaced points. This chapter presents an inventory of such sources in the basin originating from municipalities, semi-public and industrial installations.

Tables V-1, V-2 and V-3 present an alphabetical listing of municipal, semi-public and industrial wastewater discharges respectively. Included in the tables is information concerning the location of each discharge by county and an identification of the receiving stream for each discharge.

A coding system is given in the tables which assigns a reference number to each discharge. Reference numbers for municipal sources are prefixed by an M, industrial sources by an I and semi-public sources by an S. All incorporated municipalities have been assigned reference numbers without consideration as to whether a municipality has a discharge. The reference numbers are used to identify specific discharges in Figure V-1, which shows the location of point source discharges in the basin. Note that a consecutive sequence of reference numbers for the municipalities does not appear

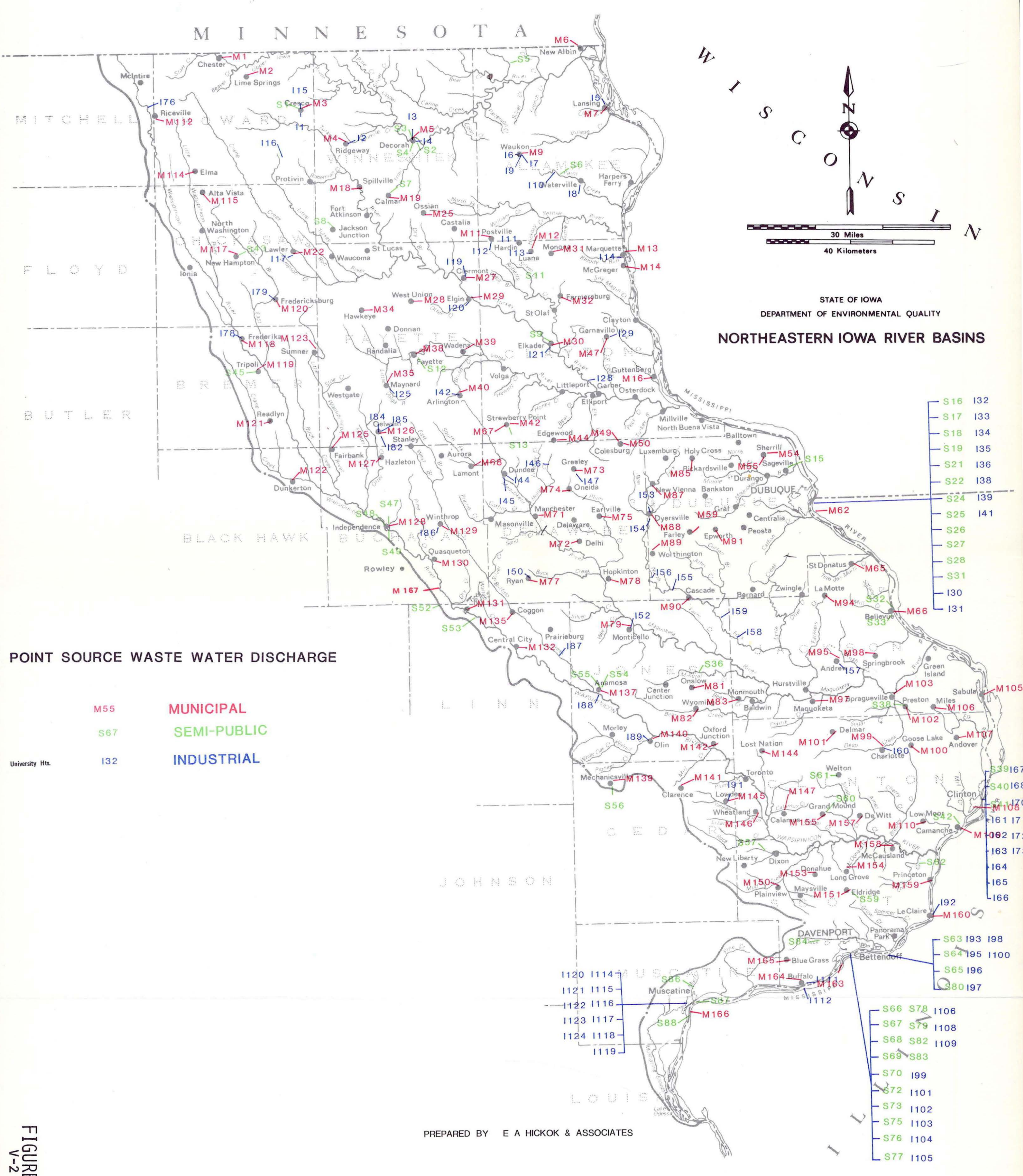
STATE OF IOWA
DEPARTMENT OF ENVIRONMENTAL QUALITY
NORTHEASTERN IOWA RIVER BASINS
POINT SOURCE WASTE WATER DISCHARGE
M55 MUNICIPAL
S67 SEMI-PUBLIC
I32 INDUSTRIAL
University Hts.
30 Miles
40 Kilometers
N
MINNESOTA
WISCONSIN
ILLINOIS
MITCHELL
HOWARD
WINNESHIEK
ALLAMAKEE
FLOYD
CHICKASAW
FAYETTE
CLAYTON
BUTLER
BREMER
BLACK HAWK
BUCHANAN
DELAWARE
DUBUQUE
JACKSON
LINN
JONES
CEDAR
CLINTON
JOHNSON
SCOTT
MUSCATINE
LOUISA
MISSISSIPPI RIVER
DUBUQUE
DAVENPORT
Bettendorf
Muscatine
Clinton
PREPARED BY E A HICKOK & ASSOCIATES

FIGURE V-1
V-2

in Figure V-1 since all incorporated municipalities in the basin were assigned reference numbers, but only those with existing discharges are shown on the figure.

Table V-4 identifies the characteristics of each point wastewater discharge from municipal, industrial and semi-public sources. Discharges are listed in the order that the major streams in the Northeastern Iowa Basin empty into the Mississippi, from north to south, and within each basin, are listed in downstream order.

Table V-4 lists, for each discharger, present design capacity, present daily flow, BOD_5 and ammonia nitrogen effluent concentrations, type of treatment processes, method of sludge handling, and comments. Treatment processes are identified in general terms. Specific process descriptions can be obtained from the DEQ. The comments may include information obtained by the DEQ personnel concerning existing operation permit requirements, the DEQ orders for additional treatment or a delineation of proposed facilities.

A total of 111 municipal treatment facilities have been identified in the basin. In addition, there are 56 small communities presently without municipal collection or treatment systems.

MUNICIPAL

Municipal sewage flow and operational data for municipalities were extracted from the DEQ records and files. Average flow values contained in reports submitted by treatment plant operators have been used. Flow values shown in Table V-4 are the averages obtained for the last full year of record; in most instances 1972.

Most effluent quality data were collected from the DEQ's Effluent Quality Analysis Program (EQAP). These data were supplemented by review of treatment facility operation reports. Data reported through EQAP are the results of tests conducted by the Iowa State Hygienic Laboratory on wastewater samples supplied by the individual dischargers. In most instances, no more than four BOD_5 values and two ammonia nitrogen values are reported each year. This is due to the fact that a significant portion of the facilities are lagoons that only discharge a few times each year. No samples were required when the facilities are not discharging.

The results of BOD_5 analyses performed by the Iowa State Hygienic Laboratory (reported in EQAP) are reported as being between 25 mg/l and 150 mg/l. For some communities, a large percentage of the values reported are 25 or "25-" mg/l. Values designated "25-" are believed to be less than 25 mg/l, but were assumed to be equal to 25 mg/l for this study. Thus, the actual average effluent BOD_5 concentration may in some cases be lower than that obtained from EQAP information. The adequacy of the program will be reviewed since some dischargers are, or soon will be, required to provide BOD5 removals to less than 25 mg/l. In some instances, due to a sparsity and scattering of data, engineering judgement was applied to arrive at representative values rather than taking strict averages of the available data.

SEMI-PUBLIC

Information identifying semi-public treatment facilities in the study area was obtained from the DEQ files. Description of wastewater discharges from semi-public facilities was difficult due to the minimal surveillance provided. Quantitative and qualitative data was obtained from EQAP reports or design information from the DEQ files. Values in Table V-4 are thus based on both limited operational data and design characteristics and may not accurately reflect present operating conditons.

INDUSTRIAL

Information on industries discharging wastewater to streams within the study area was obtained from the U.S. Army Corps of Engineers discharge permit applications (Discharge Permit Program, River and Harbors Act of 1899), the DEQ industrial files, and the National Pollutant Discharge Elimination System (NPDES) permit applications. Although these sources provide the best available discharge information, caution must be exercised in its interpretation since it represents data that has been submitted by the individual industries with very little verification.

SUMMARY

The distribution of hydraulic and organic loads upon the streams in the basin from municipal, industrial, and semi-public point sources, is summarized in Table V-5. The relatively small quantity of BOD_5 and ammonia nitrogen discharged by industries and semi-public facilities compared to their flow is due to the following:

1. Several quarries discharge large volumes of water, but add very little BOD_5 to the stream.
2. Several industrial discharges consist only of cooling water; which adds negligible amounts of BOD_5 to the stream.
3. Insufficient monitoring data exists for many of the semi-public and industrial facilities to detect actual quantities.

Table V-6 summarized the various types of municipal wastewater treatment facilities, the number of communities served, and the population served, for each sub-basin. Table V-7 is a composite of Table V-5 for the entire basin.

TABLE V-1

MUNICIPAL POINT SOURCE
WASTEWATER DISCHARGES

NORTHEASTERN IOWA BASIN

Discharger	Reference Number	County	Discharge To	River Mile	Page Reference Inventory Chapter V	Allocation Chapter VI	Needs Chapter VIII
MUNICIPAL							
Alta Vista	M - 115	Chickasaw	Elk Creek to L. Wap. R. to Wap. R.	2/ 15/196	46	7	5
Andover	M - 107	Clinton	Elk River to Mississippi River	- / -	43	7	8
Anamosa	M - 137	Jones	Wapsipinicon R.	89	51	6	10
Andrew	M - 95	Jackson	Cedar Creek to N. Frk Maq. R. to Maq. R.	- / - / -	41	(1)	8
Arlington	M - 40	Fayette	Brush Creek to Volga R. to Turkey R.	- / - / 21	30	3	3
Aurora	M - 134	Buchanan	Buffalo Creek to Wapsipinicon River	- / -	50	(1)	13
Baldwin	M - 84	Jackson	Bear Creek to Maquoketa River	- / -	40	(1)	13
Balltown	M - 53	Dubuque	Mississippi River	596	32	(1)	(3)
Bankston	M - 58	Dubuque	L. Maquoketa R. to Mississippi River	- / -	32	(1)	(3)
Bellevue	M - 66	Jackson	Mississippi River	556	36	(1)	6
Bernard	M - 92	Dubuque	Lytle Creek to N. Frk. Maq. R. to Maq. R.	- / - / -	41	(1)	12
Bettendorf	M - 162	Scott	Mississippi River	486	55	(1)	(3)
Blue Grass	M - 165	Scott	Mississippi River	469	62	(1)	8
Buffalo	M - 164	Scott	Mississippi River	473	61	(1)	4
Calamus	M - 147	Clinton	Calamus Creek to Wapsipinicon River	- / -	53	(1)	10
Calmar	M - 19	Winneshiek	Unnamed Creek to Turkey River	- / 93	26	3	5
Camanche	M - 109	Clinton	Swan Slough to Mississippi River	- /511	45	(1)	6
Cascade	M - 90	Dubuque	N. Frk. Maquoketa R. to Maquoketa R.	- / 52	40	5	5
Castalia	M - 26	Winneshiek	Unnamed Tributary to Turkey R.	- / -	27	(1)	9
Center Junction	M - 80	Jones	Mineral Creek to Maquoketa River	- / -	39	(1)	13
Central City	M - 132	Linn	Wapsipinicon River	109	50	6	8
Centralia	M - 63	Dubuque	Catfish Creek to Mississippi River	- / -	35	(1)	9
Charlotte	M - 99	Clinton	Deep Creek to Maquoketa River	- / -	42	(1)	8
Chester	M - 1	Howard	Upper Iowa River	-	22	(1)	7
Clarence	M - 141	Cedar	Mill Creek to Wapsipinicon R.	10/ 63	52	5	6
Clayton	M - 15	Clayton	Mississippi River	624	26	(1)	10
Clermont	M - 27	Fayette	Turkey River	63	27	2	5
Clinton	M - 108	Clinton	Beaver Channel to Mississippi	- /514	43	(1)	3
Coggon	M - 135	Linn	Buffalo Creek to Wapsipinicon R.	21/ 89	50	7	13
Colesburg (SE)	M - 49	Dubuque	Little Turkey River to Turkey R.	- / -	32	(1)	10

Note: Mississippi River mileages are measured from confluence with Ohio River

TABLE V-1

MUNICIPAL POINT SOURCE
WASTEWATER DISCHARGES

NORTHEASTERN IOWA BASIN

Discharger	Reference Number	County	Discharge To	River Mile	Page Reference Inventory	Allocation	Needs
MUNICIPAL					Chapter V	Chapter VI	Chapter VIII
Colesburg (NW)	M - 50	Dubuque	Little Turkey R. to Turkey River	- / -	32	(1)	10
Cresco	M - 3	Howard	Silver Creek to Upper Iowa River	12/ 80	22	2	4
Davenport	M - 163	Scott	Mississippi River	480	59	(1)	2
De Witt	M - 157	Clinton	Dry Run to Silver Creek to Wapsipinicon R.	- / 4/ 19	54	5	6
Decorah	M - 5	Winneshiek	Upper Iowa River	52	22	2	4
Delaware	M - 76	Delaware	Plum Creek to Maquoketa	- / -	38	(2)	(3)
Delhi	M - 72	Delaware	Honey Creek to Maquoketa R.	- / -	38	(1)	5
Delmar	M - 101	Clinton	Deep Creek to Maquoketa R.	- / -	42	(1)	8
Dixon	M - 149	Scott	Walnut Creek to Wapsipinicon R.	- / -	53	(1)	8
Donahue	M - 153	Scott	Mud Creek E. Br. to Wapsipinicon R.	- / -	53	(1)	11
Donnan	M - 37	Fayette	Volga River to Turkey R.	- / -	30	(2)	(3)
Dyersville	M - 88	Dubuque	Unnamed Creek to N. Frk. Maq. R. to Maq. R.	- / - / -	40	(1)	12
Dubuque	M - 62	Dubuque	Mississippi River	578	33	(1)	2
Dundee	M - 69	Delaware	Maquoketa River	-	37	(1)	11
Dunkerton	M - 122	Black Hawk	Crane Creek to Wapsipinicon River	- / -	48	(1)	7
Durango	M - 57	Dubuque	Little Maquoketa R. to Miss. R.	- / -	32	(1)	(3)
Earlville	M - 75	Delaware	Plum Creek to Maquoketa River	- / 99	38	4	5
Edgewood	M - 44	Clayton	Bear Creek to Volga River		31	3	2
Eldridge	M - 151	Scott	Hickory Creek to Mud Creek to Wap. R.	- / -	53	(1)	10
Elgin	M - 29	Fayette	Turkey River	58	28	2	5
Elkader	M - 30	Clayton	Turkey River	38	28	2	3
Elkport	M - 45	Clayton	Volga River to Turkey River	- / -	31	(2)	(3)
Elma	M - 114	Howard	Little Wapsipinicon R. to Wapsipinicon R.	21/196	46	7	9
Epworth	M - 91	Dubuque	Whitewater Creek to N. Frk. Maq. R. to Maq. R.	- / - / 61	41	5	12
Fairbank	M - 125	Buchanan	L. Wapsipinicon R. to Wapsipinicon R.	- / -	48	(1)	6
Farley	M - 59	Dubuque	L. Maquoketa R. to Mississippi R.	- / -	32	(1)	11
Farmersburg	M - 32	Clayton	Roberts Creek to Turkey R.	- / -	29	(1)	9
Fayette	M - 38	Fayette	Volga River to Turkey R.	- / 21	30	3	7
Fort Atkinson	M - 20	Winneshiek	Turkey River	-	26	(1)	11

Note: Mississippi River mileages are measured from confluence with Ohio River.

TABLE V-1

MUNICIPAL POINT SOURCE
WASTEWATER DISCHARGES

NORTHEASTERN IOWA BASIN

Discharger	Reference Number	County	Discharge To	River Mile	Page Reference Inventory	Allocation	Needs
MUNICIPAL					Chapter V	Chapter VI	Chapter VIII
Fredericksburg	M - 120	Chickasaw	E. Frk. Wapsipinicon R. to Wapsipinicon R.	- /194	47	6	3
Frederika	M - 118	Bremer	Wapsipinicon River	-	47	(1)	7
Garber	M - 46	Clayton	Turkey River	-	31	(2)	(3)
Garnavillo	M - 47	Clayton	S. Cedar Creek to Turkey River	- / 16	31	2	5
Goose Lake	M - 100	Clinton	Deep Creek to Maquoketa River	- / -	42	(1)	9
Graf	M - 60	Dubuque	Little Maquoketa R. to Mississippi R.	- / -	32	(1)	(3)
Grand Mound	M - 155	Clinton	Barber Creek to Wapsipinicon R.	- / -	54	(1)	10
Greeley	M - 73	Delaware	Plum Creek to Maquoketa River	- / -	38	(1)	7
Green Island	M - 104	Jackson	Maquoketa River	548	43	(2)	(3)
Guttenberg	M - 17	Clayton	Miners Creek to Mississippi River	- /614	26	(1)	3
Harpers Ferry	M - 8	Allamakee	Mississippi River		24	(1)	9
Hawkeye	M - 34	Fayette	N. Branch Volga R. to Volga R. to Turkey R.	- / - / 21	29	3	2
Hazelton	M - 127	Buchanan	Otter Creek to Wapsipinicon River	10/147	49	6	6
Holy Cross	M - 85	Dubuque	Dry Run to N. Frk. Maq. R. to Maquoketa R.	- / - / -	40	(1)	12
Hopkinton	M - 78	Delaware	Maquoketa River	85	39	4	4
Hurstville	M - 96	Jackson	Maquoketa River	-	41	(2)	(3)
Independence	M - 128	Buchanan	Wapsipinicon River	142	49	6	6
Ionia	M - 113	Chickasaw	Drainage Ditch to Wapsipinicon R.	- / -	46	(1)	9
Jackson Junction	M - 23	Winneshiek	Crane Creek to L. Turkey R. to Turkey R.	- / - / -	27	(1)	(3)
LaMotte	M - 94	Jackson	Farmers Creek to N. Frk. Maq. R. to Maq. R.	- / - / -	41	(1)	12
Lamont	M - 68	Buchanan	Lamont Creek to Maquoketa R.	- / -	37	(1)	11
Lansing	M - 7	Allamakee	Mississippi River	662	23	(1)	9
Lawler	M - 22	Chickasaw	Crane Creek to L. Turkey River to Turkey R.	- / - / -	27	(1)	13
Le Claire	M - 160	Scott	Mississippi River	497	54	(1)	4
Lime Springs	M - 2	Howard	Millers Creek to Upper Iowa River	1/116	22	2	4
Littleport	M - 43	Clayton	Volga River to Turkey River	- / -	31	(2)	(3)
Long Grove	M - 154	Scott	Mason Creek to Wapsipinicon R.	- / -	53	(1)	10
Lost Nation	M - 144	Clinton	Drainage Ditch #11 to Wap. R.	- / -	52	(1)	8
Low Moor	M - 110	Clinton	Rock Creek to Mississippi River	- / -	46	(1)	5

Note: Mississippi River mileages are measured from confluence with Ohio River.

TABLE V-1

MUNICIPAL POINT SOURCE
WASTEWATER DISCHARGES

NORTHEASTERN IOWA BASIN

Discharger	Reference Number	County	Discharge To	River Mile	Page Reference Inventory	Allocation	Needs
MUNICIPAL					Chapter V	Chapter VI	Chapter VIII
Lowden	M - 145	Cedar	Yankee Run Creek to Wapsipinicon R.	8/43	52	5	6
Luana	M - 12	Clayton	Hickory Creek to Mississippi R.	- / -	25	(1)	12
Luxemburg	M - 86	Dubuque	N. Frk. Maquoketa R. to Maquoketa R.	- / -	40	(1)	12
Manchester	M - 71	Delaware	Maquoketa River	140	38	4	2
Maquoketa	M - 97	Jackson	Maquoketa River	39	41	(1)	2
Marquette	M - 13	Clayton	Mississippi River	534	25	3	3
Masonville	M - 70	Delaware	Prairie Creek to Coffin Creek to Maq. R.	- / - / -	37	(2)	(3)
Maynard	M - 35	Fayette	Little Volga R. to Volga R. to Turkey R.	- / - / 21	29	3	7
Maysville	M - 152	Scott	Slopertown Ditch to Hickory Ditch to Mud Creek to Wapsipinicon R.	- / - / - / -	53	(1)	11
McCausland	M - 158	Scott	Wapsipinicon River	-	54	(1)	8
McGregor	M - 14	Clayton	Mississippi River	633	26	(1)	3
McIntire	M - 111	Howard	Wapsipinicon River	-	46	(1)	9
Mechanicsville	M - 139	Cedar	Pioneer Creek to Walnut Creek to Wap. R.	10/ - / 74	51	6	10
Miles	M - 106	Jackson	Elk River to Mississippi River	- / -	43	7	13
Millville	M - 51	Clayton	Little Turkey River to Turkey River	- / -	32	(2)	(3)
Monmouth	M - 83	Jackson	Bear Creek to Maquoketa River	- / -	40	(1)	12
Monona	M - 31	Clayton	Silver Creek to Roberts Creek to Turkey R.	- / - / 36	29	2	3
Monticello	M - 79	Jones	Maquoketa River	75	39	4	11
Morley	M - 138	Jones	Walnut Creek to Wapsipinicon	- / -	51	(2)	(3)
Muscatine	M - 166	Muscatine	Mississippi River	455	62	(1)	3
New Albin	M - 6	Allamakee	Mississippi River	673	23	(1)	6
New Hampton	M - 117	Chickasaw	Spring Creek to L. Wap. R. to Wap. R.	5/ 1/196	46	7	5
New Liberty	M - 148	Scott	Walnut Creek to Wapsipinicon River	- / -	53	(I)	(3)
New Vienna	M - 87	Dubuque	N. Frk. Maquoketa R. to Maquoketa R.	- / -	40	5	12
North Buena Vista	M - 52	Clayton	Mississippi River	603	32	(1)	(3)
N. Washington	M - 116	Chickasaw	L. Wapsipinicon R. to Wapsipinicon R.	- / -	46	(2)	(3)
Oelwein	M - 126	Fayette	Otter Creek to Wapsipinicon R.	14/147	48	6	6
Olin	M - 140	Jones	Walnut Creek to Wapsipinicon R.	- / -	52	(1)	10
Oneida	M - 73	Delaware	Plum Creek to Maquoketa R.	- / -	38	(1)	(3)
Onslow	M - 81	Jones	Bear Creek to Maquoketa R.	- / -	39	(1)	13

Note: Mississippi River mileages are measured from confluence with Ohio River.

TABLE V-1

MUNICIPAL POINT SOURCE
WASTEWATER DISCHARGES

NORTHEASTERN IOWA BASIN

Discharger	Reference Number	County	Discharge To	River Mile	Page Reference Inventory	Allocation	Needs
MUNICIPAL					CHAPTER V	CHAPTER VI	CHAPTER VIII
Ossian	M - 25	Winneshiek	Nutting Creek to Turkey River	- / 69	27	2	4
Osterdock	M - 48	Clinton	Turkey River	-	32	(2)	(3)
Oxford Junction	M - 142	Jones	Wapsipinicon River	-	52	(1)	8
Panorama Park	M - 161	Scott	Mississippi River	490	55	(1)	8
Peosta	M - 64	Dubuque	Catfish Creek to Mississippi River	-	36	(1)	9
Plainview	M - 150	Scott	Mud Creek to Wapsipinicon R.	-	53	(2)	(3)
Postville	M - 11	Allamakee	Williams Creek to Mississippi R.	- / -	25	2	4
Prairieburg	M - 136	Linn	Buffalo Creek to Wapsipinicon R.	- / -	50	(1)	13
Preston	M - 102	Jackson	Copper Creek to Deep Creek to Maq. R.	- / - / -	42	(1)	7
Princeton	M - 159	Scott	Mississippi River	502	54	(1)	10
Protivin	M - 17	Howard	Bohemian Creek to Turkey River	- / -	26	(1)	12
Quasqueton	M - 130	Buchanan	Wapsipinicon River	-	50	(1)	5
Randalia	M - 36	Fayette	Volga River to Turkey R.	- / -	30	(2)	(3)
Readlyn	M - 121	Bremer	Ditch #5 to Crane Creek to Wap. R.	8/ 6/159	47	6	5
Riceville	M - 112	Howard	Wapsipinicon R.	-	46	(1)	4
Richardsville	M - 56	Dubuque	Little Maquoketa R., Middle Fork to Miss. R.	- / -	32	(1)	11
Ridgeway	M - 4	Winneshiek	Walnut Creek to Upper Iowa River	- / -	22	(1)	7
Rowley	M - 167	Buchanan	Unnamed Tributary to Wap. R.		50	(1)	5
Ryan	M - 77	Delaware	Buck Creek to Maquoketa R.	- / -	38	4	2
Sabula	M - 105	Jackson	Mississippi River	535	43	(1)	6
Sageville	M - 61	Dubuque	Little Maquoketa R. to Mississippi R.	- / -	33	(1)	11
St. Donatus	M - 65	Jackson	Tete des Morts Cr. to Mississippi R.	- / -	36	(1)	9
St. Lucas	M - 21	Fayette	Turkey River	- / -	26	(1)	12
St. Olaf	M - 33	Clayton	Roberts Creek to Turkey R.	- / -	29	(2)	(3)
Sherrill East	M - 54	Dubuque	Bloody Run Creek to L. Maq. R. to Miss. R.	- / - / -	32	(1)	11
Sherrill South	M - 55	Dubuque	Bloody Run Creek to L. Maq. R. to Miss. R.	- / - / -	32	(1)	11
Spillville	M - 18	Winneshiek	Turkey River	-	26	(1)	11
Spragueville	M - 103	Jackson	Deep Creek to Maquoketa R.	- / 11	42	3	3
Springbrook	M - 98	Jackson	Unnamed Creek to Brush Creek to Maq. R.	- / - / -	42	(1)	9
Stanley	M - 133	Fayette	West Branch to Buffalo Cr. to Wap. R.	- / - / -	50	(1)	(3)
Strawberry Point N.	M - 42	Clayton	Spring Creek to Volga River to Turkey R.	- / - / -	30	(1)	6

Note: Mississippi River mileages are measured from confluence with Ohio River.

TABLE V-1

MUNICIPAL POINT SOURCE
WASTEWATER DISCHARGES

NORTHEASTERN IOWA BASIN

Discharger	Reference Number	County	Discharge To	River Mile	Page Reference Inventory	Page Reference Allocation	Page Reference Needs
MUNICIPAL					Chapter V	Chapter VI	Chapter VIII
Strawberry Point S.	M - 67	Clayton	Drainage Ditch to Maquoketa River	- / -	37	(1)	11
Sumner	M - 123	Bremer	L. Wapsipinicon R. to Wapsipinicon R.	26/152	48	6	6
Toronto	M - 143	Clinton	Wapsipinicon River	-	52	(2)	(3)
Tripoli	M - 119	Bremer	Wapsipinicon River	-	47	(1)	7
Troy Mills	M - 131	Linn	Wapsipinicon River	121	50	6	3
Volga	M - 41	Clinton	Volga River to Turkey River	-	30	(1)	8
Wadena	M - 39	Fayette	Volga River to Turkey River	-	30	(1)	8
Waterville	M - 10	Allamakee	Paint Creek to Mississippi R.	- / -	24	(1)	10
Waucoma	M - 24	Fayette	Crane Creek to L. Turkey R. to Turkey R.	- / - / -	27	(1)	13
Waukon	M - 9	Allamakee	Paint Creek to Mississippi R.	- / -	24	2	4
Welton	M - 156	Clinton	Silver Creek to Wapsipinicon R.	- / -	54	(2)	(3)
West Union	M - 28	Fayette	Otter Creek to Turkey River	- / 58	28	2	2
Westgate	M - 124	Fayette	Little Wapsipinicon R. to Wapsipinicon R.	- / -	48	(1)	7
Wheatland	M - 146	Clinton	Yankee Run Creek to Wapsipinicon R.	3/ 43	52	5	10
Winthrop	M - 129	Buchanan	Pine Creek to Wapsipinicon R.	6/133	49	6	7
Worthington	M - 89	Dubuque	Durian Brook to N. Frk. Maq. R. to Maq. R.	- / - / -	40	5	12
Wyoming	M - 82	Jones	Bear Creek to Maquoketa R.	- / -	39	(1)	12
Zwingle	M - 93	Dubuque	Otter Creek to Lytle Creek to N. Frk. Maq. R. to Maquoketa River	- / - / - / -	41	(2)	(3)

Note: Mississippi River mileages are measured from confluence with Ohio River.

(1) Secondary treatment or controlled discharge.

(2) No NEMTP.

(3) None.

TABLE V-2

SEMIPUBLIC POINT SOURCE
WASTEWATER DISCHARGES

NORTHEASTERN IOWA BASIN

Discharger	Reference Number	County	Discharge To	River Mile	Page Reference Inventory	Page Reference Allocation	Page Reference Needs
SEMIPUBLIC					Chapter V	Chapter VI	Chapter VIII
Allamakee Comm. School, Dorchester	S-5	Allamakee	Upper Iowa River	-	23	(1)	(2)
Allamakee County Church Camp	S-6	Allamakee	Paint Cr. to Miss. R.	-	24	(1)	(2)
Bellevue St. Park	S-34	Jackson	Mississippi R.	-	36	(1)	(2)
Bellevue WTP	S-32	Jackson	Mississippi R.	-	36	(1)	(2)
Bethesda Found., Muscatine	S-85	Muscatine	Mad Cr. to Miss. R.	-	64	(1)	(2)
Big Spring Trout Hatchery, Elkader	S-10	Clayton	Turkey River	-	29	(1)	(2)
Black Hawk Jr. High School, Davenport	S-72	Scott	Mississippi R.	-	59	(1)	(2)
Buchanan Co. Home	S-50	Buchanan	Wapsipinicon R.	-	49	(1)	(2)
Buckendahl Trailer Court, New Hampton	S-43	Chickasaw	Spring Cr. to L. Wap. R.	-	46	(1)	(2)
Calmar WTP	S-7	Winneshiek	Unnamed Cr. to Turkey R.	-	26	(1)	(2)
Camanche WTP	S-42	Clinton	Swan Slough to Miss. R.	-	45	(1)	(2)
Camp Conestoga	S-57	Clinton	Walnut Cr. to Wap. R.	-	53	(1)	(2)
Chickasaw County Home	S-44	Chickasaw	Spring Cr. to L. Wap. R.	-	47	(1)	(2)
Clayton County Home	S-11	Clayton	Roberts Cr. to Turkey R.	-	29	(1)	(2)
Clearview Mobile Home Park, Musca-tine	S-86	Muscatine	Mad Cr. to Miss. R.	-	64	(1)	(2)
Clinton County Home	S-37	Clinton	Deep Creek to Maquoketa R.	-	37	(1)	(2)
Coach Estates Mobile Home Park, Bettendorf	S-64	Scott	Crow Creek to Miss. R.	-	55	(1)	(2)
Cono Center Bible Presbyterian Church, Walker	S-52	Linn	Sand Creek to Wap. R.	-	50	(1)	(2)
Copper Creek Village Mobile Home Park	S-38	Jackson	Copper Creek to Maq. R.	-	42	(1)	(2)
County Est. Mobile Home Comm., Eldridge	S-59	Scott	Hickory Cr. N. Br. to Wap.	-	53	(1)	(2)
Davenport Water Co.	S-67	Scott	Mississippi River	-	58	(1)	(2)
Deckert Mobile Home Park, Dubuque	S-29	Dubuque	Catfish Cr. to L. Maq. R.	-	35	(1)	(2)
Dubuque WTP	S-17	Dubuque	Mississippi River	-	33	(1)	(2)
Dubuque County Home, Dubuque	S-25	Dubuque	Mississippi River	-	35	(1)	(2)
Eldridge WTP	S-58	Scott	Hickory Cr. N.Br. to Wap.	-	53	(1)	(2)
Elk River Mobile Est., Clinton	S-39	Clinton	Beaver Ch. to Miss. R.	-	43	(1)	(2)
Executive Mobile Home Court, Davenport	S-77	Scott	Mississippi River	-	60	(1)	(2)
Fairview Terrace, Anamosa	S-54	Jones	Wapsipinicon R.	-	51	(1)	(2)
Fawn Cr. Mobile Home Court, Anamosa	S-55	Jones	Wapsipinicon R.	-	51	6	(2)
Fayette Co. Home	S-12	Fayette	Volga R.	-	30	(1)	(2)

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NORTHEASTERN IOWA BASIN

Discharger	Reference Number	County	Discharge To	River Mile	Page Reference Inventory Chapter V	Allocation Chapter VI	Needs Chapter VIII
SEMIPUBLIC							
Garnavillo WTP	S-14	Clayton	S. Cedar Cr. to Turkey R.	-	31	(1)	(2)
Granada Gardens Mobile Home Park, Dubuque	S-21	Dubuque	Mississippi R.	-	34	(1)	(2)
Grand Mound WTP	S-60	Clinton	Barber Cr. to Wap. R.	-	54	(1)	(2)
Grand Vu Acres Mobile Home Park, Tripoli	S-45	Bremer	Wapsipinicon R.	-	47	6	(2)
Hidden Valley Mobile Home Park	S-62	Scott	Lost Cr. to Wap. R.	-	54	(1)	(2)
Howard County Home, Cresco	S-1	Howard	Silver Cr. to U. Iowa R.	-	22	(1)	(2)
Independence Mobile Home Park, Independence	S-48	Buchanan	Wapsipinicon R.	-	49	(1)	(2)
D.O.T. Hwy. Div. Rest Area, Davenport	S-66	Scott	Crow Creek to Miss. R.	-	55	(1)	(2)
D.O.T. Hwy. Div. Area	S-79	Scott	Mississippi R.	-	61	(1)	(2)
Jackson County Home	S-35	Jackson	Farmers Cr. to Maq. R.	-	39	(1)	(2)
Jones County Home	S-36	Jones	Mineral Cr. to Maq. R.	-	39	(1)	(2)
KOA Campground, Davenport	S-75	Scott	Cedar R. to Miss. R.	-	60	(1)	(2)
Knapp Mobile Home Park #4, Dubuque	S-20	Dubuque	Mississippi R.	-	34	(1)	(2)
Lakeside Manor Mobile Homes, Davenport	S-78	Scott	Mississippi R.	-	60	(1)	(2)
Lakeview Mobile Home Court, Oelwein	S-46	Fayette	Otter Cr. to Wap. R.	-	48	(1)	(2)
*Lakewood Mobile Home Park, Davenport	S-68	Scott	Duck Creek to Miss. R.	-	58	(1)	(2)
Light Trailer Court	S-23	Dubuque	Mississippi R.	-	34	(1)	(2)
Lore Mobile Home Park, Dubuque	S-26	Dubuque	L. Maq. R. to Miss. R.	-	35	(1)	(2)
Lost Canyon Mobile Home Park	S-30	Dubuque	Catfish Cr. to L. Maq. R.	-	36	(1)	(2)
Luther College, Decorah	S-2	Winneshiek	Upper Iowa River	-	23	(1)	(2)
Maple Hills Subdiv., Dubuque	S-19	Dubuque	Mississippi R.	-	34	(1)	(2)
Mathias Mobile Home Park, Davenport	S-70	Scott	Mississippi R.	-	59	(1)	(2)
Mental Health Inst., Independence	S-47	Buchanan	Wapsipinicon R.	-	49	6	(2)
Muscatine County Home	S-88	Muscatine	Mississippi R.	-	66	(1)	(2)
Naval Reserve Center, Dubuque	S-31	Dubuque	Catfish Cr. to L. Maq. R.	-	36	(1)	(2)

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NORTHEASTERN IOWA BASIN

Discharger	Reference Number	County	Discharge To	River Mile	Page Reference Inventory Chapter V	Page Reference Allocation Chapter VI	Page Reference Needs Chapter VIII
SEMIPUBLIC							
Nickerson Farms, Stockton	S-84	Scott	Unnamed Tributary to Miss.	-	62	(1)	(2)
North Haven Mobile Park Home, Muscatine	S-87	Muscatine	Mississippi R.	-	65	(1)	(2)
Nursing Care, Ltd., Davenport	S-82	Scott	Mississippi R.	-	61	(1)	(2)
Oakvale Subdivision, Clinton	S-40	Clinton	Mill Creek to Miss. R.	-	45	(1)	(2)
Oxbow Est. Mobile Home Park, Clinton	S-41	Clinton	Unnamed Trib. to Miss. R.	-	45	(1)	(2)
Parkview Sanitary District	S-61	Scott	Glynns Cr. to Wap. R.	-	54	(1)	(2)
Pine Ridge Mobile Home Park	S-49	Buchanan	Wapsipinicon R.	-	49	(1)	(2)
Pleasant Valley High School, Pleasant Valley	S-65	Scott	Crow Cr. to Miss. R.	-	55	(1)	(2)
Pleasant View Elem. School, Davenport	S-73	Scott	Mississippi R.	-	59	(1)	(2)
Riemers Add'n, Elkader	S-9	Clayton	Turkey R.	-	28	(1)	(2)
RLDS Church Camp, Mechanicsville	S-56	Scott	Pioneer Cr. to Wap. R.	-	51	(1)	(2)
Riverview Manor Nursing Home, Pleasant Valley	S-80	Scott	Mississippi R.	-	61	(1)	(2)
Royal Neighbors Home for the Aged, Davenport	S-81	Scott	Mississippi R.	-	61	(1)	(2)
Safari Campground, Davenport	S-69	Scott	Silver Cr. to Duck Cr. to Miss. R.	-	58	(1)	(2)
Scott County I-280 Lake Park, Davenport	S-83	Scott	Black Hawk Cr. to Miss. R.	-	61	(1)	(2)
Scott County Swimming Pool, Davenport	S-76	Scott	Mississippi R.	-	60	(1)	(2)
Spring Valley Mobile Home Park, Bellevue	S-33	Dubuque	Mississippi R.	-	36	(1)	(2)
Starmont Sr. High School, Strawberry Pt.	S-13	Clayton	Spring Cr. to Volga R.	-	31	(1)	(2)
State Cons. Comm., Decorah Fish Hatchery	S-3	Winneshiek	Upper Iowa River	-	23	(1)	(2)
Sundown Ski Area	S-16	Dubuque	L. Maq. R. to Miss. R.	-	33	(1)	(2)

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WASTEWATER DISCHARGES

NORTHEASTERN IOWA BASIN

Discharger	Reference Number	County	Discharge To	River Mile	Page Reference Inventory	Allocation	Needs
SEMIPUBLIC					Chapter V	Chapter VI	Chapter VIII
Table Mound Mobile Home Court, Dubuque	S-28	Dubuque	Catfish Cr. to L. Maq. R.	-	35	(1)	(2)
Table Mound Trailer Court #2, Dubuque	S-24	Dubuque	Mississippi R.	-	35	(1)	(2)
Trailer Village, Davenport	S-71	Scott	Mississippi R.	-	59	(1)	(2)
Turkey Valley School, Jackson Junction	S-8	Winneshiek	Little Turkey R.	-	27	(1)	(2)
Twin Ridge Subdiv. Dubuque	S-18	Dubuque	Mississippi R.	-	34	(1)	(2)
Twin "T" Mobile Home Park, Dubuque	S-27	Dubuque	Catfish Cr. to L. Maq. R.	-	35	(1)	(2)
U.S. Lock & Dam #14, Davenport	S-74	Scott	Mississippi R.	-	60	(1)	(2)
Valley Trailer Court, Bettendorf	S-63	Scott	Crow Creek to Miss. R.	-	55	(1)	(2)
Valley Hill Mobile Home Court, Sageville	S-15	Dubuque	L. Maq. R. to Miss. R.	-	33	(1)	(2)
Wendy Oaks Motel	S-53	Linn	Wapsipinicon R.	-	51	(1)	(2)
Westgate Mobile Home Park, Dubuque	S-22	Dubuque	Mississippi R.	-	34	(1)	(2)
Winneshiek County Home, Decorah	S-4	Winneshiek	Upper Iowa River	-	23	(1)	(2)
Winthrop WTP	S-51	Jones	Pine Cr. to Wap. R.	-	49	(1)	(2)

(1) BPT

(2) None

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INDUSTRIAL POINT SOURCE
WASTEWATER DISCHARGES

NORTHEASTERN IOWA BASIN

Discharger	Reference Number	County	Discharge To	River Mile	Page Reference Inventory Chapter V	Page Reference Allocation Chapter VI	Page Reference Needs Chapter VIII
INDUSTRIAL							
Alpha Crushed Stone Inc.	I-87	Linn	Buffalo Creek	-	51	(3)	(4)
Alpha Crushed Stone Inc.	I-89	Clinton	Walnut Creek	-	52	(3)	(4)
Aluminum Co. of America, Riverdale	I-98	Scott	Mississippi R.	-	57	(3)	(4)
American Oil Co., Dubuque	I-40	Dubuque	Catfish Creek	-	35	(3)	(4)
American Oil Co., Bettendorf	I-95	Scott	MSTP (1)	-	56	(3)	(4)
American Oil Co., Davenport	I-104	Scott	Mississippi R.	-	60	(3)	(4)
Andrew Quarry, Andrew	I-57	Jackson	Cedar Creek	-	41	(3)	(4)
Assoc. Milk Prod. Inc. Arlington	I-42	Delaware	Maquoketa R.	-	36	4	23
Assoc. Milk Prod. Inc. Ryan	I-50	Delaware	MSTP (1)	-	38	(3)	(4)
Baguss Quarry	I-53	Jackson	Bear Creek	-	39	(3)	(4)
Black Hawk Foundry And Machine, Davenport	I-109	Scott	Black Hawk Creek	-	61	(3)	(4)
Bauer Mink Farm, Winthrop	I-86	Buchanan	Pine Creek	-	50	(3)	(4)
Bundag, Inc., Muscatine	I-114	Muscatine	Mississippi R. &MSTP (1)	-	62	(3)	(4)
Caradco Division, Dubuque	I-30	Dubuque	Mississippi R. & MSTP (1)	-	33	(3)	(4)
Carlson Mat'ls Co, Schley	I-16	Howard	Little Turkey R.	-	26	(3)	(4)
Caterpillar Tractor Co., Bettendorf	I-94	Scott	MSTP (1)	-	55	(3)	(4)
Central Steel Co., Camanche	I-75	Clinton	MSTP (1)	-	45	(3)	(4)
Chemplex Co., Clinton	I-70	Clinton	Beaver Channel	-	44	(3)	23
Chicago, Milwaukee, St. Paul & Pacific Railroad, Marquette	I-14	Clayton	Bloody Run Creek	-	25	(3)	(4)
Chicago, Milwaukee St. Paul & Pacific RR, Davenport	I-103	Scott	Mississippi R.	-	59	(3)	(4)
Chicago and North-western RR, Clinton	I-74	Clinton	Mill Creek	-	45	(3)	(4)
Chicago, Northwestern RR Co., Oelwein	I-83	Fayette	Otter Creek & MSTP (1)	-	48	(3)	(4)
Clinton Corn Proc., Clinton	I-63	Clinton	Beaver Channel	-	43	(3)	23
Clinton Engines Corp., Clinton	I-58	Jackson	S. Frk. Maquoketa R.	-	41	(3)	(4)
Collis Co., Clinton	I-73	Clinton	Mill Creek & MSTP (1)	-	45	(3)	23

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WASTEWATER DISCHARGES

NORTHEASTERN IOWA BASIN

Discharger	Reference Number	County	Discharge To	River Mile	Page Reference Inventory	Allocation	Needs
INDUSTRIAL					Chapter V	Chapter VI	Chapter VIII
Commonwealth Edison, Davenport	I-105	Scott	Mississippi R.	-	60	(3)	(4)
Continental Oil Co., Clinton	I-67	Clinton	Beaver Channel	-	44	(3)	(4)
Cooney Const. Co., Waukon	I-7	Allamakee	Paint Creek	-	24	(3)	(4)
Culligan Water Cond., Elkader	I-23	Clayton	Turkey River	-	29	(3)	(4)
Davenport Ridgeview Dr., N. Division, Davenport	I-101	Scott	Goose Creek	-	59	(3)	(4)
Deco Products Co., Decorah	I-3	Winneshiek	Upper Iowa River	-	23	(3)	(4)
Deere John & Co., Davenport	I-99	Scott	MSTP (1)	-	58	(3)	(4)
Deere John & Co., Dubuque	I-38	Dubuque	Little Maquoketa R.	-	35	(3)	23
Dewey Cement Co., Buffalo	I-113	Scott	Mississippi R.	-	62	(3)	(4)
Donaldson Co., Oelwein	I-85	Buchanan	Otter Creek	-	49	(3)	(4)
Dubuque Sand & Gravel, Dubuque	I-41	Dubuque	Catfish Cr.	-	35	(3)	(4)
Dubuque Stamping & Mfg. Co., Dubuque	I-36	Dubuque	Mississippi R. & MSTP (1)	-	34	(3)	(4)
E. I. DuPont Nemours, Clinton	I-64	Clinton	Beaver Channel	-	44	(3)	23
Dyersville Ready Mix, Dyersville	I-54	Jones	N. Frk. Maquoketa R.	-	40	(3)	(4)
Eastern Iowa Light & Power, Muscatine	I-118	Muscatine	Mississippi R.	-	64	(3)	(4)
Elgin Canning Co., Elgin	I-20	Fayette	Turkey R. (2)	-	28	(3)	(4)
Fairport National Fish Hatchery, Muscatine	I-123	Muscatine	Mississippi R.	-	66	(3)	(4)
Farmers Butter & Dairy Coop, Fredericksburg	I-80	Chickasaw	MSTP (1)	-	47	(3)	(4)
Farmers Coop Creamery, Cresco	I-1	Howard	MSTP (1)	-	22	(3)	(4)
Farmers Coop Creamery, Decorah	I-4	Winneshiek	Upper Iowa River	-	23	(3)	(4)
Farmers Coop Creamery Ass'n, Waterville	I-8	Allamakee	Paint Creek	-	24	(3)	(4)
Farmers Coop Creamery, Greeley	I-47	Delaware	Honey Creek & MSTP (1)	-	37	(3)	(4)
Farmers Coop Creamery, Alta Vista	I-77	Chickasaw	Elk Creek (Proposed closing 9/1/74)	-	46	(3)	(4)
Fisher, Inc., Dubuque	I-31	Dubuque	Mississippi R.	-	33	(3)	(4)
Flexsteel Ind. Inc., Dubuque	I-39	Dubuque	Little Maquoketa R.	-	35	(3)	(4)

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Discharger	Reference Number	County	Discharge To	River Mile	Page Reference Inventory	Page Reference Allocation	Page Reference Needs
INDUSTRIAL					Chapter V	Chapter VI	Chapter VIII
Frank's Texaco, Lowden	I-90	Cedar	MSTP (1)	-	52	(3)	(4)
Grain Proc. Corp., Muscatine	I-115	Muscatine	Mississippi R.	-	63	(3)	23
Gunder Cheese Fact. Gunder	I-28	Clayton	Turkey River (2)	-	31	(3)	(4)
Hancor of Iowa, Oelwein	I-82	Fayette	Otter Creek	-	48	(3)	(4)
Hawkeye Chemical, Clinton	I-68	Clinton	Beaver Channel	-	44	(3)	24
Hawkeye Land Ltd.*, Bettendorf	I-100	Fayette	Duck Creek	-	58	(3)	(4)
Heinz, USA, Muscatine	I-116	Muscatine	MSTP (1)	-	64	(3)	(4)
Hewitt Bros. Inc., Oelwein	I-84	Buchanan	Otter Creek	-	49	(3)	(4)
Hon Industries, Muscatine	I-119	Muscatine	Mississippi R.	-	65	(3)	(4)
International Paper, Clinton	I-72	Clinton	MSTP (1)	-	45	(3)	(4)
Interstate Power, Clinton	I-71	Clinton	Mill Creek	-	44	(3)	(4)
Interstate Power Co., Lansing	I-5	Allamakee	Mississippi R.	-	23	(3)	(4)
Interstate Power Co., Dubuque	I-32	Dubuque	Mississippi R. & MSTP (1)	-	33	(3)	(4)
Ia. Electric Light & Power, Anamosa	I-88	Jones	Wapsipinicon R.	-	51	(3)	(4)
Ia.-Ill. Gas & Elec., Riverdale	I-97	Scott	Mississippi R.	-	56	(3)	(4)
Jacobson Quarry	I-19	Fayette	Turkey River	-	27	(3)	(4)
Kelsey Hayes Co., Davenport	I-102	Scott	Mississippi R.	-	59	(3)	(4)
Keystone Gelatin Co., Dubuque	I-33	Dubuque	Mississippi R. & MSTP (1)	-	33	(3)	(4)
LeClaire Quarries, LeClaire	I-92	Scott	Mississippi R.	-	55	(3)	(4)
Linwood Stone Prod., Buffalo	I-111	Scott	Mississippi R.	-	62	(3)	(4)
Ludlow Comm. Dairy, Waukon	I-9	Allamakee	Yellow River (2)	-	24	(3)	(4)
Lunex Co., Pleasant Valley	I-93	Scott	Mississippi R. (2)	-	55	(3)	(4)
MacMillian Oil Co., Davenport	I-108	Scott	Mississippi R.	-	61	(3)	(4)
Manchester Hide Proc., Manchester	I-49	Delaware	MSTP (1)	-	38	(3)	(4)
Martin Marietta Corp	I-29	Clayton	S. Cedar Cr.	-	31	(3)	(4)

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Discharger	Reference Number	County	Discharge To	River Mile	Page Reference Inventory	Page Reference Allocation	Page Reference Needs
INDUSTRIAL					Chapter V	Chapter VI	Chapter VIII
Martin Marietta, Cement	I-112	Scott	Mississippi R.	-	62	(3)	(4)
Martin Marietta Co.	I-46	Delaware	Honey Creek	-	37	(3)	(4)
Martin Marietta Corp.	I-78	Bremer	Wapsipinicon R.	-	47	(3)	(4)
Martin Marietta Rossow Quarry	I-59	Jackson	Maquoketa R.	-	42	(3)	(4)
Martin Marietta Walston Quarry	I-45	Delaware	Coffin Creek	-	37	(3)	(4)
Mason Co., Davenport	I-110	Scott	Black Hawk Creek	-	61	(3)	(4)
Maynard Quarry (Hewitt Bros. Inc.)	I-25	Fayette	Little Volga River	-	30	(3)	(4)
Meadowland Dairy Ass'n, Waukon	I-6	Allamakee	Paint Creek	-	24	(3)	(4)
Meinerz Creamery, Fredericksburg	I-79	Chickasaw	E. Frk. Wap. R. (2)	-	47	6	24
Mid-America Dairymen, Inc., Elkader	I-22	Clayton	MSTP (1)	-	28	(3)	(4)
Midland Lab., Inc., Dubuque	I-34	Dubuque	Mississippi R. & MSTP (1)	-	34	(3)	(4)
Miss.Valley Milk Prod. Ass'n, Luana	I-13	Clayton	Hickory Creek	-	25	2	24
Miss.Valley Milk Prod., Hopkinton	I-51	Delaware	MSTP (1)	-	39	(3)	(4)
Molo Sand & Gravel Co. Dubuque	I-37	Dubuque	Mississippi R.	-	34	(3)	(4)
Monsanto Co., Muscatine	I-120	Muscatine	Mississippi R.	-	65	(3)	24
Monticello Quarry	I-52	Jones	Wet Creek	-	39	(3)	(4)
Muscatine Power & Water Co., Muscatine	I-124	Muscatine	Mississippi R.	-	66	(3)	(4)
National By Prod., Clinton	I-62	Clinton	Beaver Channel	-	43	(3)	(4)
Paul Nieman Const. Co.	I-81	Buchanan	L. Wapsipinicon R.	-	48	(3)	(4)
Paul Nieman Const. Co.	I-43	Fayette	Lamont Creek	-	37	(3)	(4)
Paul Nieman Const.Co. (Falek Quarry)	I-44	Fayette	Maquoketa R.	-	37	(3)	(4)
Paul Nieman Const.Co (Gifford Sand Pit)	I-24	Fayette	N.BR. Volga R.	-	29	(3)	(4)
Paul Nieman Const.Co, (Olson Sand Pit)	I-18	Fayette	Turkey River	-	27	(3)	(4)
Paul Nieman Const.Co. (Yearons Sand Pit)	I-27	Fayette	Volga River	-	30	(3)	(4)
Norplex Div. UOP, Postville	I-12	Allamakee	Williams Creek	-	25	(3)	(4)

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Discharger	Reference Number	County	Discharge To	River Mile	Page Reference Inventory	Allocation	Needs
INDUSTRIAL					Chapter V	Chapter VI	Chapter VIII
Occidental Chemical, Davenport	I-106	Scott	Mississippi R.	-	60	(3)	(4)
Polaris Plating Co., Elkader	I-21	Clayton	Turkey River	-	28	(3)	24
Postville Ind. Laggon, Postville	I-11	Allamakee	Williams Creek	-	25	(3)	(4)
Prestolite, Manchester	I-48	Delaware	MSTP (1)	-	38	(3)	(4)
Publicker Ind., Muscatine	I-117	Muscatine	Mississippi R.	-	64	(3)	(4)
Ridgeway Dairy, Ridgeway	I-2	Winneshiek	Walnut Creek (2)	-	22	(3)	(4)
Ridley, Inc., Muscatine	I-122	Muscatine	Mississippi R.	-	66	(3)	(4)
Rockdale Stone Quarry	I-56	Dubuque	N. Frk. Maquoketa R.	-	41	(3)	(4)
Schley Cheese Co., Cresco	I-15	Howard	Turkey River	-	26	(3)	(4)
Sethness Prod. Co., Clinton	I-65	Clinton	Beaver Channel	-	44	(3)	(4)
Sun Oil Co., Walcott	I-107	Scott	Mississippi R.	-	61	(3)	(4)
Swift Dairy & Poultry, Clinton	I-61	Clinton	Beaver Channel	-	43	(3)	(4)
Texaco, Inc., Bettendorf	I-96	Scott	Mississippi R.	-	56	(3)	(4)
Thatcher Plastic Pkg., Muscatine	I-121	Muscatine	Mississippi R.	-	65	(3)	(4)
F.J. Trenkamp Quarry	I-60	Clinton	Deep Creek	-	42	(3)	(4)
Union Carbide, Clinton	I-69	Clinton	MSTP (1)	-	44	(3)	(4)
U. S. Ind. Chem. Co., Dubuque	I-35	Dubuque	Mississippi R.	-	34	(3)	(4)
Voloney Cheese Co.	I-10	Allamakee	Yellow River	-	25	(3)	(4)
Wadena Cheese & Butter Co., Wadena	I-26	Fayette	Volga River (2)	-	30	(3)	(4)
Waukesha Motor Co., Clinton	I-66	Clinton	Beaver Channel	-	44	(3)	(4)
Welp & McCarten, Inc. Lawler	I-17	Chickasaw	Crane Creek	-	27	(3)	(4)
Welp & McCarten, Inc.	I-76	Howard	Wapsipinicon R.	-	46	(3)	(4)
Wendling Quarries, Inc.	I-55	Dubuque	N. Frk. Maquoketa R.	-	41	(3)	(4)
Wendling Quarries, Inc., Lowden	I-91	Cedar	Yankee Run Creek	-	52	(3)	(4)

LEGEND

(1) Sanitary and/or process wastes to municipal sewage treatment plant

(2) Land disposal system in operation presently

(3) BPT

(4) None

TABLE V-4
DISCHARGE INVENTORY
NORTHEASTERN IOWA BASIN

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent Flow (mgd) Average/Design	Effluent BOD_5 (mg/l)/(lb/day)	Effluent Ammonia-N (mg/l)/(lb/day)	Treatment Type / Sludge Disposal	Comments
Upper Iowa River Chester M-1	185	200	- /.020	-	-	None	3 cell lagoon proposed
Millers Creek Lime Springs M-2	497	-	.096/.049	61/ 49	5/ 4	Trickling filter Sludge drying beds to land	-
Silver Creek Cresco M-3	3,927	5,880	.283/.380	49/116	6/ 14	Activated sludge & Trickling filter Wet sludge to land	-
Farmers Coop. Creamery, Cresco I-1	-	-	.12/.180	-	-	None	Cooling waters; process waters to municipal STP.
Howard County Home, Cresco S-1	60	-	- /.006	-	-	2 cell lagoon Not applicable	.9 acres
Walnut Creek Ridgeway M-4	218	250	.020/.030	-	-	2 cell lagoon Not applicable	3.8 acres
Ridgeway Dairy I-2	-	-	-	-	-	Activated sludge with .25 acres lagoon Unknown	Discharge to 6 acre drain-field
Upper Iowa River Decorah M-5	7,458	8,550	.849/1.625	101/715	20/212	Trickling filter Sludge drying beds to land	-

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent Flow (mgd) Average/Design	Effluent BOD$_5$ (mg/l)(lb/day)	Effluent Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Luther College, Decorah S-2	-	-	-	-	-	Unknown	
State Conservation Commission, Decorah Fish Hatchery S-3	-	-	-	-	-	Lagoons / Not applicable	No discharge
Deco Products Co., Decorah I-3	-	-	-/.081	-	-	None	Cooling water
Winneshiek County Home, Decorah S-4	-	82 beds	-	-	-	3 Compartment septic tank / Unknown	Effluent to river via drain tile
Farmers Coop. Creamery, Decorah I-4	-	-	- /.002	-	-	None	Cooling water
Allamakee Community School, Dorchester S-5	-	-	-	-	-	Polishing pond / Not applicable	-
Mississippi River							
New Albin M-6	644	-	.056/ -	96/45	26/ 12	Trickling filter with 1 cell lagoon / Wet sludge to land	-
Lansing M-7	1,128	2,400	.140/ .18	24/28	1/ 1	Activated sludge / Wet sludge to land	Contact Stabilization
Interstate Power Co., Lansing I-5	-	-	- / 43	-	-	None	Cooling water
Interstate Power Co., Lansing I-5	-	-	- / .06	-	-	None	Ash settling pond; TSS maximum, 30 mg/l
Interstate Power Co., Lansing I-5	-	-	- /.005	-	-	None	WTP; TSS maximum, 30 mg/l

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Interstate Power Co., Lansing I-5	-	-	- /.001	-	-	None	Cool hopper sump discharge TSS maximum, 30 mg/l, BOD_5 >6 mg/l, ZN 70µg/l, phenol 3µg/l, Cr 40µg/l
Harpers Ferry M-8	227	-	-	-	-	None	-
Paint Creek							
Waukon M-9	3,883	9,480	.888/2.22	42/311	14/104	2 Stage Trickling filter / Wet sludge to land	-
Allamakee County Church Camp S-6	-	-	-	-	-	0.25 acre Lagoon / Not applicable	Facility used for 120 days per year; no discharge
Meadowland Dairy Association, Waukon I-6	-	-	- /.120	-	-	None	Cooling water; BOD_5-4 mg/l
Cooney Construction Co., Waukon I-7	-	-	- /.010	-	-	Sediment Pond / Not applicable	TSS maximum-30 mg/l
Waterville M-10	158	-	-	-	-	None	-
Farmers Coop. Creamery Association, Waterville I-8	-	-	- /.001	-	-	None	Cooling water
Yellow River							
Ludlow Community Dairy, Waukon I-9	-	-	-	-	-	Spray irrigation / Not applicable	Cooling water averages 1-5000 gpd

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Voloney Cheese Co., Allamakee County I-10	-	-	- /.018	-	-	2 Cell aerated lagoon with digester / Unknown	-
Williams Creek: Postville M-11	1,546	3,600	.186/.282	37/ 58	19/30	Trickling filter / Sludge drying beds to land	-
Postville Industrial Lagoon I-11	-	10,920	.485/.727	-	-	Three cell lagoon / Not applicable	
Norplex Div., UOP, Postville I-12	-	-	- /.500	-	-	.5 mg cooling pond / Not applicable	Cooling water BOD_5-4 mg/l, NH_3-0.1 mg/l
Hickory Creek: Luana M-12	225	390	.031/.046	-	-	2 cell lagoon / Not applicable	6.0 acres
Mississippi Valley Milk Producers Association Luana I-13	-	-	- /.180	-	-	Activated sludge / Unknown	Extended Aeration; designed for 22# BOD ef fluent
Mississippi River: Marquette M-13	509	738	.069/ -	168/ 97	24/ 14	Collection system only, no STP	
Bloody Run Creek: Chicago, Milwaukee, St. Paul, and Pacific RR, Marquette I-14	-	-	- /.003	-	-	None	Drainage from fueling facilities and engine-house inspection pits

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Mississippi River							
McGregor M-14	990	1,500	.086/.165	92/ 66	28/ 20	Primary / Sludge drying beds to land	-
Clayton M-15	113	-	-	-	-	None	-
Miners Creek							
Guttenberg M-16	2,177	-	.342/.275	201/573	2/ 6	Primary / Sludge lagoon	-
Turkey River							
Schley Cheese Co., Cresco I-15	-	-	- /.913mgy	-	-	2 cell lagoon / Not applicable	5.72 acres
Bohemian Creek							
Protivin M-17	333	400	-	-	-	None	-
Turkey River							
Spillville M-18	361	525	.014/.050	67/ 8	29/ 3	2 cell lagoon / Not applicable	5.4 acres
Unnamed Creek							
Calmar STP M-19	1,008	2,000	.103/.216	108/ 93	12/10	Trickling filter / Wet sludge to land	
Calmar WTP S-7	-	-	-	-	-	None	Iron filter backwash
Turkey River							
Fort Atkinson M-20	339	-	-	-	-	Septic tanks / Unknown	-
St. Lucas M-21	194	-	-	-	-	None	-
Little Turkey River							
Carlson Materials Co., Schley I-16	-	-	-	-	-	Stilling basin / Unknown	-

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent Flow (mgd) Average/Design	Effluent BOD_5 (mg/l)(lb/day)	Effluent Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Crane Creek							
Lawler M-22	513	550	- /.055	-	-	2 cell lagoon / Not applicable	-
Welp & McCarten, Inc., Lawler I-17	-	-	-	-	-	None	Quarry dewatering
Jackson Junction M-23	106	-	-	-	-	Septic tank / Unknown	-
Turkey Valley School, Jackson Junction S-8	-	-	- /.024	-	-	Aerated lagoon / Not applicable	-
Waucoma M-24	357	-	-	-	-	None	-
Nutting Creek							
Ossian M-25	847	940	.076/.082	38/ 24	-	Trickling filter / Sludge drying beds to land	-
Unnamed Tributary							
Castalia M-26	210	-	-	-	-	None	-
Turkey River							
Clermont M-27	582	727	.038/.073	63/ 20	22/ 7	Trickling filter / Sludge drying beds to land	
Paul Nieman Construction Co.(Olsen sand pit) I-18	-	-	-	-	-	Unknown	Closed system; not used since 1968
Jacobson Quarry I-19	-	-	-	-	-	3 Settling basins / Unknown	

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Otter Creek							
West Union M-28	2,624	4,600	.149/.435	100/182	21/ 38	Trickling filter (old plant) / Wet sludge hauled to land	Flow values for new plant presently under construction; to attain 2.0 mg/l NH_3
Turkey River							
Elgin M-29	631	900	.052/.093	52/ 23	17/ 7	Trickling filter / Sludge drying beds	
Elgin Canning Co., Elgin I-20	-	-	-	-	-	Irrigation fields and tile / Not applicable	Constructed new trenches in 1971.
Elkader M-30	1,592	-	.145/.228	187/266	21/ 25	Primary treatment / Sludge lagoons	
Riemers Add'n., Elkader S-9	199	-	.004/.007	152/ 5	16/ .5	1 cell lagoon / Not applicable	
Polaris Plating Co., Elkader I-21	-	-	- /.020	-	-	None	Interested in connecting to Elkader STP.
Mid-America Dairymen, Inc., Elkader I-22	-	-	- / .01	-	-	To Elkader STP. / Not applicable	Pre-treatment plan proposed; to consist of primary and secondary treatment (Biomodule)

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent Flow (mgd) Average/Design	Effluent BOD$_5$ (mg/l)(lb/day)	Effluent Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Culligan Water Cond., Elkader I-23	-	-	-	-	-	Septic tank for sanitary wastes / Unknown	
Big Spring Trout Hatchery, Elkader S-10	-	-	- /6.90	-	-	Unknown	-
Roberts Creek							
Silver Creek							
Monona M-31	1,395	1,750	.147/.165	54/ 66	18/ 22	Trickling filter / Wet sludge hauled to land	
(Turkey River cont.)							
Roberts Creek							
Farmersburg M-32	232	433	.016/.032	25/ 3	10/ 1	2 Cell lagoon / Not applicable	3.5 acres
St. Olaf M-33	140	-	-	-	-	None	-
Clayton Co. Home S-11	-	100	-	-	-	3 cell lagoon / Not applicable	1.24 acres
Volga River							
North Branch Volga River							
Hawkeye M-34	529	2,239	.025/.079	59/ 12	16/ 3	Trickling filter / Sludge drying beds to land	
Paul Niemann Const. Co. (Gifford Sand Pit) I-24	-	-	-	-	-	Closed system lagoon / Not applicable	
Little Volga River							
Maynard M-35	503	-	.037/.035	25/ 8	4/ 1	Activated sludge with detention pond / Wet sludge to land	Extended Aeration

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent Flow (mgd) Average/Design	Effluent BOD5 (mg/l)(lb/day)	Effluent Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Maynard Quarry (Hewitt Bros. Inc.) I-25		-	-/.075	-	-	None	Quarry dewatering
Volga River							
Randalia M-36	81	-	-	-	-	None	-
Donnan M-37	18	-	-	-	-	None	-
Fayette M-38	1,947	4,450	.197/.378	25/ 41	8/ 13	2 Trickling filters / Wet sludge to land	
Fayette Co. Home S-12	-	220	-/.010	-	-	1 cell lagoon / Not applicable	1.75 acres
Wadena M-39	237	318	.052/.015	-	-	2 cell lagoon / Not applicable	
Wadena Cheese & Butter Co. I-26	-	-	-/.004	-	-	Spray irrigation / Not applicable	
Paul Niemann Const. Co. (Yearons Sand Pit) I-27	-	-	-	-	-	Closed system lagoon / Not applicable	
Brush Creek							
Arlington M-40	481	1,050	.055/.045	36/ 17	18/ 8	Trickling filter / Sludge drying beds to land	-
Volga River							
Volga M-41	305	-	-	-	-	None	-
Spring Creek							
Strawberry Point North M-42	1,281	350	.024/.027	40/ 10	1/ 0	2 cell lagoon / Not applicable	6 acres

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Starmont Senior High School, Strawberry Point S-13	-	-	-	-	-	Lagoon / Not applicable	1 acre
Volga River Littleport M-43	97	-	-	-	-	None	-
Bear Creek Edgewood M-44	786	1,016	.057/.110	57/ 27	25/ 12	Trickling filter / Sludge drying beds to land	-
Volga River Elkport M-45	87	-	-	-	-	None	-
Turkey River Garber M-46	148	-	-	-	-	None	-
Gunder Cheese Factory, Gunder I-28	-	-	-	-	-	Present spray irrigation system completely inadequate; raw discharge probably occurring	
So. Cedar Creek Garnavillo STP M-47	634	780	.040/.078	32/ 11	1/ 0	Trickling filter / Sludge drying beds to land	No final clarifier
Garnavillo WTP S-14	-	-	-	-	-	None	Backwash water discharged to municipal STP.
Martin Marietta Corp I-29	-	-	- /.400	-	-	None	Discharge from air scrubbers

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD$_5$ (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Turkey River							
Osterdock M-48	59	-	-	-	-	None	-
Little Turkey River							
Colesburg (SE) M-49	379	330	.018/.024	25/ 4	25/ 4	2 cell lagoon / Not applicable	3 acres
Colesburg (NW) M-50	-	-	.019/.014	25/ 4	25/ 4	2 cell lagoon / Not applicable	2 acres
Millville M-51	27	-	-	-	-	None	-
Mississippi River							
North Buena Vista M-52	118	-	-	-	-	None	-
Balltown M-53	79	-	-	-	-	None	-
Little Maquoketa River Bloody Run Creek							
Sherrill East M-54	190	170	-/.015	-	-	1 cell lagoon / Not applicable	1.7 acres
Sherrill South M-55	-	130	-/.011	-	-	1 cell lagoon / Not applicable	1.3 acres
Little Maquoketa River Middle Fork							
Rickardsville M-56	193	-	-	-	-	None	Proposed 3 cell lagoon
Little Maquoketa River							
Durango M-57	55	-	-	-	-	None	-
Bankston M-58	28	-	-	-	-	None	-
Farley M-59	1,096	1,430	.076/.163	25/ 16	1/ 1	2 cell lagoon / Not applicable	12.5 acres
Graf M-60	70	-	-	-	-	None	-

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent Flow (mgd) Average/Design	Effluent BOD_5 (mg/l)(lb/day)	Effluent Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Sageville M-61	338	-	-	-	-	None	-
Valley Hill Mobile Home Court, Sageville S-15	-	-	-	-	-	Trickling filter / Unknown	40 spaces in park
Sundown Ski Area, Dubuque County S-16	-	-	- /.001	-	-	1 cell lagoon / Not applicable	0.62 acres
Mississippi River							
Dubuque M-62	62,309	615,794	9.8/15.33	361/29,505	35/2,861	2 Trickling filters and activated sludge/Incineration	Ash lagooned
Dubuque, WTP S-17	-	-	- /.011	-	-	None	Discharge to Mississippi River via flood detention basin
Caradco Division, Dubuque I-30	-	-	- /.715	-	-	None	Cooling water; all process wastes to Dubuque STP
Fisher Inc., Dubuque I-31	-	-	- /.648	-	-	None	Cooling Water
Interstate Power Co., Dubuque I-32	-	-	- /61.1	-	-	None	Cooling Water; all process wastes to Dubuque STP
Keystone Gelatin Co., Dubuque I-33	-	-	- /.756	-	-	None	Cooling water; All process wastes to Dubuque STP

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent Flow (mgd) Average/Design	BOD$_5$ (mg/l) (lb/day)	Ammonia-N (mg/l) (lb/day)	Treatment Type / Sludge Disposal	Comments
Midland Laboratories Inc., Dubuque I-34	-	-	- /.003	-	-	None	Cooling water; all process wastes to Dubuque STP.
U.S.Industrial Chemical Co., Dubuque I-35	-	-	- /2.31	-	-	None	Cooling water
Dubuque Stamping & Mfg. Co., Dubuque I-36	-	-	-	-	-	.042 mgd to Dubuque STP., .027 mgd No Treatment-discharged to storm sewer	
Molo Sand & Gravel Co., Dubuque I-37	-	-	-	-	-	None	-
Twin Ridge Subdivision, Dubuque S-18	180	-	-	-	-	Temporary Lagoon / Not applicable	May be diverted to Dubuque STP
Maple Hills Subdivision, Dubuque S-19	-	-	-	-	-	To Dubuque STP	Connection to be made 7-1-75
Knapp Mobile Home Park #4, Dubuque S-20	-	-	-	-	-	Septic tank & each filter	-
Granada Gardens Mobile Home Park, Dubuque S-21	-	-	-	-	-	Lagoon	40 spaces in park.
Westgate Mobile Home Park, Dubuque S-22	-	-	-	-	-	Activated sludge / Unknown	-
Light Trailer Court, Dubuque S-23	-	-	-	-	-	Septic tank and rock filter	-

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref.No.)	1970 Pop.	Design P.E.	Effluent Flow (mgd) Average/Design	Effluent BOD$_5$ (mg/l)(lb/day)	Effluent Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Table Mound Trailer Court No.2 Dubuque S-24	-	-	-	-	-	Activated Sludge / Unknown	Extended aeration
Dubuque County Home S-25	-	-	-	-	-	2 cell lagoon / Not applicable	No dicharge
Little Maquoketa River							
John Deere & Co., Dubuque I-38	-	2,000	31.93/13,43	-/2329	-	Primary treatment & polishing lagoon / Sludge drying beds	
Lore Mobile Home Park, Dubuque S-26	-	-	-	-	-	Lagoon existed in 1968	May have connected to Dubuque STP
Flexsteel Industries Inc., Dubuque I-39	-	-	- /.002	-	-	None	Cooling water
Catfish Creek							
American Oil Co., Dubuque I-40	-	-	-	-	-	Unknown	
Dubuque Sand & Gravel, Dubuque I-41	-	-	-	-	-	None	Quarry water
Twin "T" Mobile Home Park, Dubuque S-27	-	-	-	-	-	Lagoon / Not applicable	-
Table Mound Mobile Home Court, Dubuque S-28	-	-	-	-	-	1 cell aerated lagoon, final clarifier / Unknown	
Deckert Mobile Home Park, Dubuque S-29	-	-	-	-	-	Septic Tank & Rock Filter / Unknown	-
Centralia M-63	105	-	-	-	-	None	-

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	BOD$_5$ (mg/l)(lb/day)	Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Peosta M-64	116	-	-	-	-	None	-
Lost Canyon Mobile Home Park S-30	-	-	-	-	-	Unknown	-
Naval Reserve Center, Dubuque S-31	-	-	-	-	-	2-1000 gal. septic tanks to 2 cell lagoon/Unknown	0.14 acres
Tete des Morts Creek							
St. Donatus M-65	164	300	.004/.030	34/ 1	-	2 cell lagoon / Not applicable	3.0 acres
Mississippi River							
Bellevue STP M-66	2,336	-	.234/.135	42/ 82	28/ 55	Trickling filter / Sludge lagoon & drying beds	-
Bellevue WTP S-32	-	-	-	-	-	To City STP	Stormwater, floor drains, air cooling tower blowdown (200 gal) to river
Spring Valley Mobile Home Park, Bellevue S-33	44 spaces	80 spaces	-	-	-	Trickling filter / Unknown	
Bellevue State Park S-34	-	-	- / .06	-	-	Lagoon / Not applicable	Total detention no discharge
Maquoketa River							
Associated Milk Producers, Inc., Arlington I-42	-	-	- /.395	-	-	Trickling filter with aerated polishing lagoon / To 12 acre land disposal site	10 acre lagoon

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Drainage Ditch							
Strawberry Point South M-67	1,281	1,250	.150/.090	31/ 39	9/ 11	2 cell lagoon / Not applicable	10.23 acres
Lamont Creek							
Lamont M-68	498	-	.009/.064	27/ 2	-	2 cell lagoon / Not applicable	5.4 acres
Paul Nieman Const. Co. (Ward Sand Pit) I-43	-	-	-	-	-	Closed system	Quarry water
Maquoketa River							
Paul Nieman Const. Co. (Falek Quarry) I-44	-	-	-	-	-	-	Quarry not used for several yrs
Dundee M-69	166	-	-	-	-	None	Proposing 3 cell lagoon
Coffin Creek							
Martin Marietta (Walston Quarry) I-45	-	-	- /.050	-	-	None	Quarry water from limestone production
Prairie Creek							
Masonville M-70	147	-	-	-	-	Septic tanks / Unknown	-
Honey Creek							
Martin Marietta Co. (Beaman Sand) I-46	-	-	- /.050	-	-	None	Washwater from sand production
Farmers Coop Creamery I-47 Greeley	-	-	- /.002	-	-	As of 10-1-75 all washwater to Greeley STP	Washwater only; no process wastes; cooling water to creek

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent Flow (mgd) Average/Design	Effluent BOD_5 (mg/l)(lb/day)	Effluent Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Prestolite, Manchester I-48	-	-	-	-	-	Process wastes to City STP.	Polishing pond used prior to sewer discharge
Maquoketa River: Manchester M-71	4,641	6,500	.581/1.000	120/581	46/223	Aerobic and anaerobic lagoons & trickling filter / Digester; wet sludge to land	-
Manchester Hide Processing I-49	-	-	-	-	-	Settling basins to City STP	
Delhi M-72	527	820	.024/.065	31/ 5	13/ 3	Lagoon / Not applicable	5.0 acres
Plum Creek: Greeley M-73	323	-	- /.048	-	-	3 cell lagoon / Not applicable	-
Oneida M-74	55	-	-	-	-	Septic tanks / Unknown	-
Earlville M-75	751	750	.053/.060	64/ 28	14/ 6	Trickling filter / Sludge to drying beds	No final clarifier
Delaware M-76	153	-	-	-	-	Septic tanks / Unknown	-
Buck Creek: Ryan M-77	343	-	.207/ -	73/126	10/ 17	Trickling filter with lagoon / Unknown	-
Associated Milk Producers Inc., Ryan I-50	-	-	.145/ -	-	-	To City STP	.070 mgd cooling water to creek

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Maquoketa River							
Hopkinton M-78	800	9,000	.177/.200		20/ 30	Bio-disc / Wet sludge to land	-
Mississippi Valley Milk Producers, Hopkinton I-51	-	-	- /.035	-	-	15 acre aerated holding pond prior to discharge to City STP.	-
Wet Creek							
Monticello Quarry I-52	-	-	- /.600	-	-	Settling Ponds	Dewatering and quarry water
Maquoketa River							
Monticello M-79	3,509	8,000	.490/.805	43/176	18/ 74	Trickling filter / Wet sludge to land	-
Farmers Creek							
Jackson County Home S-35	55	65	- /.007	-	-	Septic tank / Unknown	Activated sludge with 3 polishing lagoons proposed, on 2/75
Mineral Creek							
Center Junction M-80	172	-	-	-	-	Septic tanks / Unknown	-
Jones County Home S-36	150	-	-	-	-	Lagoon / Not applicable	-
Bear Creek							
Onslow M-81	253	418	.008/.035	27/ 2	-	2 cell lagoon / Not applicable	4 acres
Wyoming M-82	746	-	.054/.057	33/ 15	14/ 6	2 cell lagoon / Not applicable	-
Baguss Quarry I-53	-	-	- /.015	-	-	None	Intermittent dewatering to keep quarry dry

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Monmouth M-83	257	350	-	-	-	Septic tanks / Unknown	6-7 Units per drainfield; excess flows to Bear Creek
Baldwin M-84	172	300	-	-	-	Individual septic tanks / Unknown	-
North Fork Maquoketa River							
Dry Run							
Holy Cross M-85	290	-	.020/.054	43/ 7	5/ 1	2 cell lagoon / Not applicable	
North Fork Maquoketa River							
Luxemburg M-86	185	-	-	-	-	Septic tanks / Unknown	-
New Vienna M-87	392	745	.024/.042	32/ 6	24/ 5	Trickling filter / Sludge drying beds to land	-
Unnamed Creek							
Dyersville M-88	3,437	4,100	.442/.585	36/133	9/ 33	Aerated lagoon / Not applicable	14.55 acres
Dyersville Ready Mix I-54	-	-	-	-	-	Settling Pond	-
Durian Brook							
Worthington M-89	365	486	.029/.039	30/ 7	22/ 5	Activated sludge with polishing pond / Wet sludge to land	Extended aeration
North Fork Maquoketa River							
Cascade M-90	1,744	-	.068/.174	60/ 34	29/ 16	Trickling filter / Sludge Lagoon; wet sludge to land	-

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Wendling Quarries I-55	-	-	- /.014	-	-	2 settling ponds / Unknown	Quarry water
Rockdale Stone Quarry I-56	-	-	-	-	-	None	Quarry water
Whitewater Creek							
Epworth M-91	1,132	-	.123/.187	32/ 33	3/ 3	Trickling filter / Wet sludge to land	Proposing aerated lagoon
Lytle Creek							
Bernard M-92	148	-	-	-	-	Septic tank / Unknown	-
Otter Creek							
Zwingle M-93	96	-	-	-	-	Septic tanks / Unknown	Immediate need for lagoon
Farmers Creek							
LaMotte M-94	326	450	.040/.044	27/ 9	1/ 0	2 cell lagoon / Not applicable	3.5 acres
Cedar Creek							
Andrew M-95	335	500	.024/.080	25/ 5	1/ 0	2 cell lagoon / Not applicable	7.32 acres
Andrew Quarry I-57	-	-	-	-	-	3 settling basins / Unknown	-
North Fork Maquoketa River							
Clinton Engines Corp., I-58 Maquoketa		-	- /.057	-	-	None	Cooling water
Maquoketa River							
Hurstville M-96	88	-	-	-	-	Septic tanks / Unknown	
Maquoketa M-97	5,677	-	.752/.750	168/1054	24/151	Primary / Wet sludge to land	Proposing new STP.

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Martin Marietta Rossow Quarry I-59	-	-	- /.050	-	-	None	Quarry water from limestone production
Unnamed Creek to Brush Creek							
Springbrook M-98	196	200	.006/.029	27/1	10/ 1	1 cell lagoon / Not applicable	7.97 acres
Deep Creek							
Charlotte M-99	444	570	- /.054	-	-	Septic tanks / Unknown	Controlled discharge system
F.J.Trenkamp Quarry I-60	-	-	-	-	-	None	-
Clinton Co. Home S-37	-	-	-	-	-	Unknown	-
Goose Lake M-100	218	340	.001/.037	31/0	-	2 cell lagoon / Not applicable	3.25 acres
Delmar M-101	599	1,000	-	-	-	Septic tanks / Unknown	Controlled discharge system; recently proposed aerated lagoon
Copper Creek							
Preston M-102	950	2,500	.320/.250	47/125	1/ 3	2 cell lagoon / Not applicable	first cell aerated; 12.5 ac.
Copper Creek Village Mobile Home Park S-38	-	-	- /.007	-	-	2 cell lagoon / Not applicable	55 spaces in park
Deep Creek							
Spragueville M-103	112	130	.003/.013	32/ 1	32/ 1	Activated sludge with polishing lagoon / Wet sludge to land	Extended aeration

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	BOD$_5$ (mg/l)(lb/day)	Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Maquoketa River							
Green Island M-104	112	-	-	-	-	Septic tanks / Unknown	-
Mississippi River							
Sabula M-105	845	1,200	.078/.120	48/ 31	11/ 7	Imhoff tank / Sludge drying beds to land	
Elk River							
Miles M-106	409	600	.039/.053	26/ 8	7/ 2	Activated sludge with polishing lagoon / Wet sludge to land	Extended aeration; needs disinfection
Andover M-107	90	120	.006/.012	25/ 1	-	1 cell lagoon / Not applicable	
Beaver Channel							
Clinton M-108	34,719	78,000	7.99/7.50	218/14,527	18/1199	Primary and disinfection / Sludge drying beds to land	Activated sludge plant under construction
Elk River Mobile Estates, Clinton S-39	-	103	-	-	-	Lagoon / Not applicable	Private sewer system and STP.
Swift Dairy & Poultry, Clinton I-61	-	-	- /.150	-	-	None	Cooling water
National By Products, Clinton I-62	-	-	- /1.76	-	-	None	Cooling water
Clinton Corn Processing, Clinton I-63	-	-	53.3/55.0	- /63,000	- / -	None at present	Treatment works to be completed 4-14-75; presently have 21 discharges

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
E.I.DuPont Nemours, Clinton I-64	-	-	-/001=12.0 -/002=.450	-/2640	-	Activated sludge, extended aeration / Sludge management program being developed	001=75% cooling water 002=effluent from fly ash lagoon
Sethness Products Co., Clinton I-65	-	-	- /.127	-	-	None	Cooling water
Waukesha Motor Co., Clinton I-66	-	-	- /.008	-	-	None	Cooling water
Continental Oil Co., Clinton I-67	-	-	- /.005	-	-	None	Cooling water
Hawkeye Chemical, Clinton I-68	-	-	- /1.85	-	- /10,000	None	25% process water 75% cooling water
Union Carbide, Clinton I-69	-	-	-	-	-	To Clinton STP	-
Chemplex Co., Clinton I-70	-	-	- /1.29	- /1223	-/21	Holding pond / Not applicable	-
Mill Creek							
Interstate Power, Clinton I-71	-	-	-/001=13.0	-	-	None	001=Cooling water
			-/002=78.0			None	002=Cooling water
			-/003=2.00			None	003=Fly ash pond
			-/004=.012			None	004=Emergency settling pond
			-/005=.002			None	005=Coal hopper sump

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
International Paper, Clinton I-72	-	-	- /.008	-	-	None	Cooling water; process wastes to Clinton STP. Metal limitations proposed
Collis Company, Clinton I-73	-	-	437/-	-/226	-/5	Neutralization tank settling tank, final filter / Unknown	Plating wastes; Sanitary wastes to Clinton STP
Oakvale Subdivision, Clinton S-40	-	-	-	-	-	Activated sludge with polishing pond / Unknown	30 day detention pond; will divert to City in 1977
Chicago & Northwestern Railroad, Clinton I-74	-	-	- /.020	-	-	Septic tanks / Unknown	For sanitary wastes only
Unnamed Tributary							
Oxbow Estates Mobile Home Park, Clinton S-41	-	375	-	-	-	Lagoon / Not applicable	-
Swan Slough							
Camanche STP M-109	3,470	5,294	.405/.600	67/226	31/104	Activated sludge and disinfection / To landfill	-
Camanche WTP S-42	-	-	-	-	-	Unknown	-
Central Steel Co. I-75	-	-	-	-	-	-	Discharges to Camanche STP.

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Rock Creek Low Moor M-110	347	592	.035/.064	54/ 16	3/ 1	1 cell lagoon Not applicable	-
Wapsipinicon River McIntire M-111	234	-	-	-	-	None	-
Riceville M-112	877	1,235	.140/.120	68/ 79	17/ 20	2 cell lagoon Not applicable	12.0 acres
Welp & McCarten, Inc. I-76	-	-	-	-	-	None	Quarry water
Drainage Ditch Ionia M-113	270	-	-	-	-	None	
Little Wapsipinicon River Elma M-114	601	900	.068/ -	26/ 15	11/ 6	Activated sludge with polishing lagoon Wet sludge to land	Extended aeration
Elk Creek Alta Vista M-115	283	-	.017/.020	46/ 7	21/ 3	Trickling filter Unknown	-
Farmers Coop Creamery, Alta Vista I-77	-	-	-	-	-	None	Proposed Closing date 9-1-74
Little Wapsipinicon River North Washington M-116	134	-	-	-	-	None	-
Spring Creek New Hampton M-117	3,621	4,300	.784/1.40	37/242	22/144	Trickling filter with 2 polishing ponds Digester;wet sludge to land	-
Buckendahl Trailer Court, New Hampton S-43	-	-	-	25/	-	Septic tank Unknown	Has effluent discharge

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Chickasaw County Home S-44	-	-	-	-	-	Unknown	-
Wapsipinicon River							
Frederika M-118	190	295	- /.030	-	-	2 cell lagoon / Not applicable	3.0 acres
Martin Marietta Corp., (Frederika Quarry) I-78	-	-	- /.850	-	-	None	Quarry water
Tripoli M-119	1,345	1,620	.123/ -	26/ 27	1/ 1	2 cell lagoon / Not applicable	16.2 acres
Grand Vu Acres Mobile Home Park, Tripoli S-45	-	-	-	-	-	Activated sludge with polishing lagoon / Unknown	58 spaces in park
East Fork Wapsipinicon River							
Fredericksburg M-120	912	5,900	.210/.356	104/182	6/ 11	2 stage trickling filter / Wet sludge to land	
Meinerz Creamery, Fredericksburg I-79	-	-	.206/ -	4285/7362	-	Spray irrigation / Not applicable	
Farmer's Butter & Dairy Coop, Fredericksburg I-80	-	-	-	-	-	As of 4-18-73 all wastes diverted to Fredericksburg STP.	-
Wapsipinicon River / Crane Creek / Drainage Ditch #5							
Readlyn M-121	616	962	.076/.100	25/ 16	3/ 2	Activated sludge with polishing lagoon / Unknown	-

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Crane Creek							
Dunkerton M-122	563	1,078	.036/.096	29/ 9	2/ 1	2 cell lagoon / Not applicable	8.28 acres
Little Wapsipinicon River							
Sumner M-123	2,174	3,750	.141/.317	45/ 17	53/ 20	Trickling filter / Digester;Unknown	
Westgate M-124	204	-	-	-	-	None	-
Fairbank M-125	810	1,070	.033/.082	41/ 11	5/ 1	2 cell lagoon / Not applicable	6.71 acres
Paul Nieman Const. Co. I-81	-	-	-	-	-	None	-
Wapsipinicon River							
Otter Creek							
Oelwein M-126	7,735	11,000	1.69/1.00	29/409	9/127	Activated sludge / Wet sludge to land	-
Hancor of Iowa, Oelwein I-82	-	-	- /.005	-	-	None	Cooling water
Lakeview Mobile Home Court, Oelwein S-46	-	-	-	-	-	1 cell lagoon / Not applicable	No discharge
Chicago, Northwestern RR Co., Oelwein I-83	-	-	- /.750	-	-	Storm water treatment unit;8 oil skimmer tanks for radiation coolants with chromates; air flotation, gravity settling tank / Unknown	Sanitary wastes to municipal STP.

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Hewitt Bros. Inc., (Oelwein Quarry) I-84	-	-	-	-	-	None	Quarry de-watering; discharge only rainwater
Donaldson Co., Oelwein I-85	-	-	- /.028	-	-	None	Cooling water
Hazelton M-127	626	1,000	.050/.068	28/ 12	15/ 6	Activated sludge with polishing lagoon / Wet sludge to land	Extended aeration
Wapsipinicon River							
Independence M-128	5,910	10,175	1.29/1.00	38/410	1/ 11	2 trickling filters / Digester; sludge drying beds to land	
Mental Health Institute Independence S-47	-	-	- /.150	-	-	Trickling filter / Unknown	-
Independence Mobile Home Park S-48	-	-	-	-	-	Lagoon / Not applicable	-
Pine Ridge Mobile Home Park S-49	-	-	-	-	-	Lagoon / Not applicable	-
Buchanan County Home S-50	-	-	-	-	-	Septic tanks	No correspondence since 1960
Pine Creek							
Winthrop STP M-129	750	840	.071/.080	44/ 26	7/ 4	Trickling filter / Sludge drying beds to land	-
Winthrop WTP S-51	-	-	-	-	-	To City STP	Discharge= 2,000 gallons every other day

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent Flow (mgd) Average/Design	Effluent BOD5 (mg/l)(lb/day)	Effluent Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Bauer Mink Farm, Winthrop I-86	-	-	-	-	-	2 septic tanks in series / Unknown	Estimated water use = 900 gpd
Wapsipinicon River							
Quasqueton M-130	464	500	.014/.038	44/ 5	-	2 cell lagoon / Not applicable	5 acres
Troy Mills M-131	250	300	.014/.040	-	-	Imhoff tank / Sludge lagoon	-
Sand Creek							
Rowley M-167	241	396	.015/.03	66/8.3	25/3.1	1 cell lagoon	-
Cono Center Bible Presbyterian Church, Walker S-52	65	-	-	-	-	1 cell lagoon / Not applicable	1.41 acres; no discharge
Wapsipinicon River							
Central City M-132	1,116	10,320	.045/.187	36/ 14	2/ 1	Primary / Sludge drying beds to land	-
Buffalo Creek West Branch							
Stanley M-133	151	-	-	-	-	None	STP proposed
Buffalo Creek							
Aurora M-134	229	-	-	-	-	None	Planning construction of STP in 1975
Buffalo Creek							
Coggon M-135	656	8,900	.044/.144	41/ 15	3/ 1	2 stage trickling filter / Digester; sludge drying beds to land	-
Prairieburg M-136	182	-	-	-	-	None	-

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Alpha Crushed Stone, Inc., (Plower Quarry, Linn County I-87	-	-	-	-	-	None	Quarry water
Wapsipinicon River							
Wendy Oaks Motel (Linn County) S-53	-	-	-	-	-	Lagoon / Not applicable	0.25 acres
Anamosa M-137	4,389	10,850	.534/1.000	25/111	9/ 40	Trickling filter / 2 digesters; sludge drying beds	
Fairview Terrace Mobile Park, Anamosa S-54	-	-	-	-	-	Unknown	20 spaces in park
Fawn Creek Mobile Home Court, Anamosa S-55	-	132	-	-	-	Activated sludge with polishing lagoon / Unknown	56 spaces in park
Iowa Electric Light & Power, Anamosa I-88	-	-	- /.216	-	-	None	Diesel engine cooling water
Walnut Creek							
Morley M-138	123	-	-	-	-	None	
Pioneer Creek							
Mechanicsville M-139	989	1,100	.112/.080	32/ 30	11/ 10	Trickling filter / Sludge drying beds to land	-
RLDS Church Camp, Mechanicsville S-56	-	-	-	-	-	1 cell lagoon / Not applicable	Located in Pioneer TWP; Sec. 27 & 28

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)/(lb/day)	Effluent: Ammonia-N (mg/l)/(lb/day)	Treatment Type / Sludge Disposal	Comments
Walnut Creek							
Olin M-140	710	910	.089/.091	28/ 21	3/ 2	2 cell lagoon / Not applicable	9.75 acres
Alpha Crushed Stone Inc., (Olin Quarry) I-89	-	-	- /.500	-	-	Dewatering pit for log washing	
Wapsipinicon River							
Mill Creek							
Clarence M-141	915	1,330	.070/.140	41/ 24	5/ 3	Trickling filter / Sludge drying beds; final disposal unknown	-
Wapsipinicon River							
Oxford Junction M-142	666	880	.025/.100	31/ 7	4/ 1	2 cell lagoon / Not applicable	7.9 acres
Toronto M-143	145	-	-	-	-	None	-
Drainage Ditch #11							
Lost Nation M-144	547	800	.021/ -	42/ 7	1/ 0	2 cell lagoon / Not applicable	8.0 acres
Yankee Run Creek							
Lowden M-145	667	800	.018/.072	38/ 6	9/ 2	Trickling filter / Sludge drying beds to land	-
Frank's Texaco, Lowden I-90	-	-	-	-	-	To Lowden STP	-
Wendling Quarries Inc., (Lowden Quarry) I-91	-	-	-	-	-	None	Quarry dewatering
Wheatland M-146	832	882	.066/.068	25/ 14	8/ 4	Activated sludge with polishing lagoon / Unknown	Extended aeration

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l) (lb/day)	Effluent: Ammonia-N (mg/l) (lb/day)	Treatment Type / Sludge Disposal	Comments
Calamus Creek							
Calamus M-147	396	530	.020/.023	41/ 7	1/ 0	2 cell lagoon / Not applicable	4.7 acres
Walnut Creek							
New Liberty M-148	141	-	-	-	-	None	-
Dixon M-149	276	450	.020/ -	44/ 7	4/ 1	2 cell lagoon / Not applicable	3.5 acres
Camp Conestoga, (Girl Scout Camp) S-57	200	275	- /.002	-	-	Lagoon / Not applicable	-
Wapsipinicon River							
Mud Creek							
Plain View M-150	23	-	-	-	-	None	-
Hickory Creek							
Eldridge STP M-151	1,535	1,690	.336/.180	28/ 74	2/ 6	2 cell lagoon / Not applicable	14.3 acres
Eldridge WTP S-58	-	-	-	-	-	To City STP	-
County Estates Mobile Home Community, Eldridge S-59	250	250	-	-	-	1 cell lagoon / Not applicable	1.5 acres
Maysville M-152	170	-	-	-	-	None	-
Mud Creek							
East Branch							
Donahue M-153	216	375	.018/ -	25/ 4	1/ 0	1 cell lagoon / Not applicable	2.77 acres
Mason Creek							
Long Grove M-154	269	309	.030/ -	27/ 7	3/ 1	1 cell lagoon / Not applicable	3.2 acres

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l) (lb/day)	Effluent: Ammonia-N (mg/l) (lb/day)	Treatment Type / Sludge Disposal	Comments
Barber Creek							
Grand Mound STP M-155	627	926	.042/ -	33/ 12	1/ 0	2 cell lagoon / Not applicable	8.02 acres
Grand Mound WTP S-60	-	-	-	-	-	Application for discharge to City STP	Well capacity= 0.065 mgd
Silver Creek							
Welton M-156	104	-	-	-	-	None	-
Dry Run							
DeWitt M-157	3,647	7,480	.466/.520	56/218	1/ 4	Trickling filter / 2-stage digester; Unknown	
Glynns Creek							
Parkview Sanitary District S-61	-	535	- /.053	-	-	Aerated 2 cell lagoon / Not applicable	2 acres; have proposed facility for 4,000 P.E.
Wapsipinicon River							
McCausland M-158	226	250	.035/.025	40/ 12	3/ 1	1 cell lagoon / Not applicable	2.23 acres
Lost Creek							
Hidden Valley Mobile Home Park S-62	360	-	- /.024	-	-	Aerated lagoon / Not applicable	Also have storm water retention basin
Mississippi River							
Princeton M-159	663	900	.039/ -	34/ 11	5/ 2	2 cell lagoon / Not applicable	8.0 acres
LeClaire M-160	2,520	5,000	.103/.200	123/106	3/ 3	Primary / 2 sludge drying beds	Sludge is buried

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
LeClaire Quarries I-92	-	-	- /.210	-	-	Settling ponds / Not applicable	-
Panorama Park M-161	219	-	-	-	-	None	-
Bettendorf M-162	22,315	-	-	-	-	To Davenport STP	-
Lunex Company, Pleasant Valley I-93	30	-	-	-	-	2'x5' open trench, 300' lined with limerock, remainder earthen	Process water-.032 mgd; septic tank receives, .003 mgd sanitary wastes.
Crow Creek Valley Trailer Court, Bettendorf S-63	170	170	-	-	-	1 cell aerated / Not applicable	-
Caterpillar Tractor Co., Bettendorf I-94	-	-	-	-	-	Aerobic digester, polishing pond / Unknown	Discharge to City STP
Coach Estates Mobile Home Park, Bettendorf S-64	-	-	-	-	-	Activated sludge with polishing pond / Unknown	Extended aeration; 75 spaces in park
Pleasant Valley High School, Pleasant Valley S-65	600	1,200	-	-	-	Activated sludge with polishing pond / Unknown	-
Iowa Highway Commission Recreation Area, Davenport S-66	-	-	- /.003	-	-	Lagoon / Not applicable	-

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type Sludge Disposal	Comments
Mississippi River							
American Oil Co., Bettendorf I-95	-	-	-	-	-	Sanitary wastes to Bettendorf STP as of 3-31-74	No treatment for stormwater
Texaco, Inc., Bettendorf I-96	-	-	-	-	-	None	Stormwater
Iowa-Illinois Gas & Electric, Riverdale I-97 21 discharges; .001 to .021	-	-	001=.003	-	-	None	Boiler blowdown & cooling water
	-	-	002=.001	-	-	None	Boiler blowdown
	-	-	003=.004	-	-	None	Evaporator blow-down
	-	-	004=.640	-	-	None	Ash lagoon dis-charge
	-	-	005=.001	-	-	None	Boiler blowdown
	-	-	006= n/a	-	-	None	Intake strainer backwash water
	-	-	007=.068	-	-	None	Nos. 5 & 6 sump discharge
	-	-	008=.033	-	-	None	Nos. 5A & 6B sump discharge
	-	-	009=1.44	-	-	None	Boiler cooling water
	-	-	010=1.44	-	-	None	Yard drainage
	-	-	011=1.44	-	-	None	Boiler cooling water

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l) (lb/day)	Effluent: Ammonia-N (mg/l) (lb/day)	Treatment Type Sludge Disposal	Comments
Iowa-Illinois Gas & Electric, Riverdale I-97 (continued)	-	-	012=.194	-	-	None	Ash room sump discharge
	-	-	013=95.0	-	-	None	Condensor cooling water from #5 turbine
	-	-	014=11.5	-	-	None	Condensor cooling water from #3 turbine
	-	-	015=59.0	-	-	None	Condensor cooling water from #4 turbine
	-	-	016=.004	-	-	None	Coal filter backwash water
	-	-	017=.072	-	-	None	Overflow from ash hopper on #9 boiler
	-	-	018=127	-	-	None	Cooling water from turbine
	-	-	019=.011	-	-	None	Demineralizer backwash water
	-	-	020=.001	-	-	None	Zeolite softener backwash water
	-	-	021=.014	-	-	None	Boiler room drain
Aluminum Co. of America, Riverdale I-98	-	-	001=1.77	-	-	None	Cooling water
	-	-	002=1.14	-	-	None	Ccoling water

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD5 (mg/l) (lb/day)	Effluent: Ammonia-N (mg/l) (lb/day)	Treatment Type / Sludge Disposal	Comments
Aluminum Co. of America, Riverdale I-98 (continued)	-	-	003=5.86	-	-	None	Cooling water
	-	-	004=2.08	-	-	None	Cooling water
	-	-	005=.142	-	-	None	Cooling water
	-	-	006=14.1	-	-	None	Cooling water
Davenport Water Co. S-67	98,469	-	001=.45	-	-	001-no treatment	001-filter back-wash
		-	002=.11	-	-	002-settling pond	002-sludge holding basin
<u>Duck Creek</u> John Deere & Co., Davenport I-99	-	-	- /.250	-	-	Process wastes to municipal STP	13 acre lagoon for cooling water and storm water; flow is cooling water
Hawkeye Land Ltd., Bettendorf I-100	-	-	- /.011	-	-	2 cell lagoon / Not applicable	2.5 acres
Lakewood Mobile Home Park, Davenport S-68	-	665	/.033	-	-	Aerated lagoon with polishing lagoon / Unknown	2.0 acres
<u>Silver Creek</u> Safari Campground, Davenport S-69	-	235	-	-	-	1 cell aerated lagoon / Not applicable	0.26 acres

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Goose Creek							
Davenport Ridgeview Drive (North Division) I-101	-	-	- /.600	-	-	Trickling filter / Sludge drying beds	-
Mississippi River							
Davenport M-163	98,469	325,000	17.116/19.0	215/30,690	21/2998	Primary until 10/76 / Anaerobic digesters & 2 sludge lagoons	Sludge lagoons subject to flooding
Kelsey Hayes Co., Davenport I-102	250	-	- /.023	-	-	None	Cooling water
Mathias Mobile Home Park, Davenport S-70	-	294	-/.005	-	-	Aerated lagoon / Not applicable	-
Trailer Village, Davenport S-71	-	100	-	-	-	To Davenport STP	-
Chicago, Milwaukee, St. Paul Pacific RR, Davenport I-103	-	-	- /.022	-	-	None for process waters	Septic tanks for roundhouse sanitary wastes
Black Hawk Jr. High School, Davenport S-72	-	800	-	-	-	2 cell lagoon / Not applicable	6 acres
Pleasant View Elementary School, Davenport S-73	500	-	-	-	-	Imhoff tank / Sludge drying bed	-

TABLE V- 4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l) (lb/day)	Effluent: Ammonia-N (mg/l) (lb/day)	Treatment Type / Sludge Disposal	Comments
American Oil Co., Davenport I-104	-	-	-	-	-	Holding pond for storm run-off	
Commonwealth Edison Co, Davenport I-105	-	-	-/725	-	-	None	Cooling water; must be out of river by 11/75
Occidental Chemical Co., Davenport I-106	-	-	-	-	-	None	Cooling water
U.S. Lock & Dam #14, Davenport S-74	-	-	-	-	-	None	Sanitary wastes only
Cedar River							
KOA Campground, Davenport S-75	-	170	-/.008	-	-	Lagoon / Not applicable	.18 acres
Mississippi River							
Scott County Swimming Pool, Davenport S-76	-	-	-	-	-	Lagoon / Not applicable	-
Executive Mobile Home Court, Davenport S-77	-	-	-	-	-	None	68 spaces in park; proposed STP in 1966
Lakeside Manor Mobile Home, Davenport S-78	209	-	-	-	-	3 cell lagoon / Not applicable	1.72 acres

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Iowa Hwy. Commission Rest Area, Davenport S-79	-	-	/.009	-	-	Lagoon / Not applicable	-
Sun Oil Co., Walcott I-107	-	-	-	-	-	Lagoon / Not applicable	No discharge
Riverview Manor Nursing Home, Pleasant Valley S-80	60	-	/.007	-	-	2 cell lagoon / Not applicable	
Royal Neighbors Home for the Aged, Davenport S-81	60	-	-	-	-	To Davenport STP	
MacMillian Oil Co., Davenport I-108	-	-	-	-	-	Enclosed dike	No direct discharge
Nursing Care, Ltd., Davenport S-82	50	-	/.010	-	-	2 cell lagoon / Not applicable	
Black Hawk Creek							
Blackhawk Foundry and Machine, Davenport I-109	-	-	-	-	-	None	Cooling water
Mason Company, Davenport I-110	-	-	-	-	-	-	No discharge
Scott County, I-280 Lake Park, Davenport S-83	-	400	-	-	-	Activated sludge with polishing lagoon / Unknown	
Mississippi River							
Buffalo M-164	1,513	-	.137/.100	106/121	20/ 23	Primary / Sludge drying beds to land fill	-

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Unnamed Tributary Blue Grass M-165	1,032	-	.097/.200	33/ 27	6/ 5	3 cell lagoon, 1st cell aerated Not applicable	7.5 acres
Thompson Creek Linwood Stone Products, Buffalo I-111	-	-	001=.960	-	-	Settling ponds Not applicable	Lime discharge
	-	-	002=.480	-	-	None	Surface quarry water
	-	-	003=.020	-	-	Settling pond Not applicable	Quarry water
Mississippi River Martin Marietta Cement, Buffalo I-112	-	-	-	-	-	None	Located West of Dewey Cement Co
Dewey Cement Co., Buffalo I-113	225	-	-	-	-	Septic tank Unknown	-
Unnamed Tributary Nickerson Farms, Stockton S-84	-	-	-	-	-	Lagoon Not applicable	
Mississippi River Muscatine M-166	22,405	-	5.76/13.0	174/8359	13/624	Primary To landfill	Secondary Treatment proposed
Bandag, Inc., Muscatine I-114	-	-	002=.511	-	-	None	Cooling water
	-	-	004=.040	-	-	None	Cooling water

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l)(lb/day)	Effluent: Ammonia-N (mg/l)(lb/day)	Treatment Type Sludge Disposal	Comments
	-	-	005=.0005	-	-	None	Cooling water
	-	-	006=.014	-	-	None	Sanitary wastes
	-	-	007=.008	-	-	None	Sanitary wastes
	-	-	008=.001	-	-	None	Cooling water
Grain Processing Corp., Muscatine I-115	-	-	001=1.06	184/1627	-	None	Process water from corn sweetener production unit
	-	-	002=6.10	95/4833	-	None	Process water from ethyl alcohol production and feed recovery units
	-	-	003=4.29	6/215	-	None	Process water from ethyl alcohol production units
	-	-	004=1.95	129/2098	-	None	Process water from corn steeping and starch refining units
	-	-	005=3.74	1861/58,048	-	None	Various process wastes from entire plant

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent Flow (mgd) Average/Design	Effluent BOD_5 (mg/l)(lb/day)	Effluent Ammonia-N (mg/l)(lb/day)	Treatment Type / Sludge Disposal	Comments
Mad Creek							
Heinz, USA, Muscatine I-116	-	-	001=.800	-	-	Industrial wastes to Muscatine STP	Cooling water to City storm sewer
	-	-	002=.230	-	-	None	Cooling water from pet food canning operations to City storm sewer
Bethesda Foundation, Muscatine S-85	-	-	-	-	-	Septic tank / Unknown	Will connect to municipal sewer 7/75
Clearview Mobile Home Park, Muscatine S-86	-	-	-	-	-	Lagoon / Not applicable	266 spaces in park
Mississippi River							
Publicker Industries, Muscatine I-117	17	-	- /.086	-	-	Septic tank / Unknown	Discharge contains caustic soda, sodium sulfite & phosphates. Cooling water discharged to river.
Eastern Iowa Light & Power, Muscatine I-118	-	-	001=.053	-	-	None	Discharge from ash lagoon
	-	-	002= n/a	-	-	None	Drainage from coal storage area

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD_5 (mg/l) (lb/day)	Effluent: Ammonia-N (mg/l) (lb/day)	Treatment Type / Sludge Disposal	Comments
Eastern Iowa Light & Power, Muscatine I-118 (continued)	-	-	003=.004	-	-	Septic tank	Includes deionizer regenerant flow
	-	-	004=48.0	-	-	None	Discharge from main surface condensors (cooling water)
	-	-	005=.053	-	-	None	Discharge from ash lagoon
	-	-	006=.053	-	-	None	Discharge from ash lagoon
Hon Industries, Inc. Muscatine I-119	280	400	- /.015	-	-	Sanitary waste to septic tank process water & cooling water to lagoon	Both drain to ditch tributary to river
Monsanto Company Muscatine I-120	-	-	- /11.7	-	-	Activated sludge / Unknown	-
Thatcher Plastic Packaging, Muscatine I-121	-	-	-	-	-	No treatment for process waste & cooling water - Sanitary wastes to septic tank	Preliminary report submitted 1-75. Report not acceptable
North Haven Mobile Park Home, Muscatine S-87	320	-	-	-	-	1.8 acre lagoon / Not applicable	Future aerated cell (4 day detention) also available

TABLE V-4
DISCHARGE INVENTORY

Discharger (Ref. No.)	1970 Pop.	Design P.E.	Effluent: Flow (mgd) Average/Design	Effluent: BOD5 (mg/l) (lb/day)	Effluent: Ammonia-N (mg/l) (lb/day)	Treatment Type / Sludge Disposal	Comments
Mississippi River							
Ridley, Inc. I-122	-	-	- /.005	-	-	3 cell lagoon / Not applicable	-
Fairport National Fish Hatchery, Muscatine I-123	40	-	- /.002	-	-	Activated sludge / Unknown	Extended aeration
Muscatine County Home S-88	-	-	-	-	-	Imhoff tank / Unknown	-
Muscatine Power & Water Company I-124	-	-	001=64.0	-	-	None	Non-contact cooling water
	-	-	002=.100	-	-	None	Boiler blow-down & Demineralizer back-wash
	-	-	003=29.0	-	-	None	Non-contact cooling water
	-	-	004=.225	-	-	None	Boiler blowdown & Demineralizer regenerant
	-	-	005=12.0	-	-	None	Non-contact cooling water

TABLE V-5

POINT SOURCE WASTEWATER DISCHARGE SUMMARY

NORTHEASTERN IOWA BASIN

River Basin	Municipal	Semipublic	Industrial Process Water	Industrial Cooling Water
UPPER IOWA RIVER				
Flow (mgd)	1.278	.014	0.12	.095
% Total Flow	84.8	.9	8.0	6.3
BOD_5 (lbs/day)	904	*	*	-
% Total BOD_5	100	-	-	-
Ammonia-N (lbs/day)	237	*	*	-
% Total Ammonia-N	100	-	-	-
YELLOW RIVER PAINT CREEK				
Flow (mgd)	1.592	-	.683	.500
% Total Flow	57.4	-	24.6	18
BOD_5 (lbs/day)	421	-	*	-
% Total BOD_5	100	-		-
Ammonia-N	149	-	*	-
% Total Ammonia-N	100	-		-
TURKEY RIVER (INCL. VOLGA R.)				
Flow (mgd)	1.263	.044	6.995	.400
% Total Flow	14.5	.5	80.4	4.6
BOD_5	856	*	*	-
% Total BOD_5	100	-	-	-
Ammonia-N (lbs/day)	161	*	*	-
% Total Ammonia-N	100	-	-	-
MAQUOETA RIVER				
Flow (mgd)	3.398	.022	1.174	.057
% Total Flow	73.1	.5	25.2	1.2
BOD_5 (lbs/day)	2,478	*	*	-
% Total BOD_5	100	-	-	-
Ammonia-N (lbs/day)	572	*	*	-
% Total Ammonia-N	100	-	-	-

TABLE V-5 (CONTINUED)

River Basin	Municipal	Semipublic	Industrial Process Water	Industrial Cooling Water
WAPSIPINICON RIVER				
Flow (mgd)	6.200	.344	2.31	.249
% Total Flow	68.1	3.8	25.4	2.7
BOD_5 (lbs/day)	1,899	*	*	-
% Total BOD_5	100	-	-	-
Ammonia-N (lbs/day)	389	*	*	-
% Total Ammonia-N	100	-	-	-
MISSISSIPPI RIVER				
Flow (mgd)	42.539	.317	102.499	1,413.5
% Total Flow	2.7	.02	6.6	90.7
BOD_5 (lbs/day)	84,711	*	*	-
% Total BOD_5	100	-	-	-
Ammonia-N (lbs/day)	9,057	*	*	-
% Total Ammonia-N	100	-	-	-

* No Data
** Includes: Miners Creek; Little Maquoketa; Catfish Creek; Tete Des Mortes Creek; Elk Creek; Rock Creek

TABLE V-6

MUNICIPAL WASTEWATER TREATMENT FACILITY
PROCESS SUMMARY

NORTHEASTERN IOWA BASIN

Type of Plant	No. Of Communities	Population Served
UPPER IOWA RIVER		
One Cell Lagoon	1	218
Two Cell Lagoon	1	60
Three Cell Lagoon	1	185
Trickling Filter	2	7,955
Activated Sludge	1	3,927
TOTAL	6	12,345
No Treatment Facilities	0	0
YELLOW RIVER AND PAINT CREEK		
Two Cell Lagoon	1	225
Trickling Filter	2	5,429
TOTAL	3	5,654
No Treatment Facilities	1	158
TURKEY RIVER (Includes Volga R.)		
One Cell Lagoon	1	1,592
Two Cell Lagoon	6	3,003
Three Cell Lagoon	1	140
Trickling Filter	11	11,464
Activated Sludge	2	702
Septic Tanks	1	106
TOTAL	22	17,007
No Treatment Facilities	12	1,916

TABLE V-6 (cont.)

Type of Plant	No. of Communities	Population Served
MAQUOKETA RIVER		
One Cell Lagoon	4	4,310
Two Cell Lagoon	9	4,897
Three Cell Lagoon	1	323
Trickling Filter	7	12,512
Activated Sludge	2	477
Bio-Disc	1	800
Primary	1	5,677
Septic Tanks	14	2,683
TOTAL	39	31,679
No Treatment Facilities	1	166
WAPSIPINICON RIVER		
One Cell Lagoon	5	1,321
Two Cell Lagoon	13	9,006
Trickling Filter	12	24,913
Activated Sludge	4	9,784
Primary	2	1,366
TOTAL	36	46,390
No Treatment Facilities	12	1,928
MISSISSIPPI RIVER*		
One Cell Lagoon	5	1,127
Two Cell Lagoon	3	1,923
Three Cell Lagoon	1	209
Trickling Filter	1	2,336
Activated Sludge	4	67,316
Primary	9	185,953
TOTAL	23	258,864
No Treatment Facilities	13	2,270

* Includes: Miners Creek; Little Maquoketa R.; Catfish Creek; Tete Des Mortes Creek; Elk River; Rock Creek

TABLE V-7

MUNICIPAL WASTEWATER TREATMENT FACILITY
PROCESS SUMMARY

NORTHEASTERN IOWA BASIN

Type of Plant	Communities Served	Population
One Cell Lagoon	16	8,568
Two Cell Lagoon	33	19,114
Three Cell Lagoon	4	857
Trickling Filter	35	64,609
Activated Sludge	13	82,206
Bio-Disc	1	800
Primary	12	192,996
TOTAL	114	369,150
No Treatment Facilities	57	9,916

CHAPTER VI

WASTE LOAD ALLOCATIONS AND RANKING

NORTHEASTERN IOWA BASIN

WASTE LOAD ALLOCATIONS

Using a computer methodology, effluent limitations required for dischargers to meet state water quality standards within the basin were determined. Waste load allocation analyses were performed assuming projected 1990 wastewater discharges at the 7-day, 1-in-10 year low flow under both summer and winter conditions. Analysis was performed on streams classified either A, B, or C with existing wastewater discharges. Some considerations that went into the analysis are discussed below. A detailed description of the computer methodology and the assumption used can be found in the Supporting Document (1). The waste load allocations are listed in Table VI-1. The effluent limitation for all dischargers in the Northeastern Iowa Basin not appearing in Table VI-1 is either secondary treatment or BPT.

Considerations

Four basic considerations go into the selection of the specific effluent limitation for any given discharge. These involve secondary treatment, best practicable control technology currently available (BPT), applicable standards, and antidegradation.

TABLE VI-1

WASTE LOAD ALLOCATIONS

NORTHEASTERN IOWA BASIN

Discharger (Ref. No.)	Stream Flow (mgd)	1990 Discharge (mgd)	Summer BOD_5 (mg/l)	Summer BOD_5 (lbs/day)	Summer NH_3 (mg/l)	Summer NH_3 (lbs/day)	Winter BOD_5 (mg/l)	Winter BOD_5 (lbs/day)	Winter NH_3 (mg/l)	Winter NH_3 (lbs/day)
Upper Iowa River										
Mouth to Decorah										
Decorah (M-5)	17.5	1.59	30	398	15	199	30	398	15	199
Decorah to Source										
Ridgeway (M-4)	--	0		Controlled Discharge						
Cresco (M-3)	0/3.3*	.380	10/30	32/95	2/15	6/48	10/30	32/95	2/15	6/48
Lime Springs (M-2)	0	.096	30	24	15	12	30	24	15	12
Chester (M-1)	--	0		Controlled Discharge						
Yellow River										
Entire Length										
Luana (M-12)	--	0		Controlled Discharge						
Mississippi Valley Milk Producers, Luana (I-13)	2.10	.180	15	24	N/A	N/A	15	24	N/A	N/A
Postville (M-11)	.380	.258	30	65	15	32	30	65	15	32
Paint Creek										
Entire Length										
Waukon (M-9)	.706	.900	11	80	4	27	11	80	4	27
Turkey River										
Mouth to Elkport										
Millville (M-51)		N E M T P								
Colesburg NW (M-50)	--	0		Controlled Discharge						
Colesburg SE (M-49)	--	0		Controlled Discharge						
Osterdock (M-48)		N E M T P								
Garnavillo (M-47)	0/.544*	.063	10/30	5/16	2/15	1/8	10/30	5/16	2/15	1/8
Garber (M-46)		N E M T P								
Elkport to Confluence With Little Turkey River										
St. Olaf (M-33)		N E M T P								
Farmersburg (M-32)	--	0		Controlled Discharge						
Monona (M-31)	0/1.8*	.209	10/30	17/52	2/15	4/26	10/30	17/52	2/15	4/26
Elkader (M-30)	16.2	.240	30	60	15	30	30	60	15	30
Elgin (M-29)	22.7	.058	30	15	15	7	30	15	15	7
West Union (M-28)	0	.353	10	29	2	6	10	29	2	6
Clermont (M-27)	20.7	.065	30	16	15	8	30	16	15	8
Castalia (M-26)	--	0		Controlled Discharge						
Ossian (M-25)	0/.661*	.076	10/30	6/19	2/15	1/10	10/30	6/19	2/15	1/10

TABLE VI-1

WASTE LOAD ALLOCATIONS

NORTHEASTERN IOWA BASIN

Discharger (Ref. No.)	Stream Flow	1990 Discharge	Summer				Winter			
			BOD_5		NH_3		BOD_5		NH_3	
	(mgd)	(mgd)	(mg/l)	(lbs/day)	(mg/l)	(lbs/day)	(mg/l)	(lbs/day)	(mg/l)	(lbs/day)
Confluence of Little Turkey River to Source										
St. Lucas (M-21)	--	0		Controlled		Discharge				
Fort Atkinson (M-20)	--	0		Controlled		Discharge				
Calmar (M-19)	6.74	.283	30	70	15	35	30	70	15	35
Spillville (M-18)	--	0		Controlled		Discharge				
Protivin (M-17)	--	0		Controlled		Discharge				
Volga River Entire Length										
Elkport (M-45)		N E M T P								
Edgewood (M-44)	0/.842*	.097	10/30	8/24	2/15	2/12	10/30	8/24	2/15	2/12
Littleport (M-43		N E M T P								
Strawberry Pt. N. (M-42)	--	0		Controlled		Discharge				
Volga (M-41)	--	0		Controlled		Discharge				
Arlington (M-40)	.201/.531*	.061	19/30	10/15	4/15	2/8	19/30	10/15	4/15	2/8
Wadena (M-39)	--	0		Controlled		Discharge				
Fayette (M-38)	3.40/3.86*	.371	30/30	93/93	11/15	34/46	30/30	93/93	11/15	34/46
Donnan (M-37)		N E M T P								
Randalia (M-36)		N E M T P								
Maynard (M-35)	.596	.056	30	14	15	7	30	14	15	7
Hawkeye (M-34)	0/.512*	.059	10/30	5/15	2/15	1/7	10/30	5/15	2/15	1/7
Maquoketa River Mouth to Maquoketa										
Green Island (M-104)		N E M T P								
Spragueville (M-103	112.5	.013	30	3.2	10	1.1	30	3.2	15	1.5
Preston (M-102)	--	0		Controlled		Discharge				
Delmar (M-101)	--	0		Controlled		Discharge				
Goose Lake (M-100)	--	0		Controlled		Discharge				
Charlotte (M-99)	--	0		Controlled		Discharge				
Springbrook (M-98)	--	0		Controlled		Discharge				
Maquoketa (M-97)	89.3	.926	20	154	10	77	20	154	15	16

TABLE VI-1

WASTE LOAD ALLOCATIONS

NORTHEASTERN IOWA BASIN

Discharger (Ref. No.)	Stream Flow (mgd)	1990 Discharge (mgd)	Summer BOD$_5$ (mg/l)	Summer BOD$_5$ (lbs/day)	Summer NH$_3$ (mg/l)	Summer NH$_3$ (lbs/day)	Winter BOD$_5$ (mg/l)	Winter BOD$_5$ (lbs/day)	Winter NH$_3$ (mg/l)	Winter NH$_3$ (lbs/day)
Maquoketa River										
Maquoketa to Hopkinton										
Hurstville (M-96)		N E M T P								
Baldwin (M-84)	--	0		Controlled		Discharge				
Monmouth (M-83)	--	0		Controlled		Discharge				
Wyoming (M-82)	--	0		Controlled		Discharge				
Onslow (M-81)	--	0		Controlled		Discharge				
Center Junction (M-80)	--	0		Controlled		Discharge				
Monticello (M-79)	28.4	.656	30	164	10	55	30	164	15	82
Hopkinton (M-78)	22.3	.225	30	56	10	19	30	56	15	28
Hopkinton to Manchester										
Ryan (M-77)	20.9	.207	10	17	4	7	10	17	4	7
Delaware (M-76)		N E M T P								
Earlville (M-75)	17.9	.067	30	17	10	6	30	17	15	8
Oneida (M-74)	--	0		Controlled		Discharge				
Greeley (M-73)	--	0		Controlled		Discharge				
Delhi (M-72)	--	0		Controlled		Discharge				
Manchester (M-71)	13.6	1.00	30	250	10	83	30	250	15	125
Manchester to Source										
Masonville (M-70)		N E M T P								
Dundee (M-69)	--	0		Controlled		Discharge				
Lamont (M-68)	--	0		Controlled		Discharge				
Strawberry Pt. S. (M-67)	--	0		Controlled		Discharge				
Associated Milk Prod. Inc., Arlington (I-42)	.39									

TABLE VI-1

WASTE LOAD ALLOCATIONS

NORTHEASTERN IOWA BASIN

Discharger (Ref. No.)	Stream Flow (mgd)	1990 Discharge (mgd)	Summer BOD_5 (mg/l)	Summer BOD_5 (lbs/day)	Summer NH_3 (mg/l)	Summer NH_3 (lbs/day)	Winter BOD_5 (mg/l)	Winter BOD_5 (lbs/day)	Winter NH_3 (mg/l)	Winter NH_3 (lbs/day)
North Fork Maquoketa River										
Entire Length										
Andrew (M-95	--	0		Controlled		Discharge				
La Motte (M-94)	--	0		Controlled		Discharge				
Zwingle (M-93)		N E M T P								
Bernard (M-92)	--	0		Controlled		Discharge				
Epworth (M-91)	21.3	.239	30	60	10	20	30	60	15	30
Cascade (M-90)	17.4	.225	30	56	10	19	30	56	15	28
Worthington (M-89)	8.05	.055	30	14	10	5	30	14	15	7
Dyersville (M-88)	--	0		Controlled		Discharge				
New Vienna (M-87)	1.48	.045	30	11	10	4	30	11	15	6
Luxemburg (M-86)	--	0		Controlled		Discharge				
Holy Cross (M-85)	--	0		Controlled		Discharge				
Wapsipinicon River										
Mouth to Confluence with Dry Creek										
McCausland (M-158)	--	0		Controlled		Discharge				
DeWitt (M-157)	66.8	.673	30	168	10	56	30	168	15	84
Welton (M-156)		N E M T P								
Grand Mound (M-155)	--	0		Controlled		Discharge				
Long Grove (M-154)	--	0		Controlled		Discharge				
Donahue (M-153)	--	0		Controlled		Discharge				
Maysville (M-152)	--	0		Controlled		Discharge				
Eldridge (M-151)	--	0		Controlled		Discharge				
Plain View (M-150)		N E M T P								
Dixon (M-149)	--	0		Controlled		Discharge				
New Liberty (M-148)	--	0		Controlled		Discharge				
Calamus (M-147)	--	0		Controlled		Discharge				
Wheatland (M-146)	55.5	.076	30	19	10	6	30	19	15	13
Lowden (M-145)	55.5	.019	30	5	10	2	30	5	15	2
Lost Nation (M-144)	--	0		Controlled		Discharge				
Toronto (M-143)		N E M T P								
Oxford Junction (M-142)	46.1	0		Controlled		Discharge				
Clarence (M-141)	46.2	.073	30	18	10	6	30	18	15	9
Olin (M-140)	--	0		Controlled		Discharge				

TABLE VI-1

WASTE LOAD ALLOCATIONS

NORTHEASTERN IOWA BASIN

Discharger (Ref. No.)	Stream Flow (mgd)	1990 Discharge (mgd)	Summer BOD5 (mg/l)	Summer BOD5 (lbs/day)	Summer NH3 (mg/l)	Summer NH3 (lbs/day)	Winter BOD5 (mg/l)	Winter BOD5 (lbs/day)	Winter NH3 (mg/l)	Winter NH3 (lbs/day)
Wapsipinicon River										
Mouth to Confluence with Dry Creek (cont.)										
Mechanicsville (M-139	41.1	.119	30	30	10	10	30	30	15	15
Morley (M-138)		N E M T P								
Anamosa (M-137)	34.2	.534	30	134	10	45	30	134	15	67
Central City (M-132)	23.3	.045	30	11	10	4	30	11	15	6
Troy Mills (M-131)	19.1	.022	30	6	10	2	30	6	15	3
Grand Vu Ac. MHP, (S-45)	34.2	.012	30	3	10	1	30	3	15	2
Dry Creek to Confluence with L. Wapsipinicon R.										
Rowley M-167	--	0		Controlled Discharge						
Quasqueton (M-130)	--	0		Controlled Discharge						
Winthrop (M-129)	1.10	.080	30	20	10	7	30	20	15	10
Independence (M-128)	11.6	2.08	30	520	10	173	30	520	6	104
Mental Health Inst., Independence (S-47)	11.6	.158	30	40	10	13	30	40	15	20
Hazelton (M-127)	3.74	.056	30	14	10	5	30	14	15	7
Oelwein (M-126)	2.66	1.95	20	325	10	163	20	325	10	163
Fairbank (M-125)	--	0		Controlled Discharge						
Westbank (M-124)	--	0		Controlled Discharge						
Sumner (M-123)	1.06	.230	30	58	10	19	30	58	9	17
Dunkerton (M-122)	--	0		Controlled Discharge						
Readlyn (M-121)		.082	10	7	2	1	10	7	2	1
Fredericksburg (M-120)	1.14	.425					10	35	5	17
Meinerz Creamery, Fredericksburg (I-79)	1.14	.547					7	29	2	9
Tripoli (M-119)	--	0		Controlled Discharge						
Fawn Creek MHP, Tripoli (S-55)	4.50	.013	30	3	10	1	30	3	15	2
Frederika (M-118)	--	0		Controlled Discharge						

TABLE VI-1

WASTE LOAD ALLOCATIONS

NORTHEASTERN IOWA BASIN

Discharger (Ref. No.)	Stream Flow (mgd)	1990 Discharge (mgd)	Summer BOD$_5$ (mg/l)	Summer BOD$_5$ (lbs/day)	Summer NH$_3$ (mg/l)	Summer NH$_3$ (lbs/day)	Winter BOD$_5$ (mg/l)	Winter BOD$_5$ (lbs/day)	Winter NH$_3$ (mg/l)	Winter NH$_3$ (lbs/day)
Confluence with L. Wapsipinicon R. and Above										
New Hampton (M-117)	1.63	.974	30	244	3	24	30	244	2	16
North Washington (M-116)	N E M T P									
Alta Vista (M-115)	.652	.019	30	5	10	2	30	5	15	2
Elma (M-114)	.633	.068	30	17	10	6	30	17	15	9
Ionia (M-113)	--	0		Controlled		Discharge				
Riceville (M-112)	--	0		Controlled		Discharge				
McIntire (M-111)	--	0		Controlled		Discharge				
Buffalo Creek Entire Length										
Prairieburg (M-136)	--	0		Controlled		Discharge				
Coggon (M-135)	2.29	.068	30	17	10	6	30	17	15	9
Aurora (M-134)	--	0		Controlled		Discharge				
Stanley (M-133)	--	0		Controlled		Discharge				
Elk River Entire Length										
Andover (M-107)	1.15	.006	30	1.5	10	.5	30	1.5	15	.75
Miles (M-106)	.194	.053	20	10	7	3	20	10	7	3

LEGEND

"N/A" Not applicable

"NEMTP" No existing municipal treatment plant

"*" Flow at which secondary treatment would satisfy stream standards "protected flow"

Secondary Treatment - The Act requires that all publicly owned treatment works shall, by July 1, 1977, achieve, as a minimum, secondary treatment. No municipal discharge is, therefore, allowed an effluent limitation less stringent than secondary treatment. Secondary treatment has been defined by EPA and DEQ as having the following concentrations in the effluent: 30 mg/l BOD_5, 30 mg/l suspended solids; or not less than 85% removal of BOD_5 and suspended solids; and 200 most probable number/100 ml fecal coliforms.

BPT - The Act requires that all point sources other than publicly owned treatment works shall, by July 1, 1977, achieve as a minimum, "best practicable control technology currently available" (BPT). No industrial discharge is, therefore, allowed an effluent limitation less stringent than secondary treatment. BPT for various industrial processes is defined by the EPA in their industrial development documents.

Applicable Standards - The ultimate reason for requiring any effluent limitation is the protection of water quality. The Iowa Water Quality Standards are designed to insure a reasonable degree of protection. All discharges are, therefore, required to meet effluent limitations stringent enough to assure that water quality standards will be met. If secondary treatment or BPT is not sufficient to meet the applicable water quality standards, a higher level of treatment is required.

Antidegradation - A policy on antidegradation has been adopted by DEQ to assure that in those places where water quality significantly exceeds that of the standards, this condition shall be maintained. New dischargers located in areas of high quality water may, therefore, be required to meet effluent limitations more stringent than secondary treatment or BPT, even though a lesser degree of treatment might be sufficient to meet water quality standards.

Evaluation Assumptions

In order to define waste load allocations for dischargers within the study area, specific assumptions are required. Identification of the major items required to evaluate and determine waste load allocations are identified in the following list:

1. The major objective of the present investigation is to satisfy Iowa Water Quality Standards with future effluent discharges. Determination of allowable effluent concentrations was based upon varying the effluent quality from point source discharges until the model maintained dissolved oxygen concentrations above 5.0 mg/l and ammonia nitrogen concentrations below 2.0 mg/l in all water quality classified sections of the stream. Because NPDES permits are requiring discharges from stabilization ponds to utilize controlled discharge of the effluent, no discharge from stabilization pond treatment facilities to the stream

was assumed for the low flow conditions.

2. Definition of 7-day, 1-in-10 year low flow was required for each stream modeled.

3. Ultimate carbonaceous BOD was assumed to be 1.5 times the BOD_5.

4. Where no data are available describing effluent dissolved oxygen concentrations or temperatures, the following values were assumed for each class of wastewater discharge.

Discharger	Summer Condition: Dissolved Oxygen (mg/l)	Summer Condition: Temperature (°C)	Summer Condition: Temperature (°F)	Winter Condition: Dissolved Oxygen (mg/l)	Winter Condition: Temperature (°C)	Winter Condition: Temperature (°F)
Trickling Filter	3.0	20	68	4.0	9	48
Activated Sludge	3.0	20	68	4.0	9	48
Industrial	Each Discharger Handled Individually					

5. In order to assess the reaeration rate constants under wintertime conditions, the amount of ice cover on the stream was estimated. Then the winter reaeration rate constant for each reach of the stream was determined by multiplying the predicted constant by the percentage of open water in the reach. Ice cover estimates were based upon general climatological conditions for the basin and upon personal observations of persons familiar with the area. Complete ice cover was assumed to be noncoincidental with the 7-day, 1-in-10 year low flow.

6. Deoxygenation rate coefficients were assumed to be

0.2/day for carbonaceous demand and 0.3/day for nitrogenous demand.

7. Best practicable waste treatment technology (BPT) effluent limitations described by EPA guidelines were utilized for industrial discharges when available. Otherwise, the actual allowable waste load which could be discharged into the stream was determined and identified as the waste load allocation for that discharger.

8. Tributaries (without wastewater sources) discharging to the streams being modeled were assumed to have saturated dissolved oxygen concentrations, an ultimate BOD of 6.0 and ammonia nitrogen concentrations of 0.0 mg/l in the summer and 0.5 mg/l in the winter.

Discussion of Results

The waste load allocations are based on a computer model that utilizes the best available information for the study area. Some of the input data provided are approximations, and model predictability can be considerably improved with more accurate information. Based upon available data, the model computes stream quality for the assigned wastewater discharges. For the initial run, all discharges were assumed to meet either secondary treatment (municipalities) or best practicable treatment (BPT) (industries). Where the model indicated violation of DEQ stream quality criteria, more stringent effluent requirements were imposed until satisfactory levels were achieved.

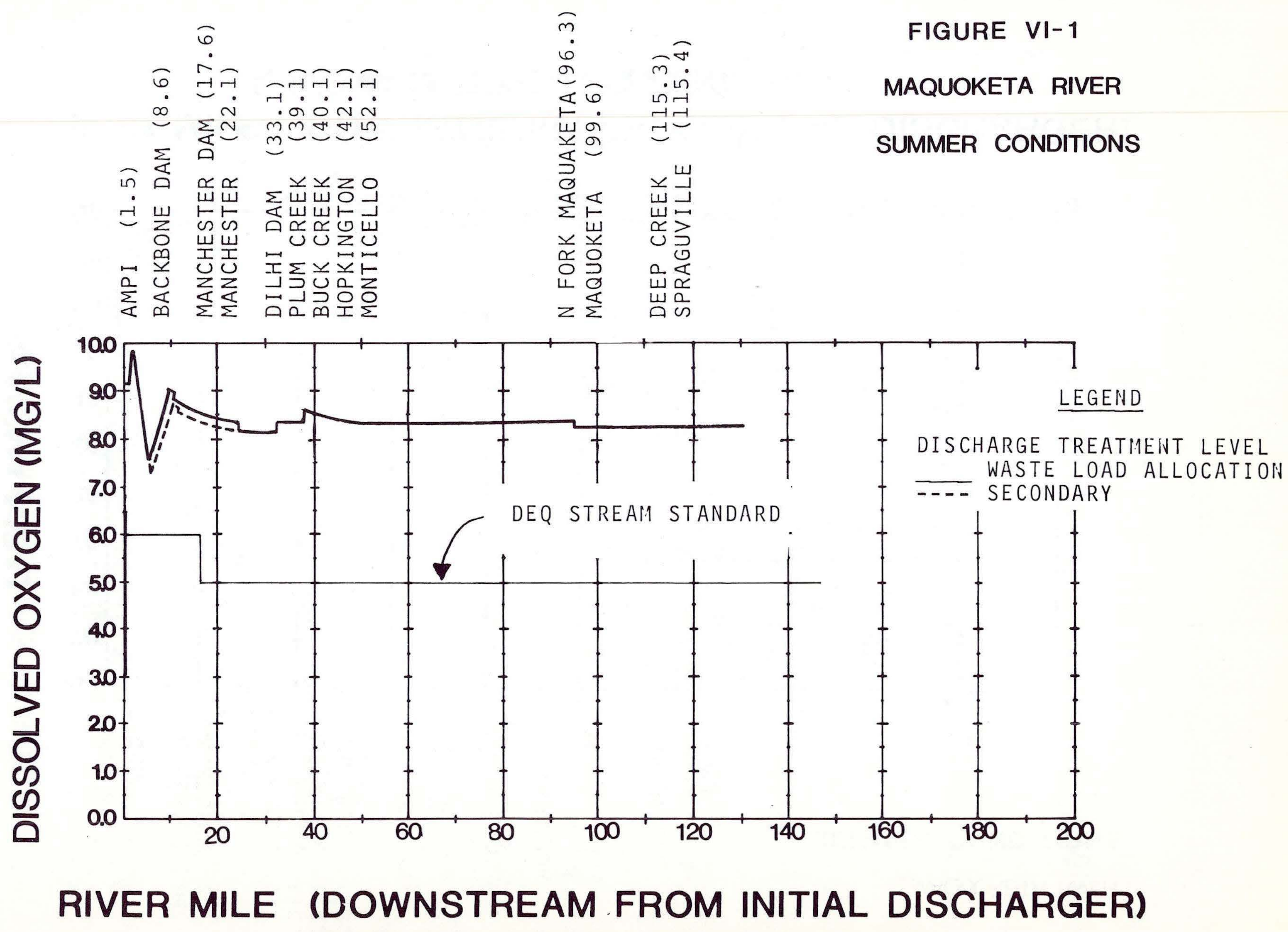
The DEQ has set the allowable ammonia nitrogen level for secondary treatment as 10 mg/l in summer. The allowable ammonia nitrogen concentration for secondary treatment has been set as 15 mg/l for winter conditions by the DEQ.

Maquoketa River Basin - The Maquoketa River is classified for its entire length. The river was modeled from Arlington to its mouth. The waste load allocations for the Maquoketa River are given in Table VI-1. Dissolved oxygen and ammonia nitrogen concentration profiles for the Maquoketa River for both secondary treatment conditions and waste load allocations with 11 1990 flows for summer conditions are shown on Figures VI-1 and VI-2 respectively. Dissolved oxygen and ammonia nitrogen concentration profiles for the Maquoketa River for both secondary treatment conditions and waste load allocations with 1990 flows for winter conditions are shown on Figures VI-3 and VI-4. Better than secondary treatment for the

FIGURE VI-1

MAQUOKETA RIVER

SUMMER CONDITIONS

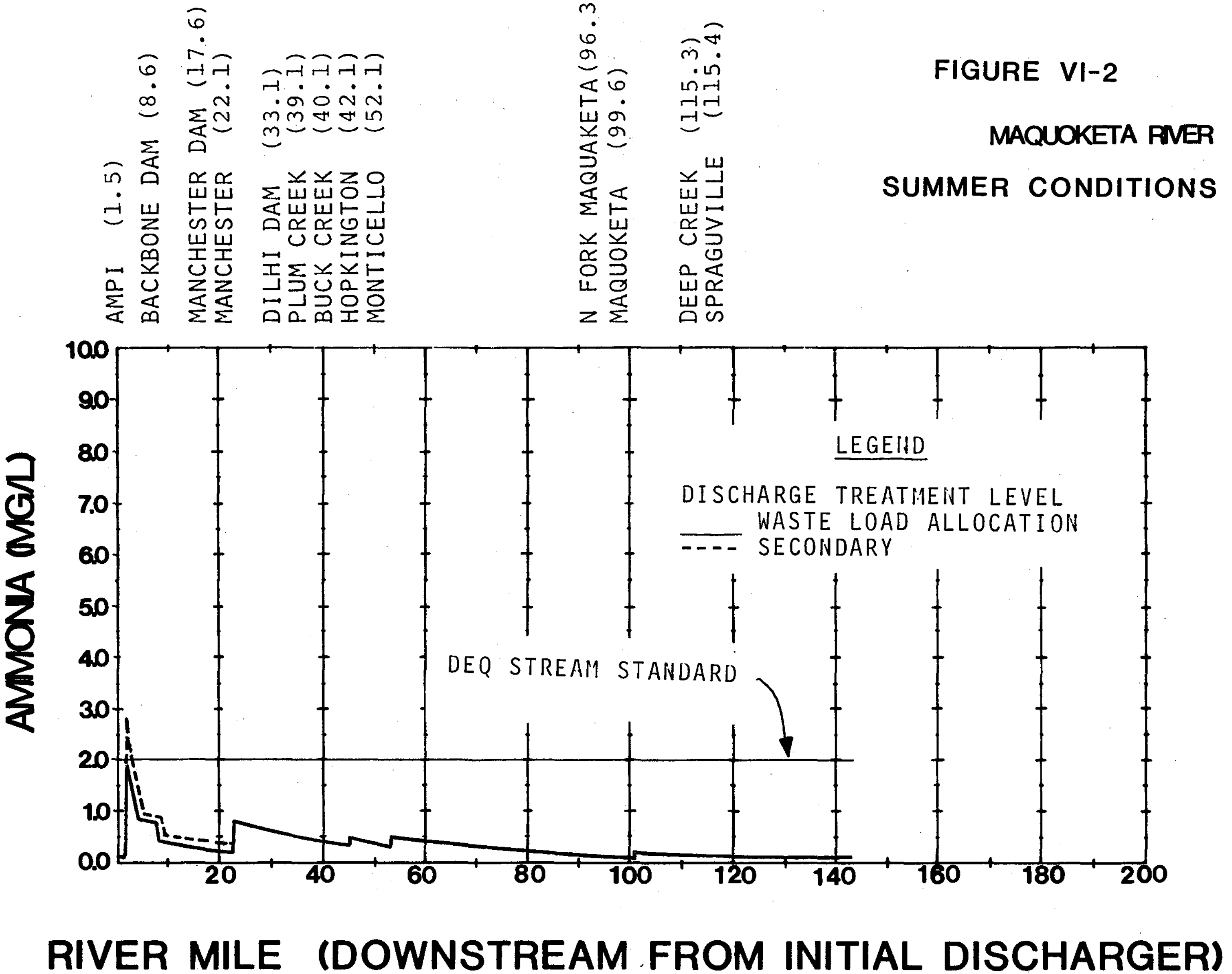


DISSOLVED OXYGEN CONCENTRATIONS

FIGURE VI-2

MAQUOKETA RIVER

SUMMER CONDITIONS



AMMONIA NITROGEN CONCENTRATIONS

communities of Manchester and Maquoketa is required as well as Associated Milk Producers, Inc. in Arlington. Associated Milk Producers, Inc. in Arlington requires ammonia nitrogen removal, and Maquoketa requires BOD removal.

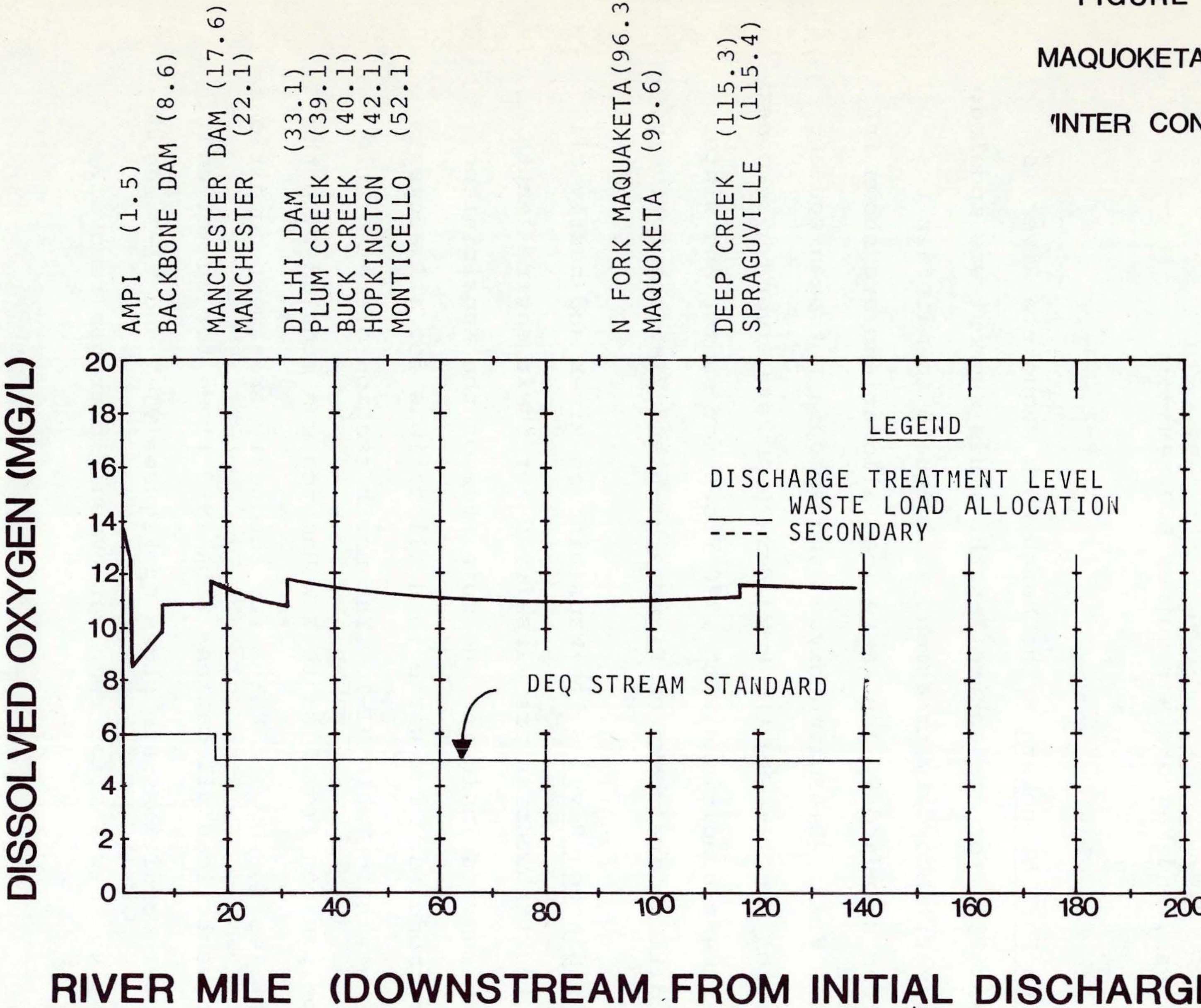
North Fork Maquoketa - The North Fork Maquoketa River is classified for its entire length. This segment was modeled; however, secondary treatment is adequate to maintain the stream standards. The waste load allocations are shown in Table VI-1. Dissolved oxygen and ammonia nitrogen concentration profiles for the North Fork Maquoketa River for secondary treatment conditions with 1990 flows for summer and winter conditions are shown on Figures VI-5 and VI-6 respectively.

Wapsipinicon River - The Wapsipinicon River and nearly all of its tributaries are classified for their entire length. Six segments including the main stem of the Wapsipinicon were modeled. The waste load allocations for all segments are given in Table VI-1. The north section of the Little Wapsipinicon from Elma to New Hampton was modeled with the profiles for DO and NH_3-N for secondary treatment conditions and waste load allocations with 1990 flows for summer and winter conditions are shown on Figures VI-7 and VI-8 respectively. New Hampton requires ammonia nitrogen removal.

FIGURE VI-3

MAQUOKETA RIVER

'INTER CONDITIONS

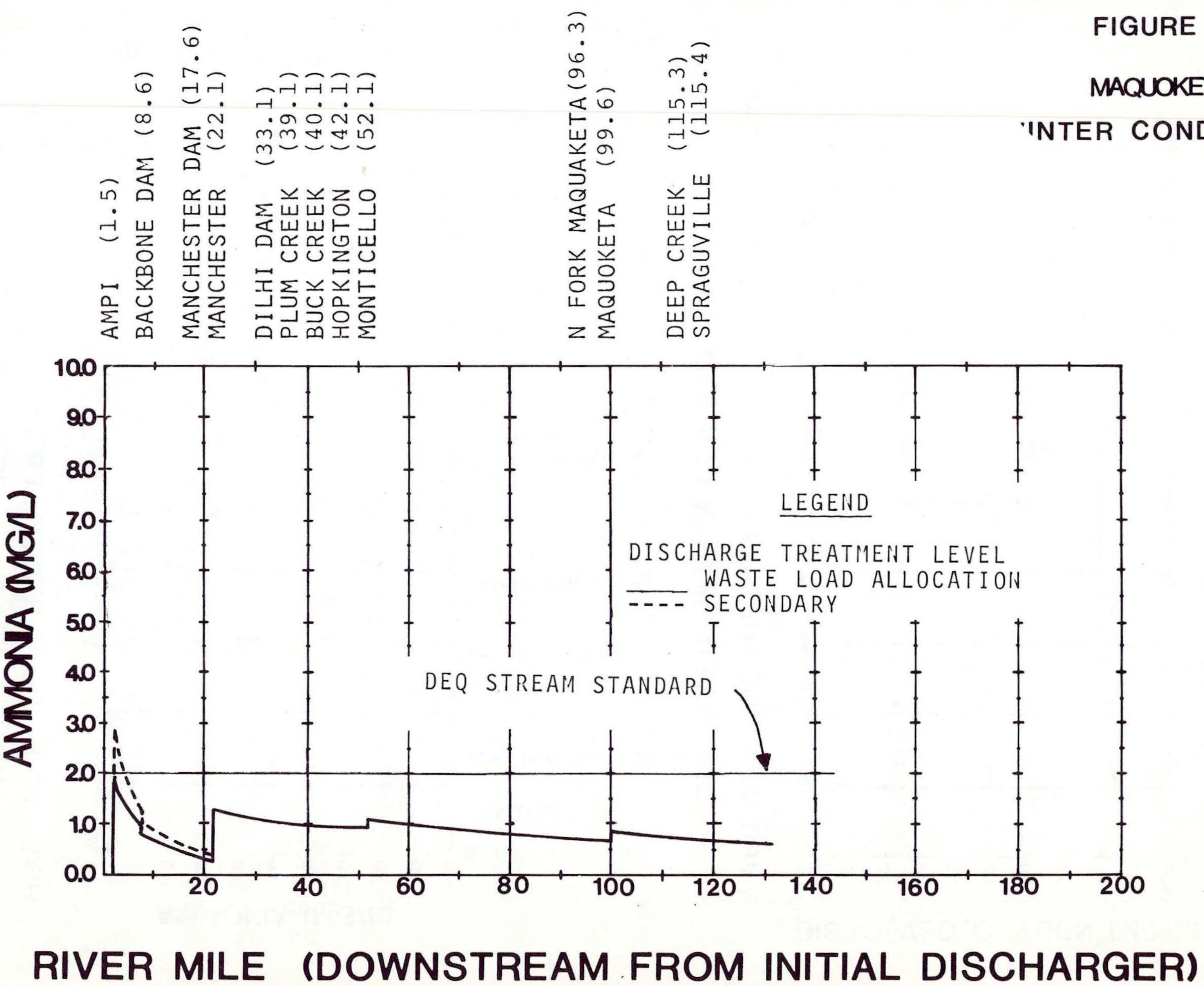


DISSOLVED OXYGEN CONCENTRATIONS

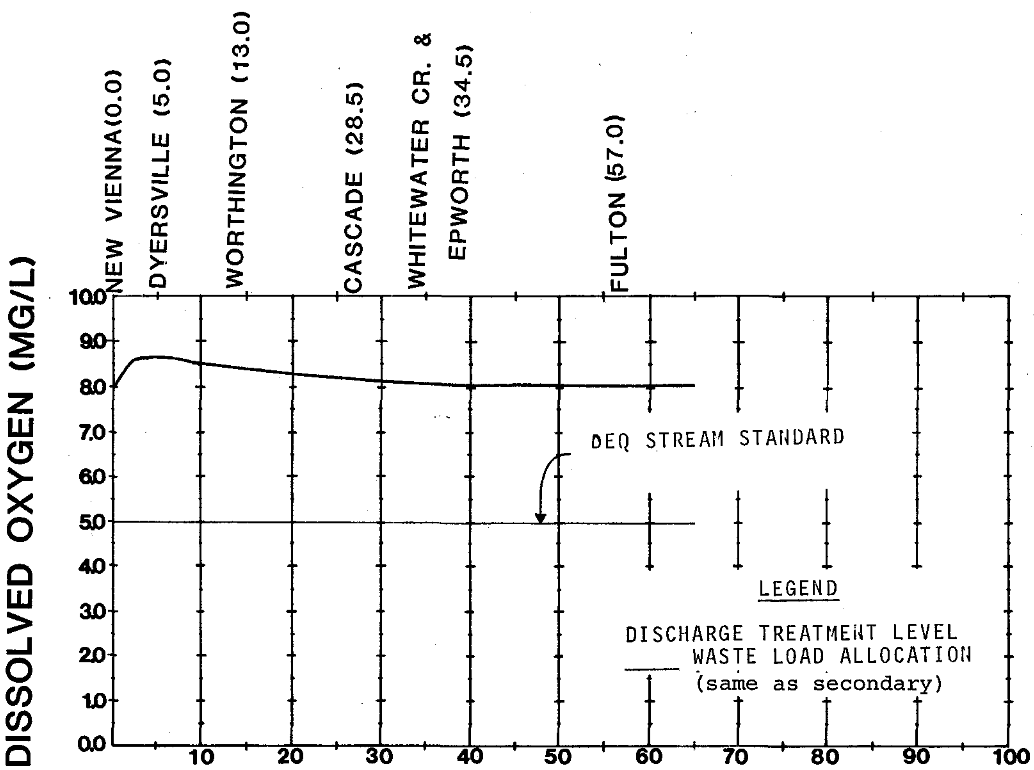
FIGURE VI-4

MAQUOKETA RIVER

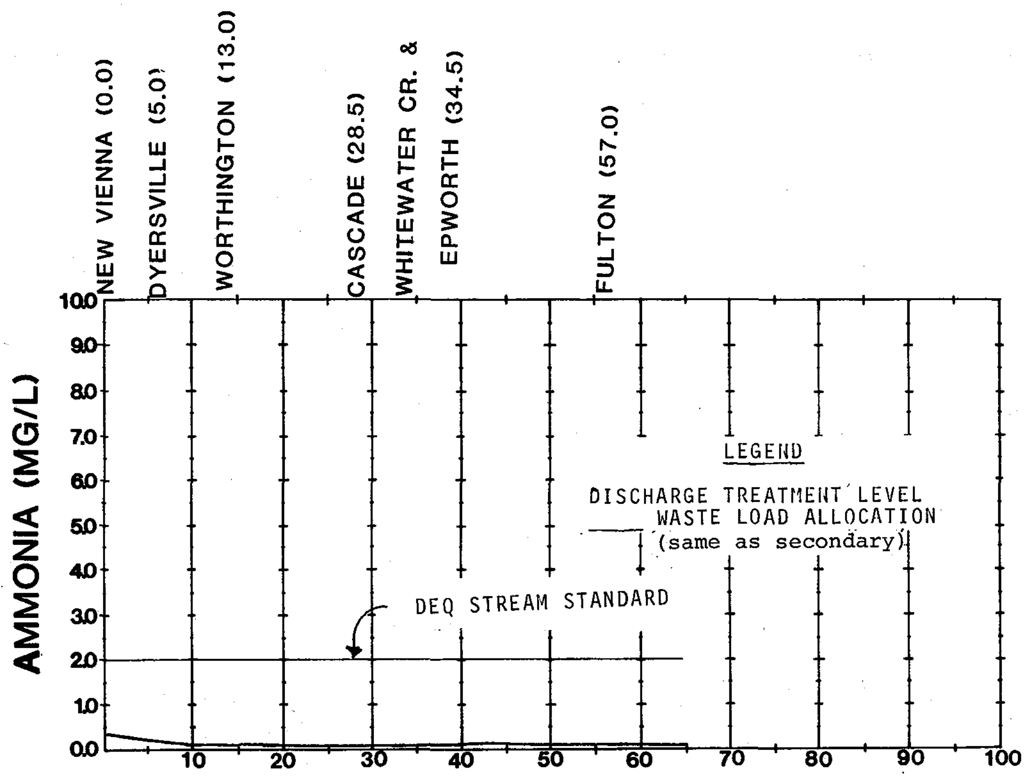
'INTER CONDITIONS



AMMONIA NITROGEN CONCENTRATIONS



RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
DISSOLVED OXYGEN CONCENTRATIONS

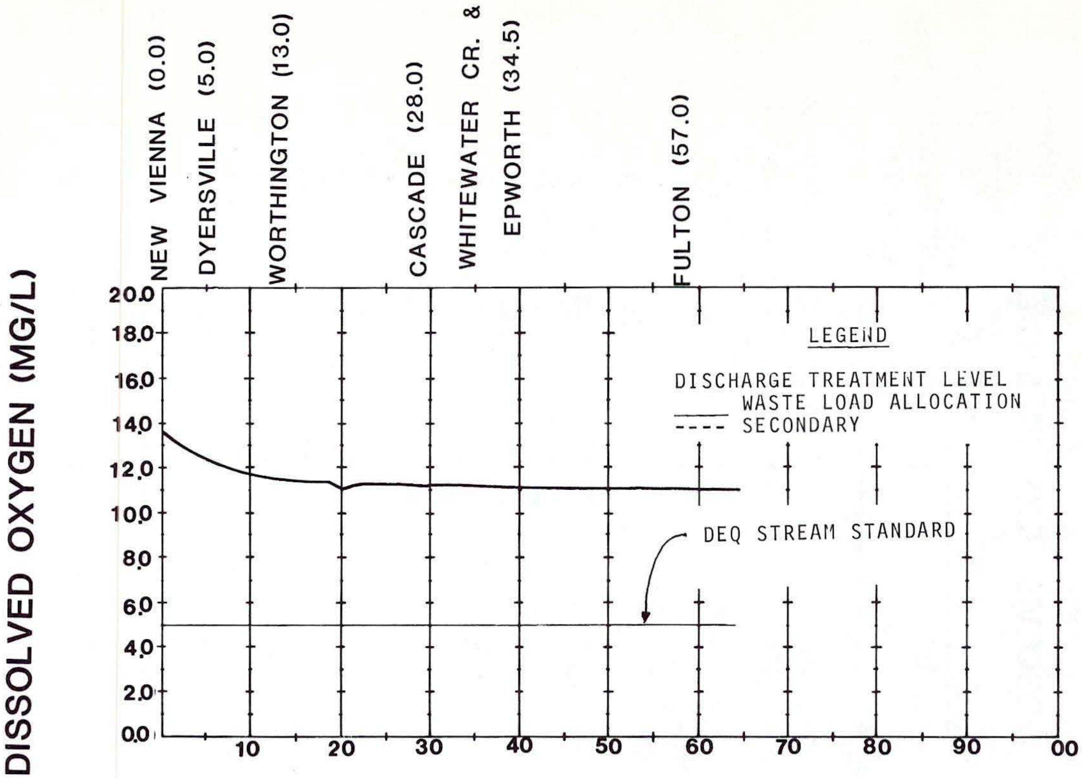


RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
AMMONIA NITROGEN CONCENTRATIONS

FIGURE VI-5

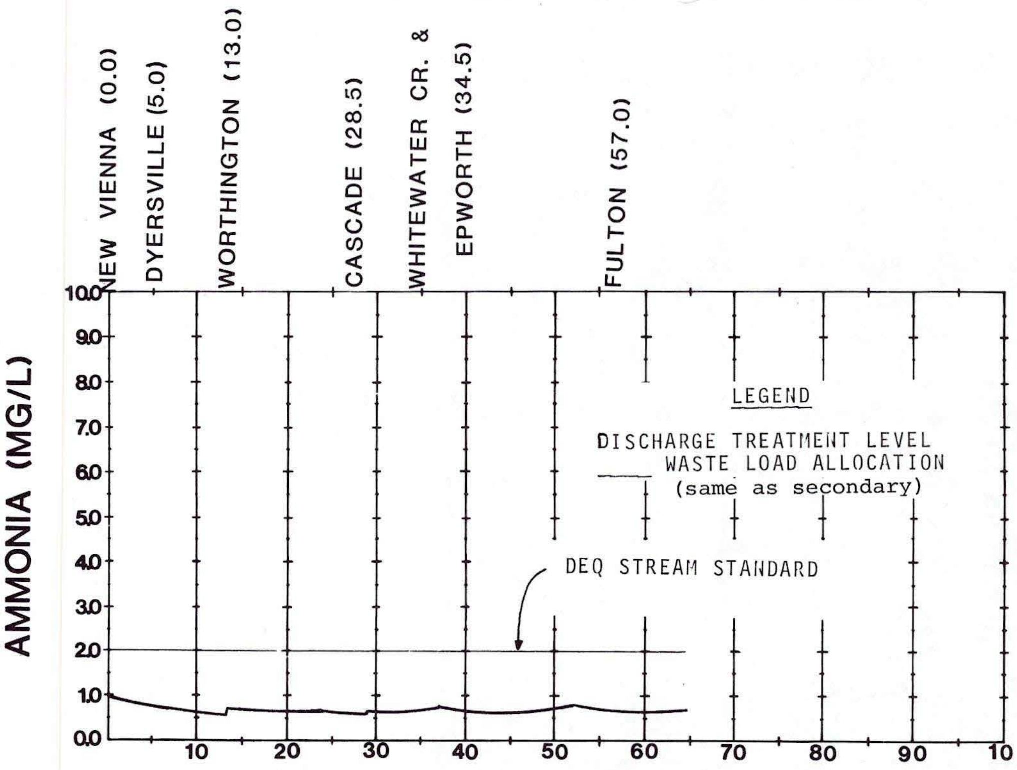
NORTH FORK MAQUOKETA RIVER

SUMMER CONDITIONS



RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)

DISSOLVED OXYGEN CONCENTRATIONS



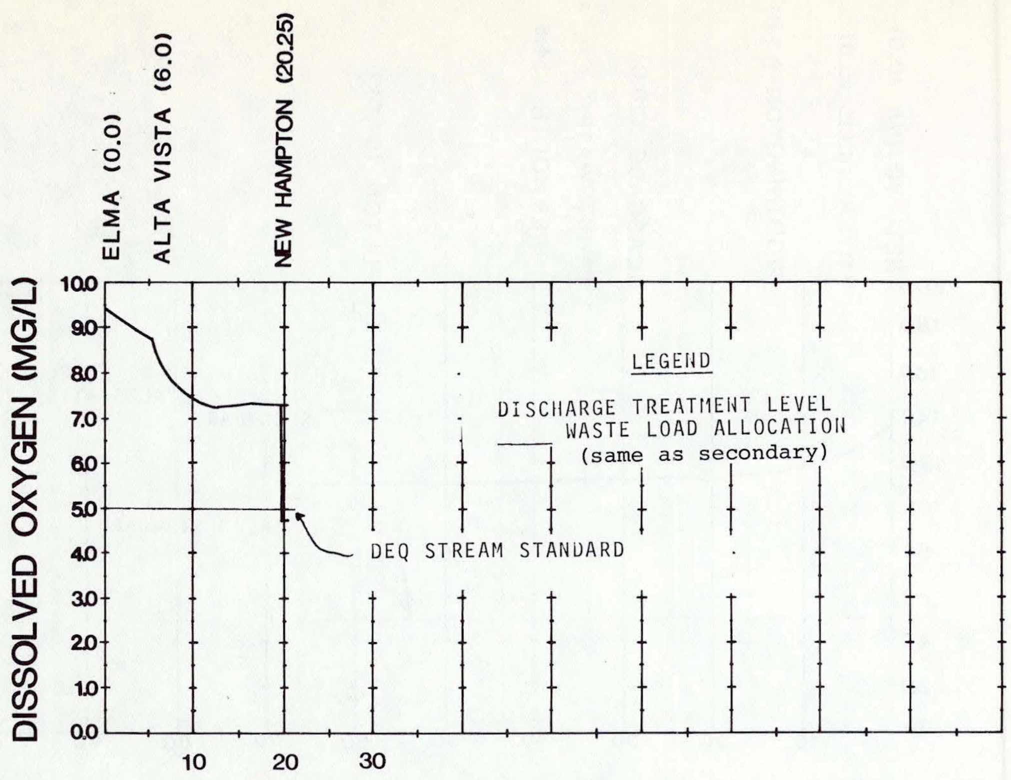
RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)

AMMONIA NITROGEN CONCENTRATIONS

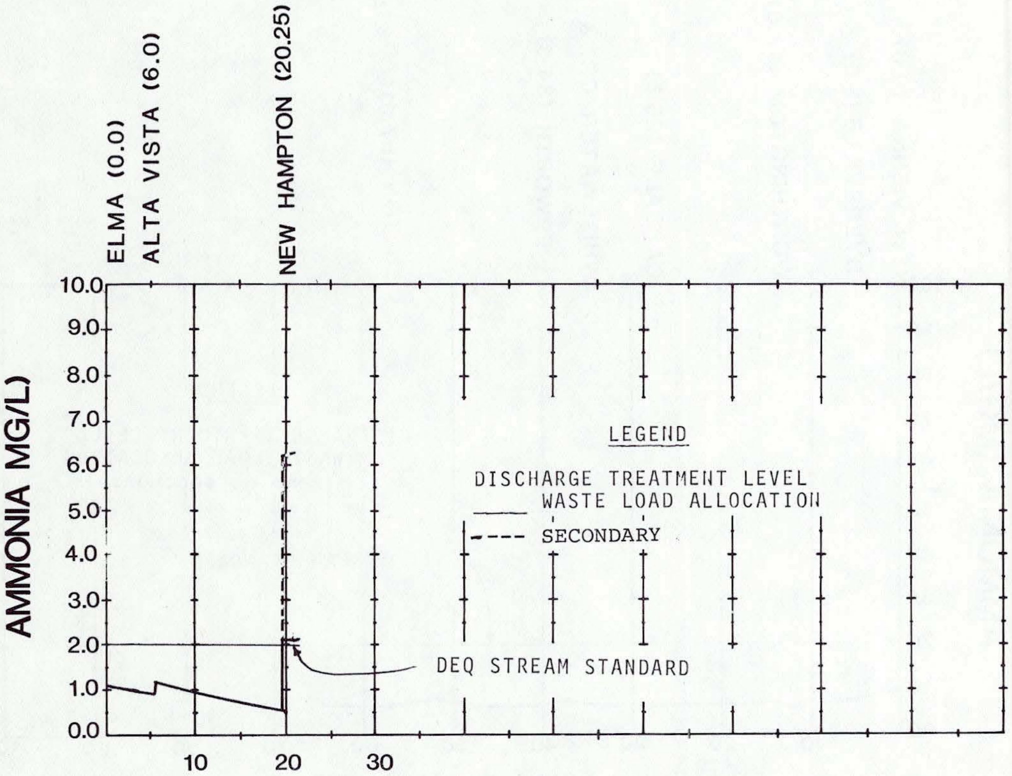
FIGURE VI-6

NORTH FORK MAQUOKETA RIVER

WINTER CONDITIONS



RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
DISSOLVED OXYGEN CONCENTRATIONS

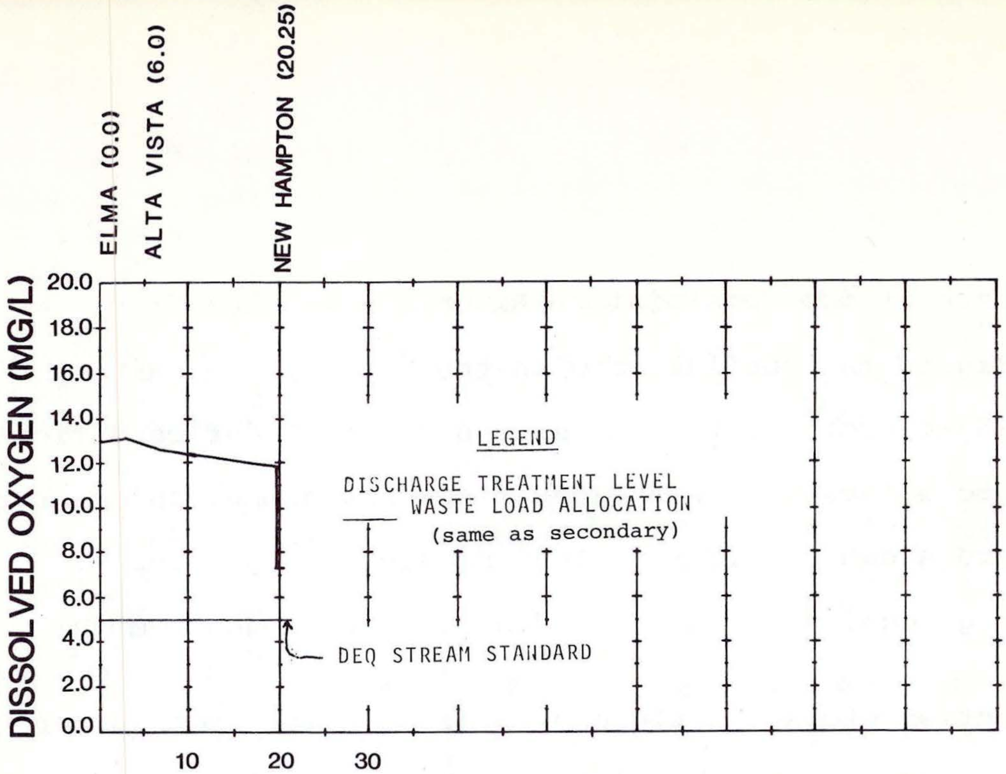


RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
AMMONIA NITROGEN CONCENTRATIONS

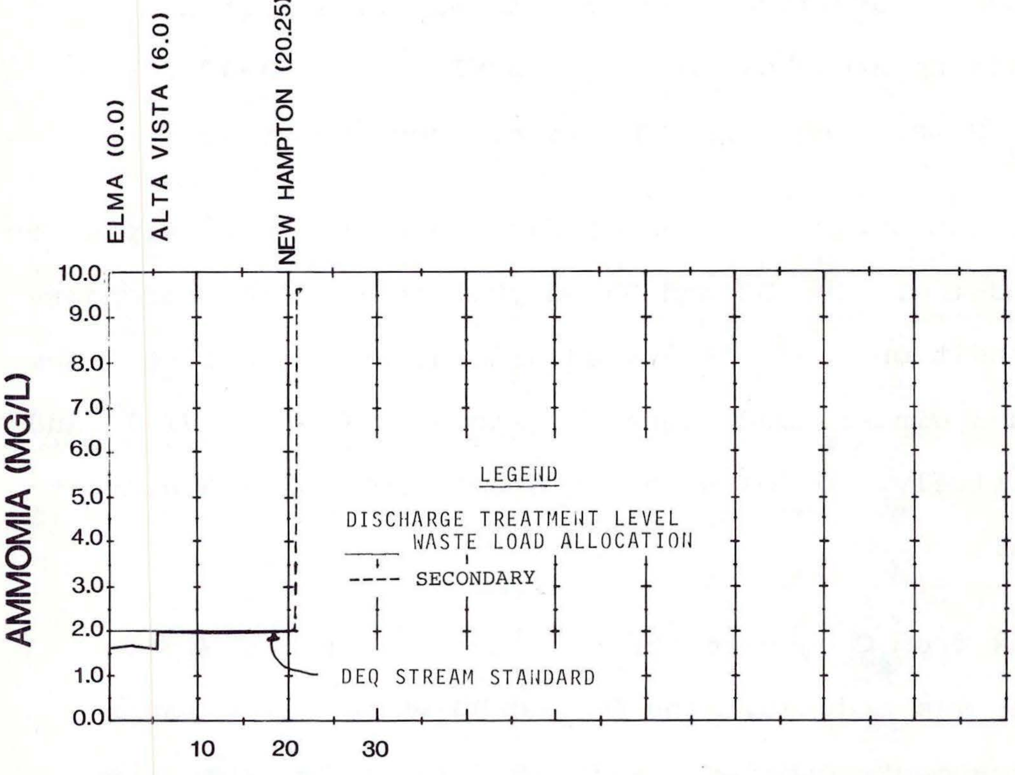
FIGURE VI-7

LITTLE WAPSIPINICON RIVER N.

SUMMER CONDITIONS



RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
DISSOLVED OXYGEN CONCENTRATIONS



RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
AMMONIA NITROGEN CONCENTRATIONS

FIGURE VI-8

LITTLE WAPSIPINICON RIVER N.

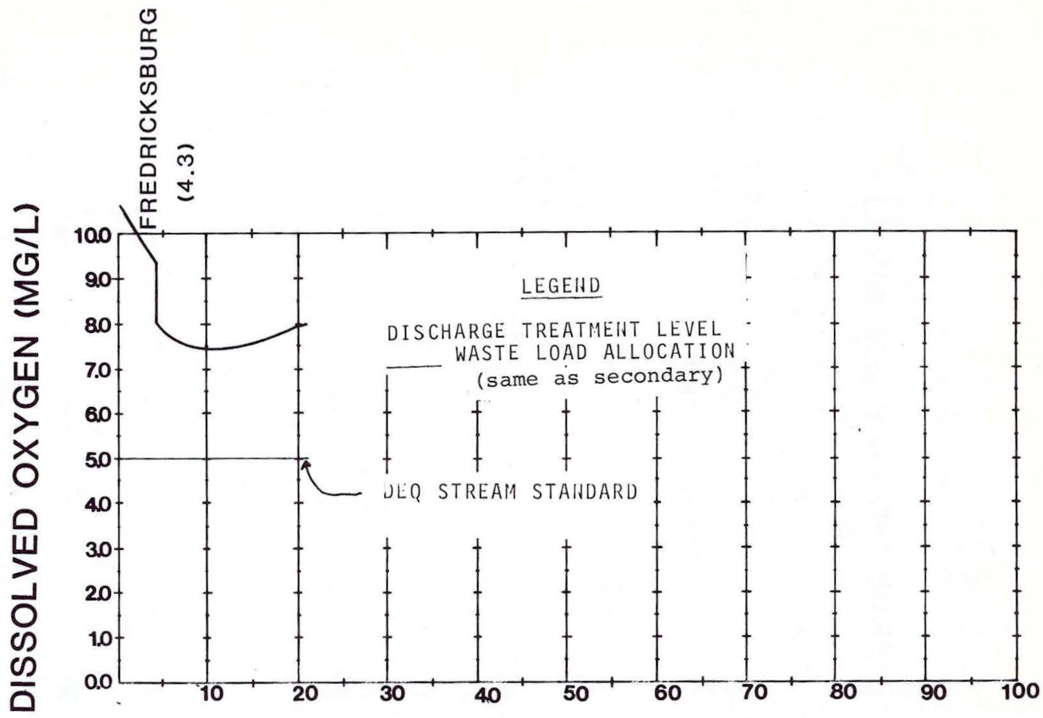
WINTER CONDITIONS

The East Branch of the Wapsipinicon River was modeled from Fredericksburg to the confluence with the Wapsipinicon River. The DO and NH_3-N profiles for the secondary treatment conditions and waste load allocations with 1990 flows for summer and winter conditions are shown on Figures VI-9 and VI-10 respectively. Fredericksburg requires both BOD and ammonia nitrogen removal.

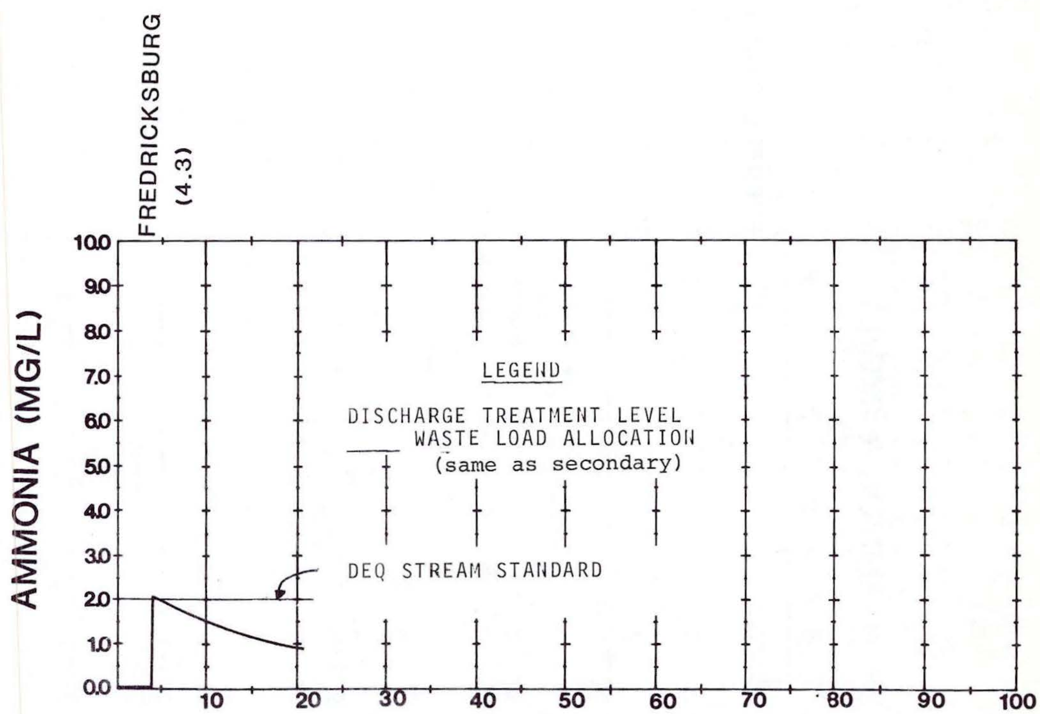
The south section of the Little Wapsipinicon River from Sumner to the confluence with the Wapsipinicon River was modeled. The DO and NH_3-N profiles for the secondary treatment conditions and waste load allocations with 1990 flows for summer and winter conditions are shown on Figures VI-11 and VI-12 respectively. Sumner requires ammonia nitrogen removal.

Otter Creek from Oelwein to the confluence with the Wapsipinicon River was modeled. The DO and NH_3-N profiles for the secondary treatment conditions and waste load allocations with 1990 flows for summer and winter conditions are shown on Figures VI-13 and VI-14 respectively. Oelwein requires both BOD and ammonia nitrogen removal.

Buffalo Creek from Coggon to the confluence with the Wapsipinicon River was modeled. The DO and NH_3-N profiles for the secondary treatment conditions with 1990 flows for summer and winter conditions are shown on Figures VI-15 and VI-16.



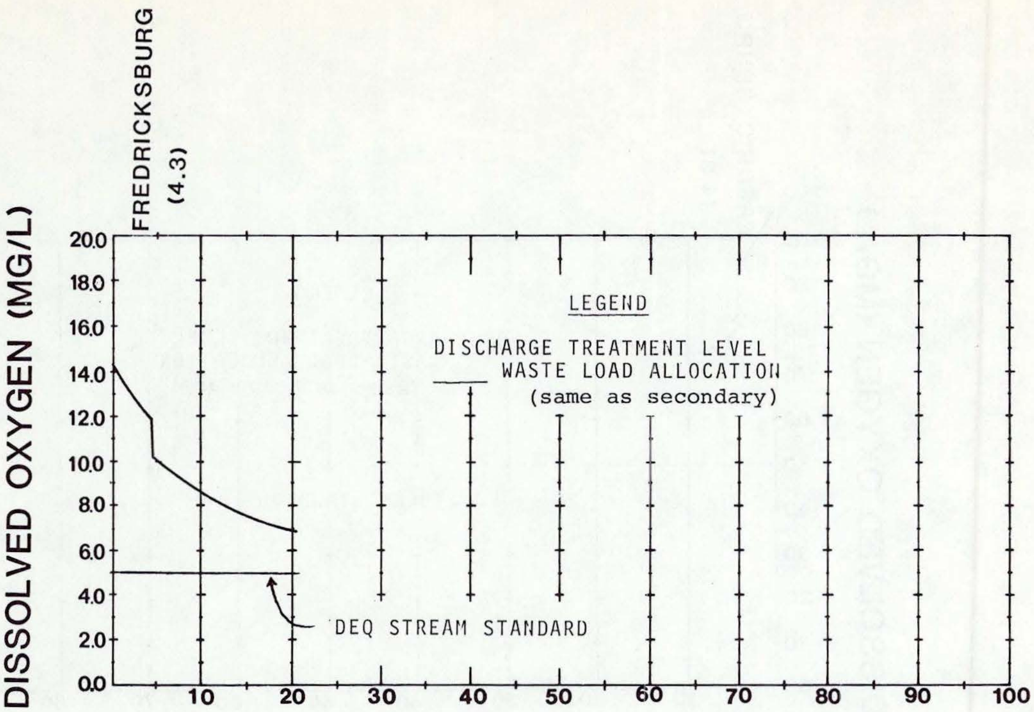
RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
DISSOLVED OXYGEN CONCENTRATIONS



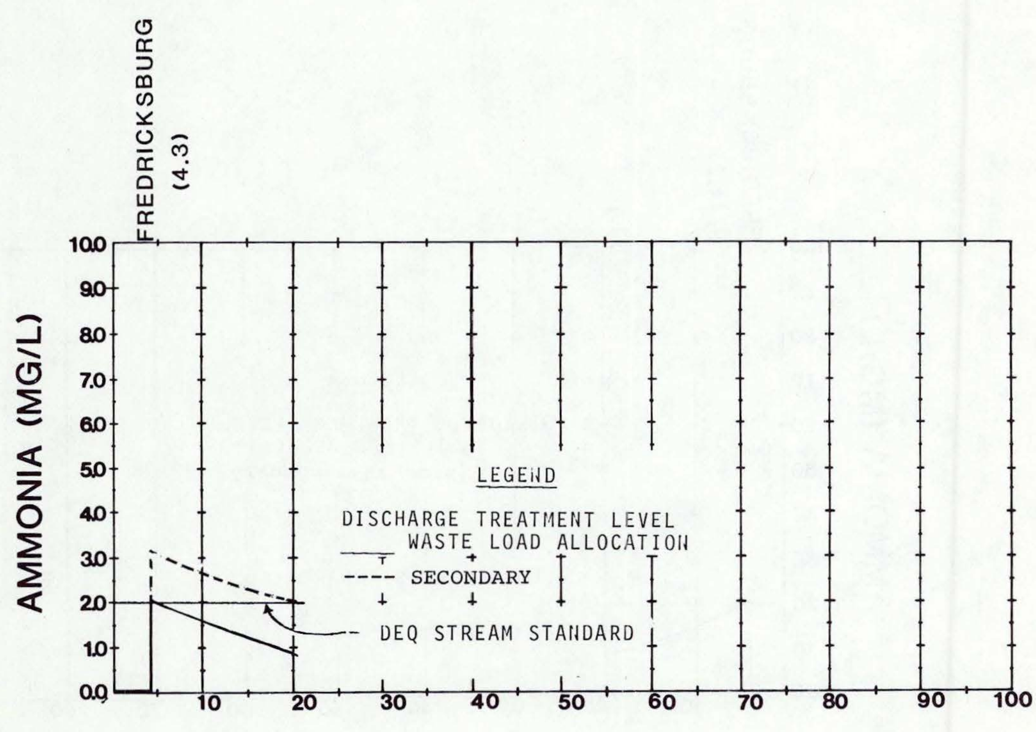
RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
AMMONIA NITROGEN CONCENTRATIONS

FIGURE VI-9

E. BR. WAPSIPINICON RIVER
SUMMER CONDITIONS



RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
DISSOLVED OXYGEN CONCENTRATIONS

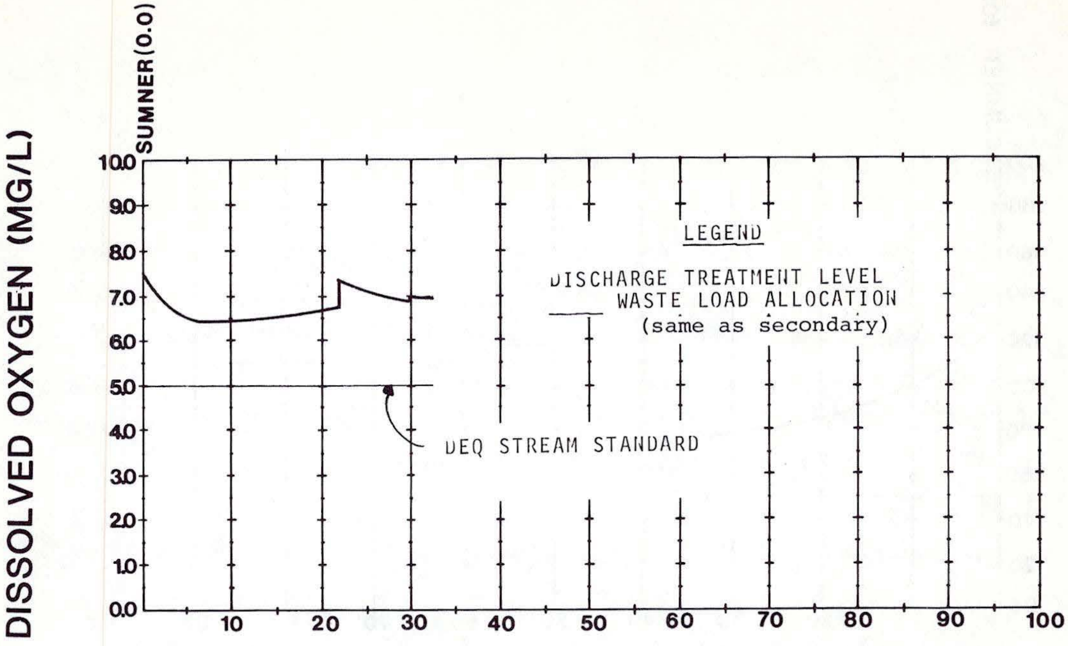


RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
AMMONIA NITROGEN CONCENTRATIONS

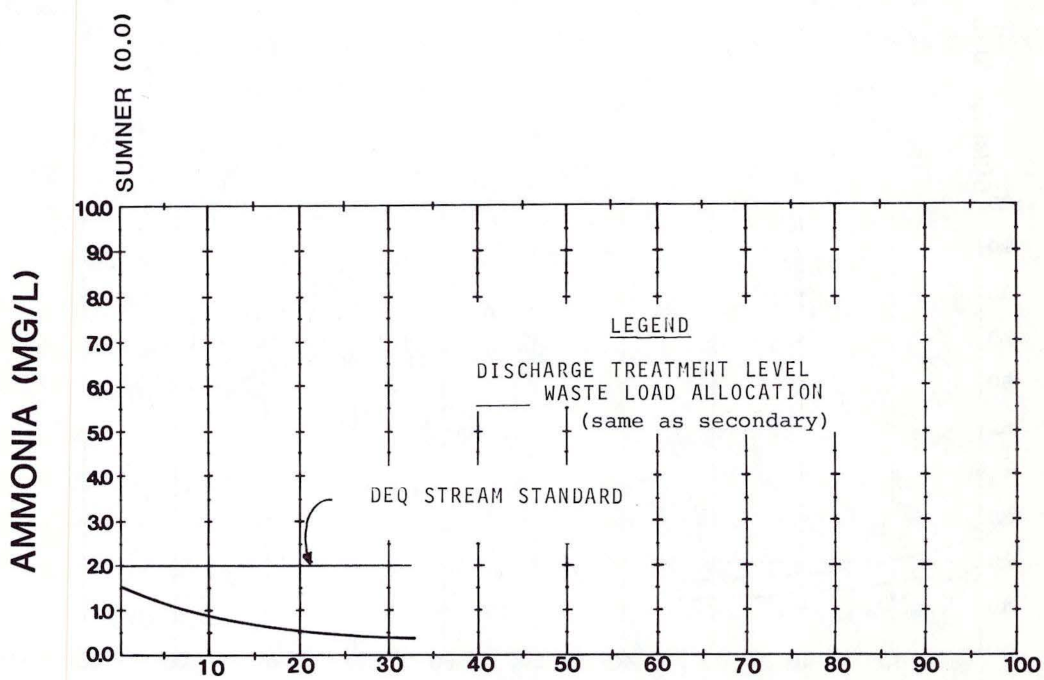
FIGURE VI-10

E. BR. WAPSIPINICON RIVER

WINTER CONDITIONS



RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
DISSOLVED OXYGEN CONCENTRATIONS

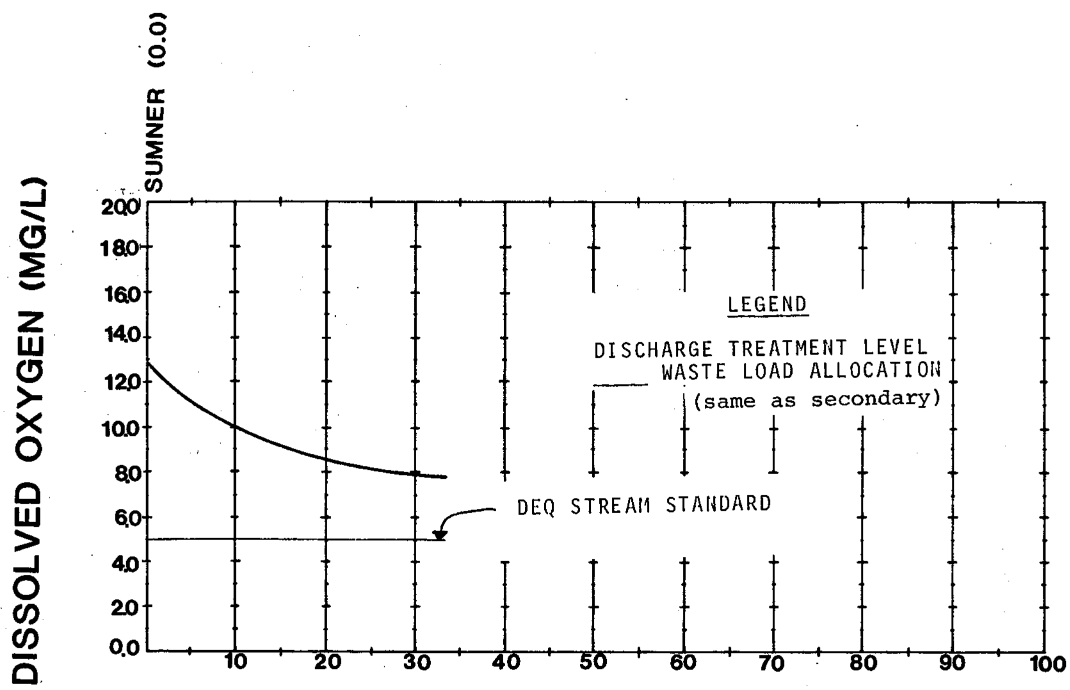


RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
AMMONIA NITROGEN CONCENTRATIONS

FIGURE VI-11

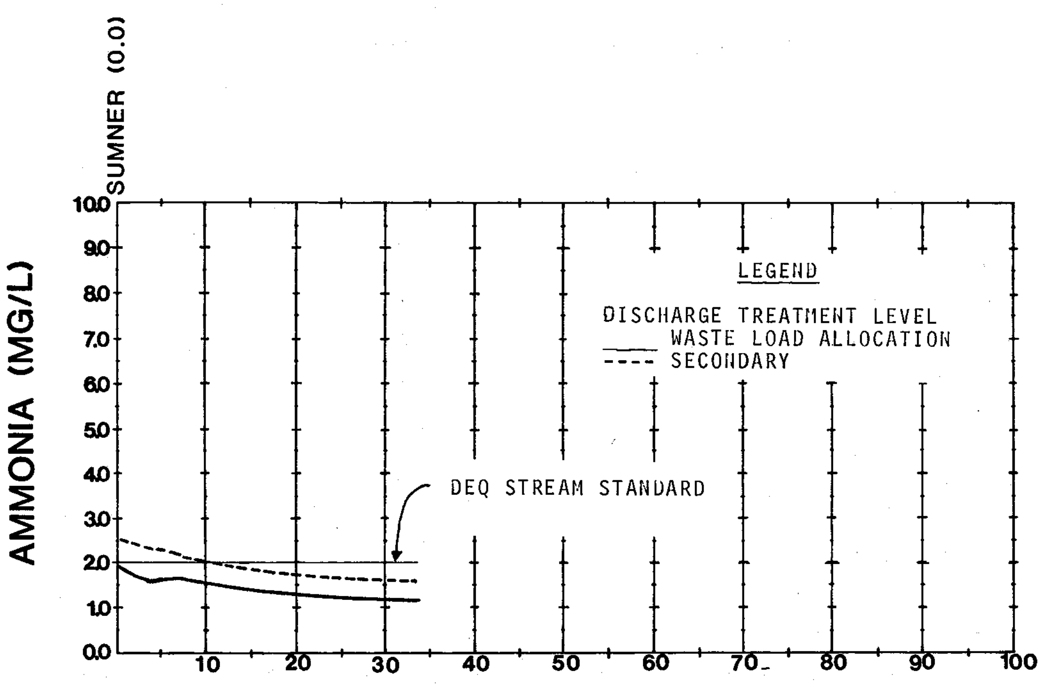
LITTLE WAPSIPINICON RIVER (SOUTH)

SUMMER CONDITIONS



RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)

DISSOLVED OXYGEN CONCENTRATIONS



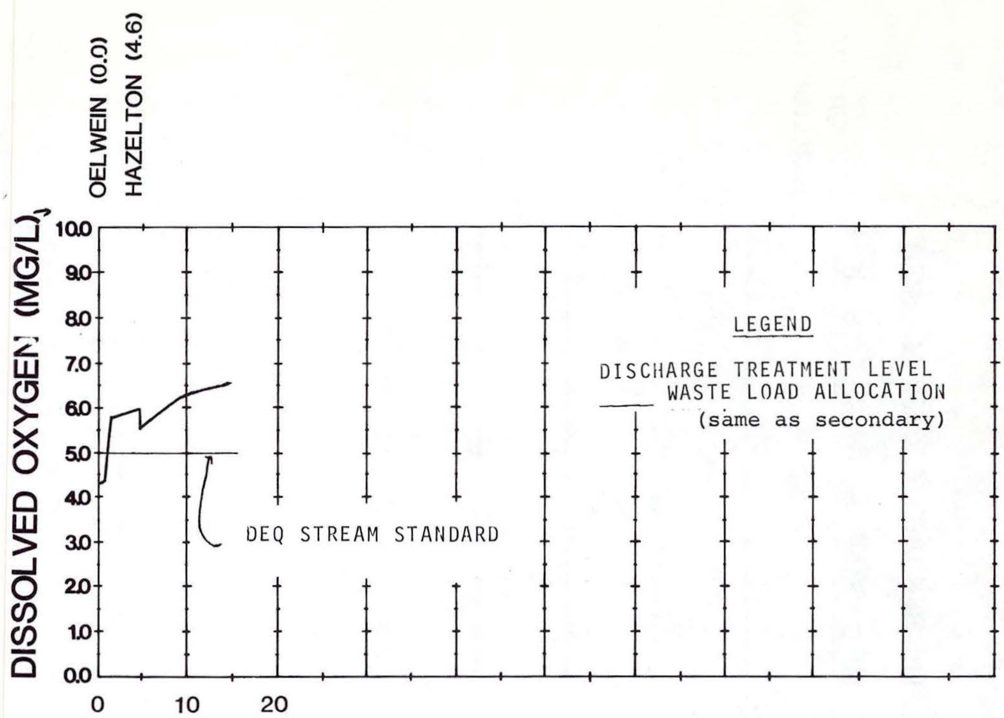
RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)

AMMONIA NITROGEN CONCENTRATIONS

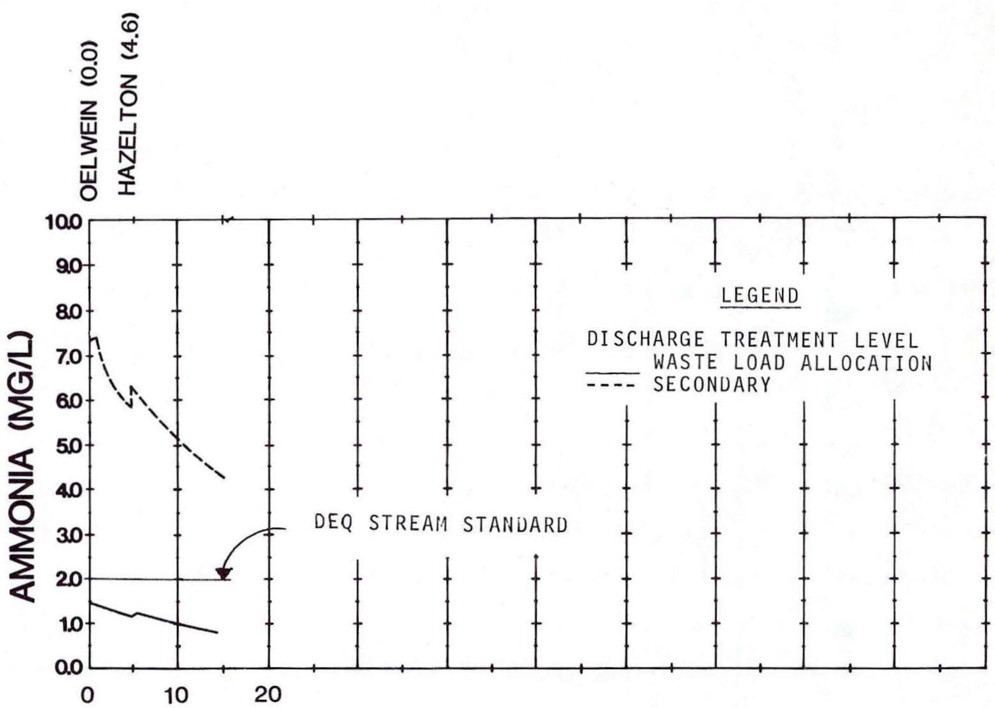
FIGURE VI-12

LITTLE WAPSIPINICON (SOUTH)

WINTER CONDITIONS



RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
DISSOLVED OXYGEN CONCENTRATIONS

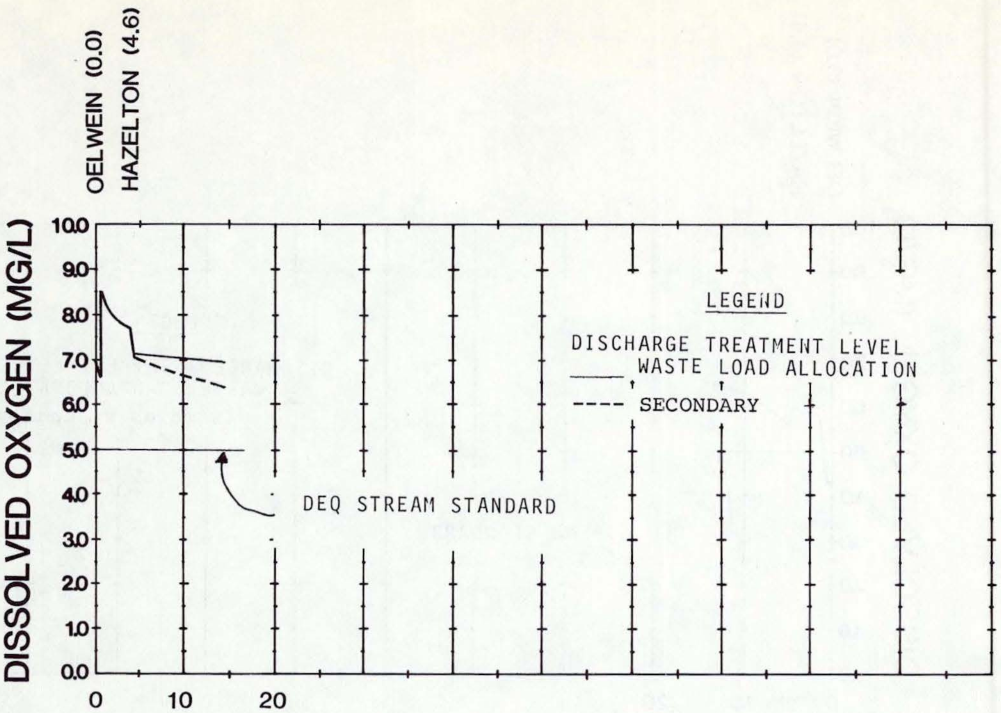


RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
AMMONIA NITROGEN CONCENTRATIONS

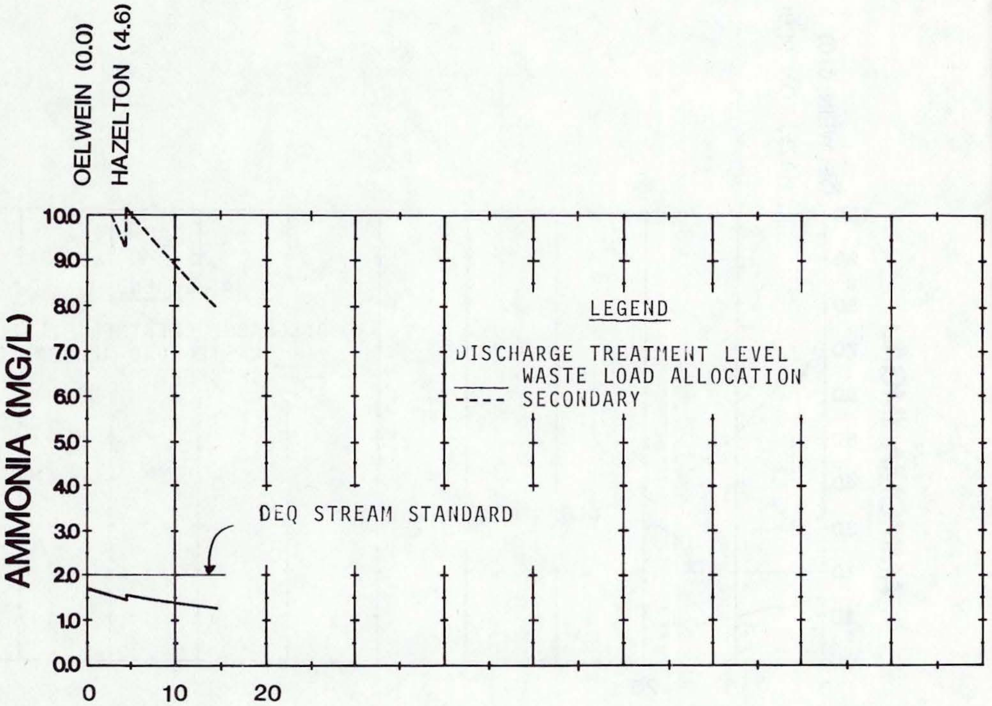
FIGURE VI-13

OTTER CREEK

SUMMER CONDITIONS



RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
DISSOLVED OXYGEN CONCENTRATIONS

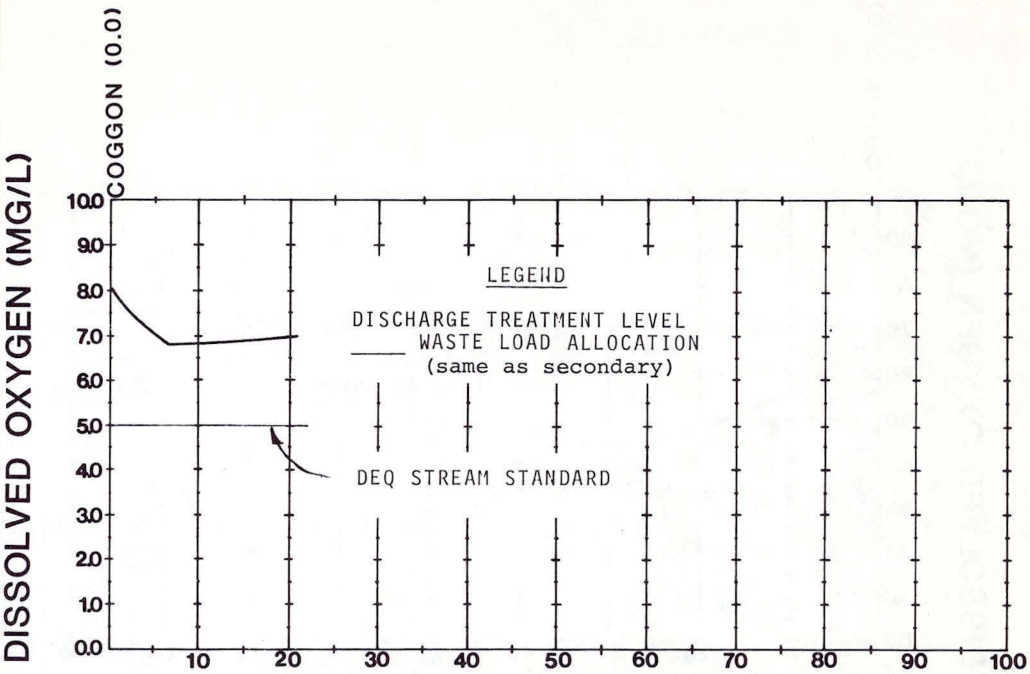


RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
AMMONIA NITROGEN CONCENTRATIONS

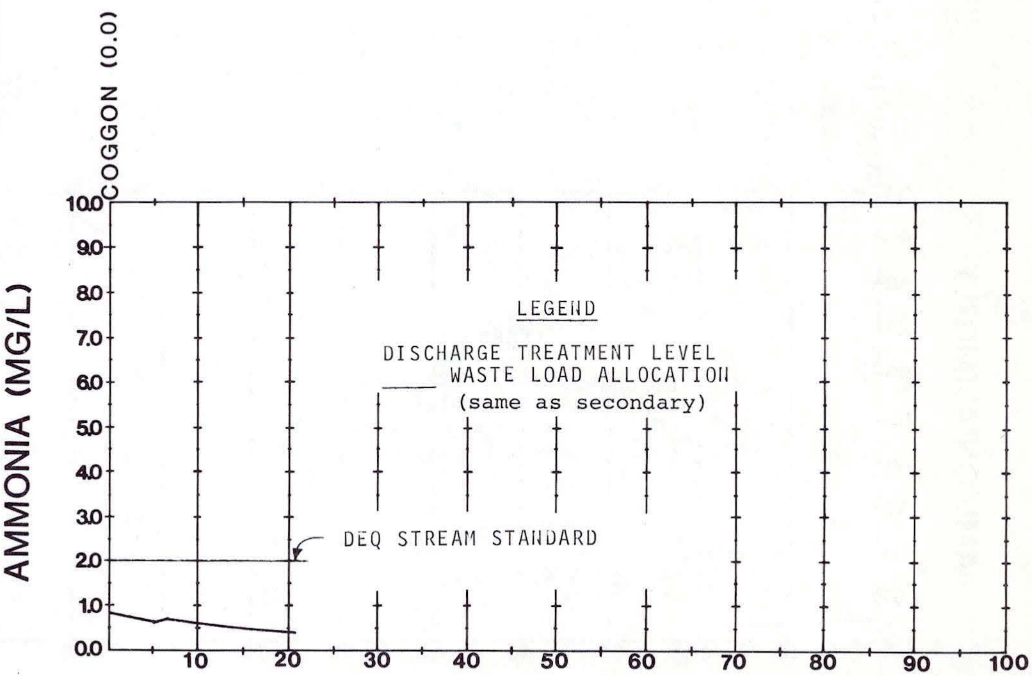
FIGURE VI-14

OTTER CREEK

WINTER CONDITIONS



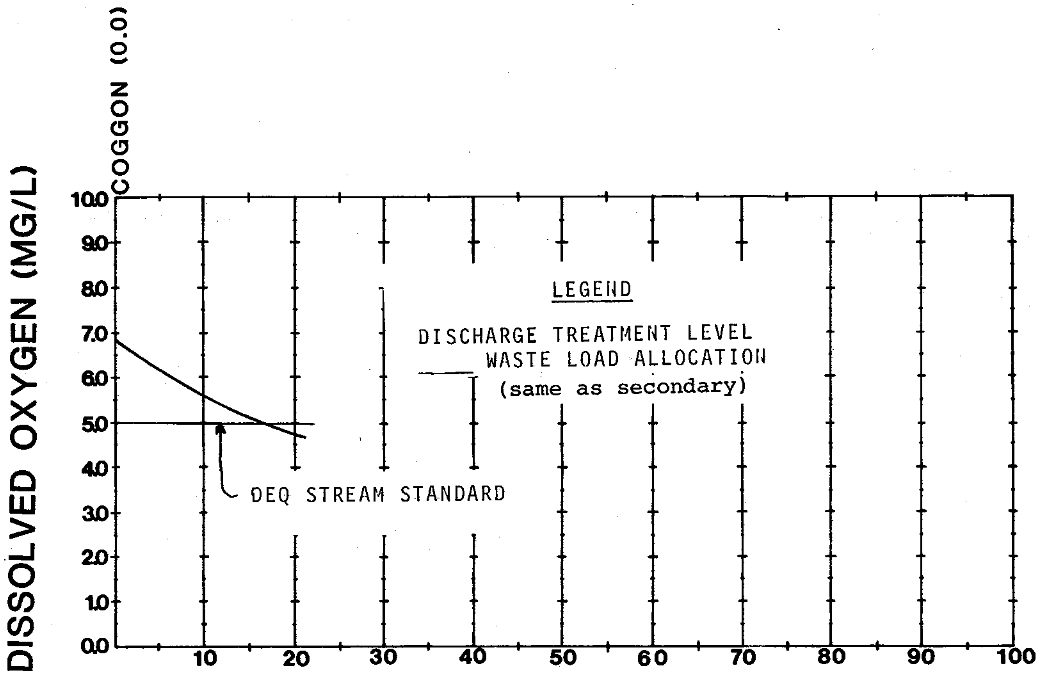
RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
DISSOLVED OXYGEN CONCENTRATIONS



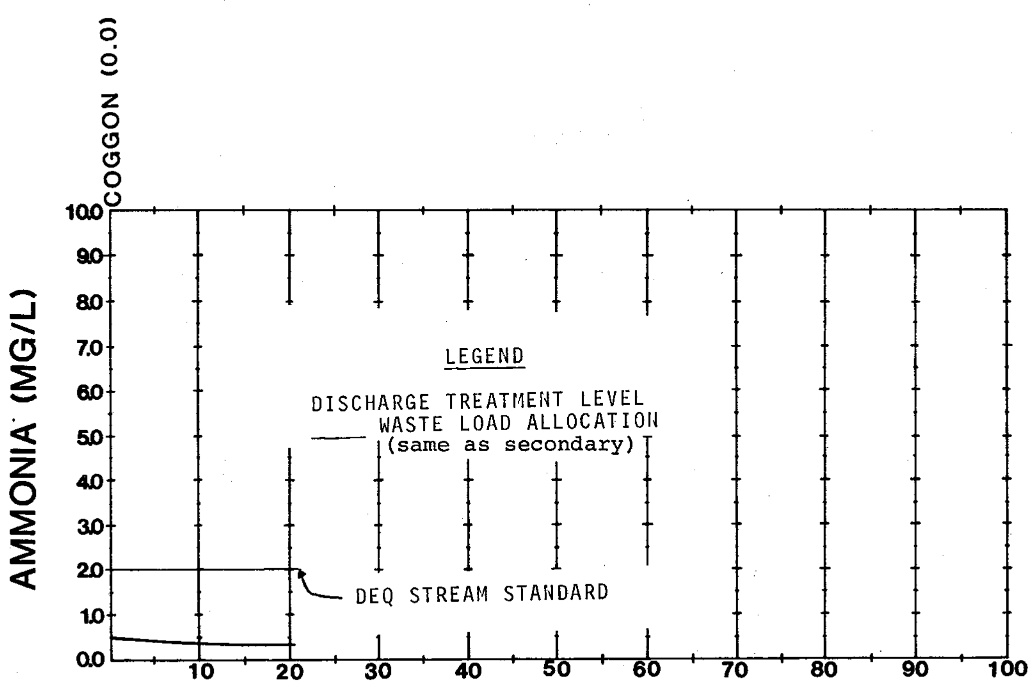
RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
AMMONIA NITROGEN CONCENTRATIONS

FIGURE VI-15

BUFFALO CREEK
SUMMER CONDITIONS



RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
DISSOLVED OXYGEN CONCENTRATIONS



RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)
AMMONIA NITROGEN CONCENTRATIONS

FIGURE VI-16

BUFFALO CREEK
WINTER CONDITIONS

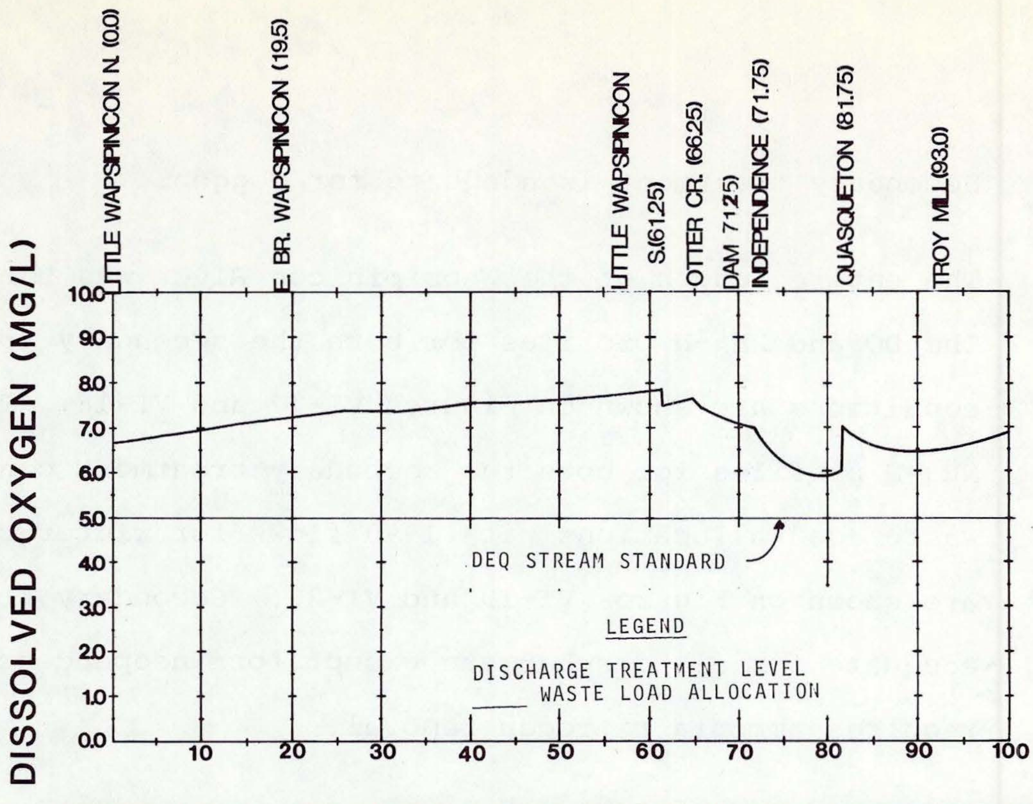
Secondary treatment is adequate for Coggon.

The entire length of the Wapsipinicon River was then modeled. The DO and NH_3-N profiles for both the secondary treatment conditions are shown on Figures VI-17 and VI-18. The DO and NH_3-N profiles for both the secondary treatment conditions and waste load allocations with 1990 flows for winter conditions are shown on Figures VI-19 and VI-20. Secondary treatment is adequate for all dischargers except for Independence which requires ammonia nitrogen removal.

SEGMENT CLASSIFICATION

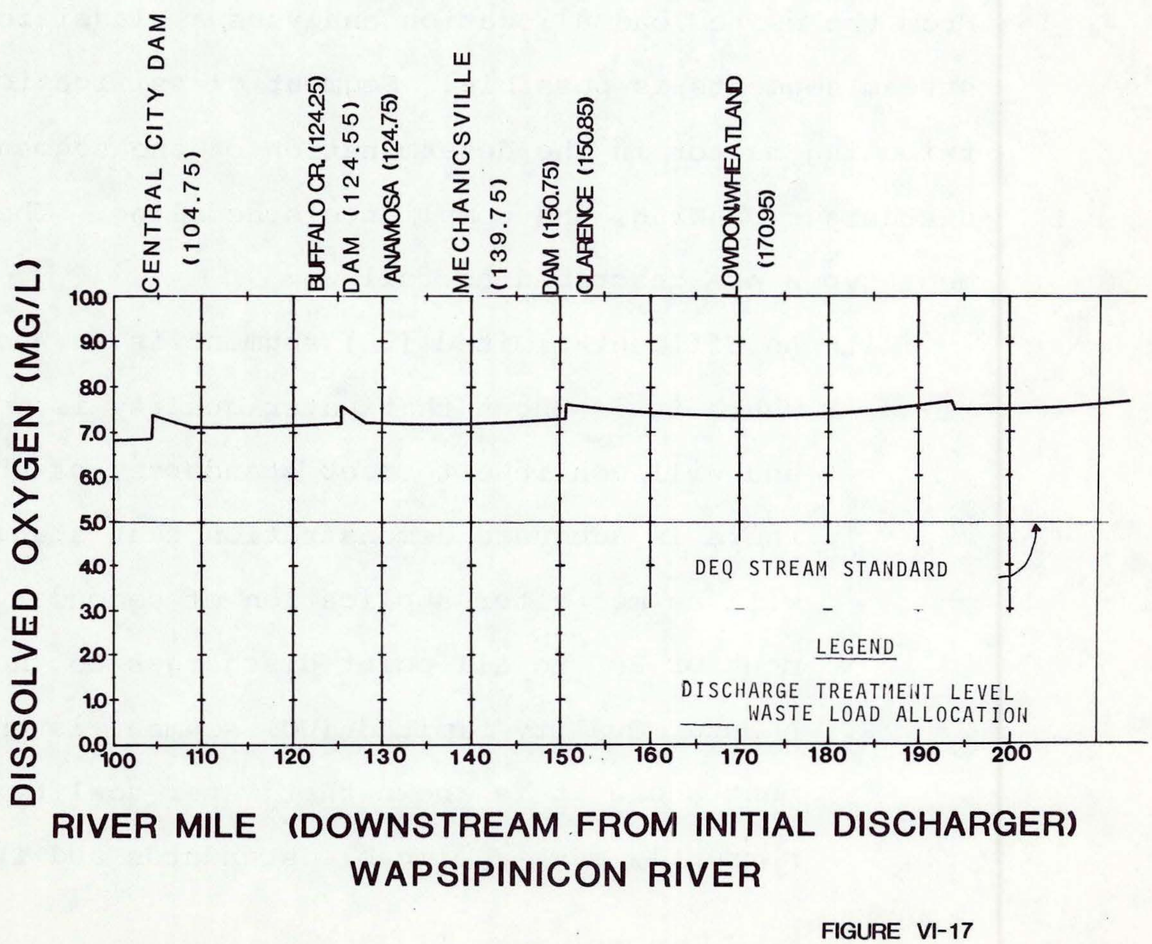
From the waste load allocation analyses, a classification of stream segments is possible. Segment classification is a contributing factor in the determination of the segment ranking, discharger ranking, and compliance scheduling. The two segment types are described as follows:

1. An Effluent Limited (EL) segment is any segment where it is known that water quality is meeting and will continue to meet standards, or where there is adequate demonstration that standards will be met after application of secondary treatment or BPT to all point discharges to the segment.
2. A Water Quality Limited (WQ) segment is any segment where it is known that water quality does not currently meet applicable standards and it is not



RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)

WAPSIPINICON RIVER

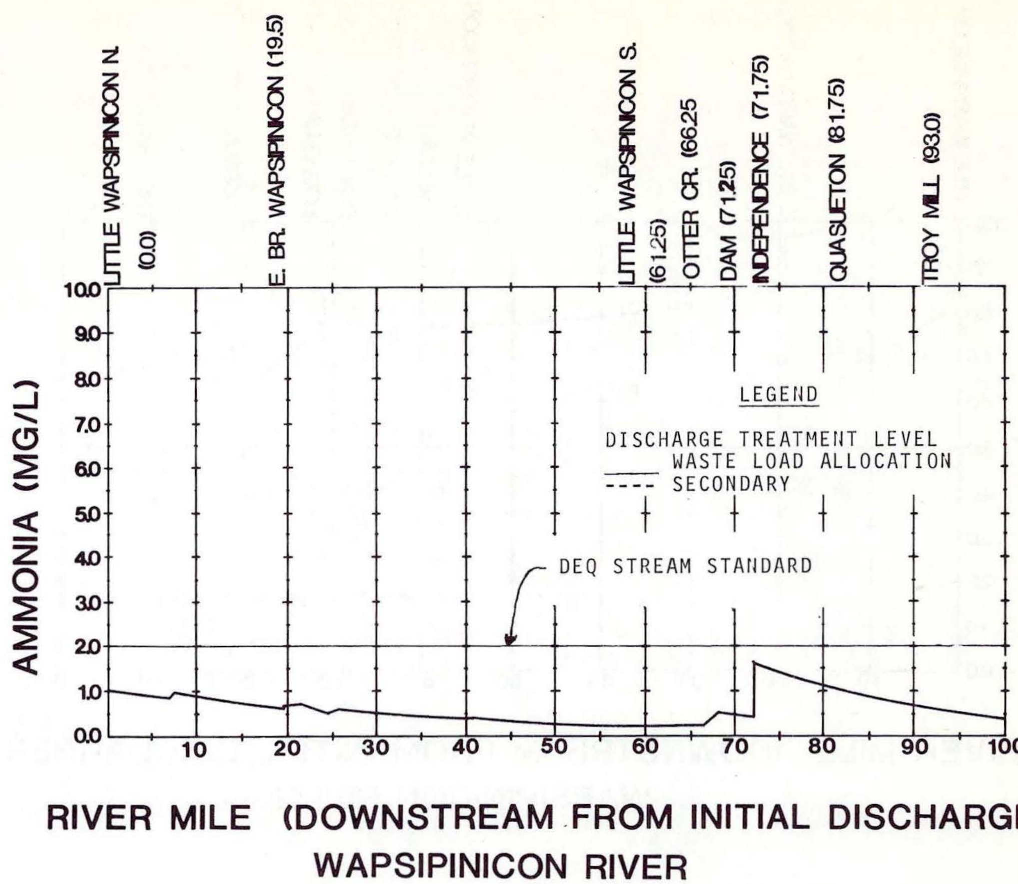


RIVER MILE (DOWNSTREAM FROM INITIAL DISCHARGER)

WAPSIPINICON RIVER

FIGURE VI-17

DISSOLVED OXYGEN CONCENTRATIONS
WAPSIPINICON RIVER
SUMMER CONDITIONS



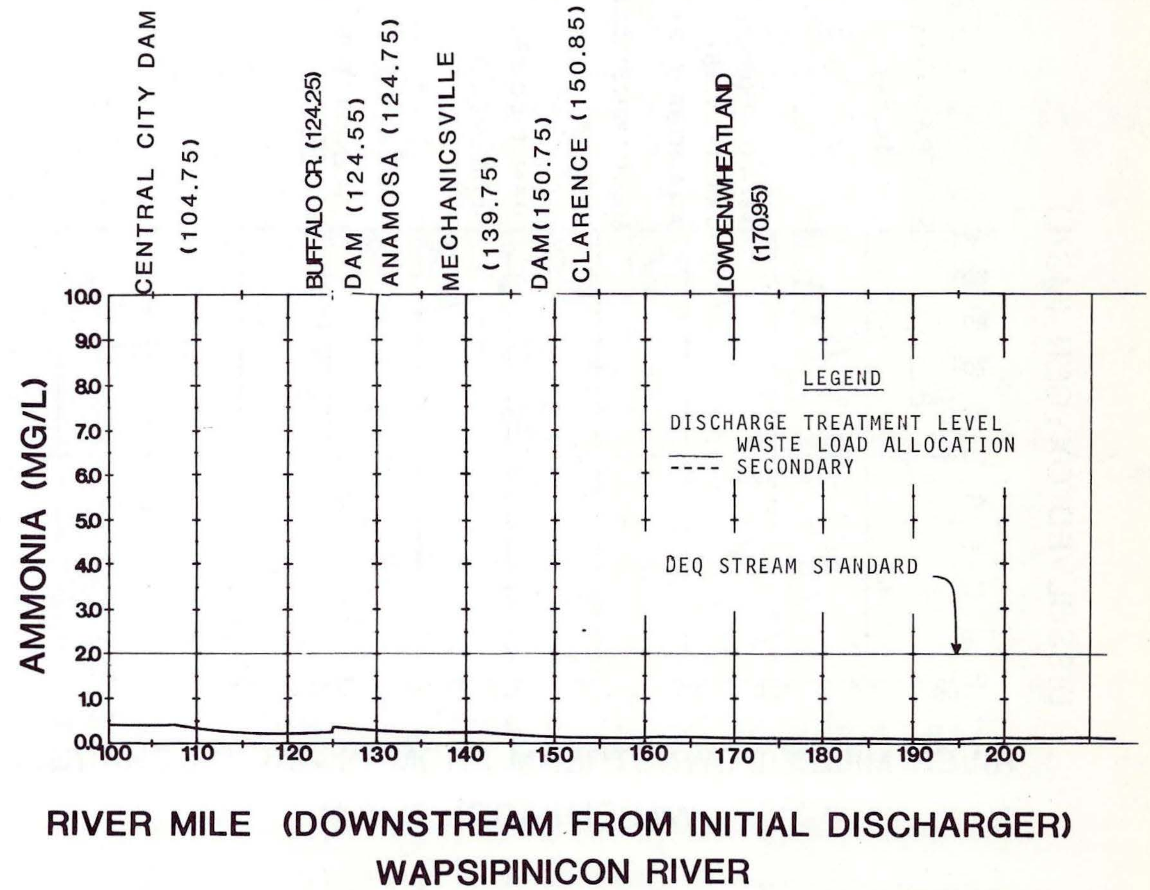
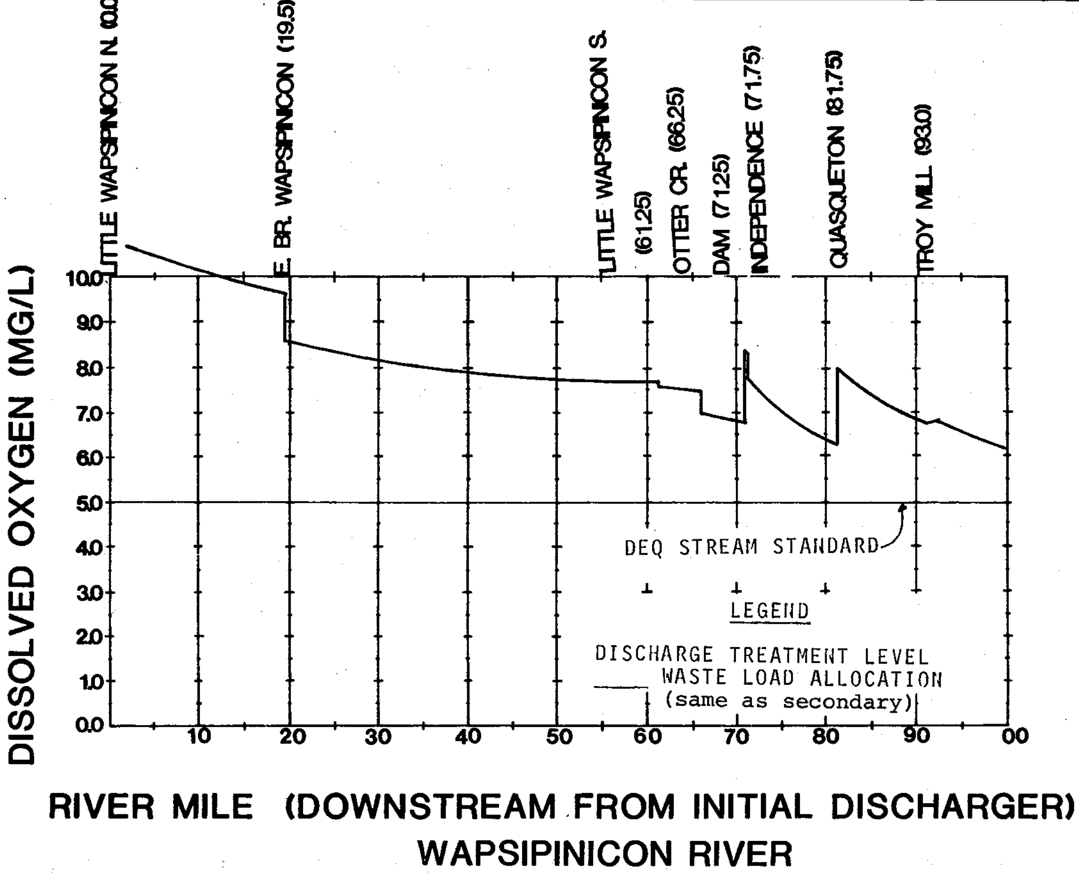


FIGURE VI-18

AMMONIA NITROGEN CONCENTRATIONS

WAPSIPINICON RIVER

SUMMER CONDITIONS



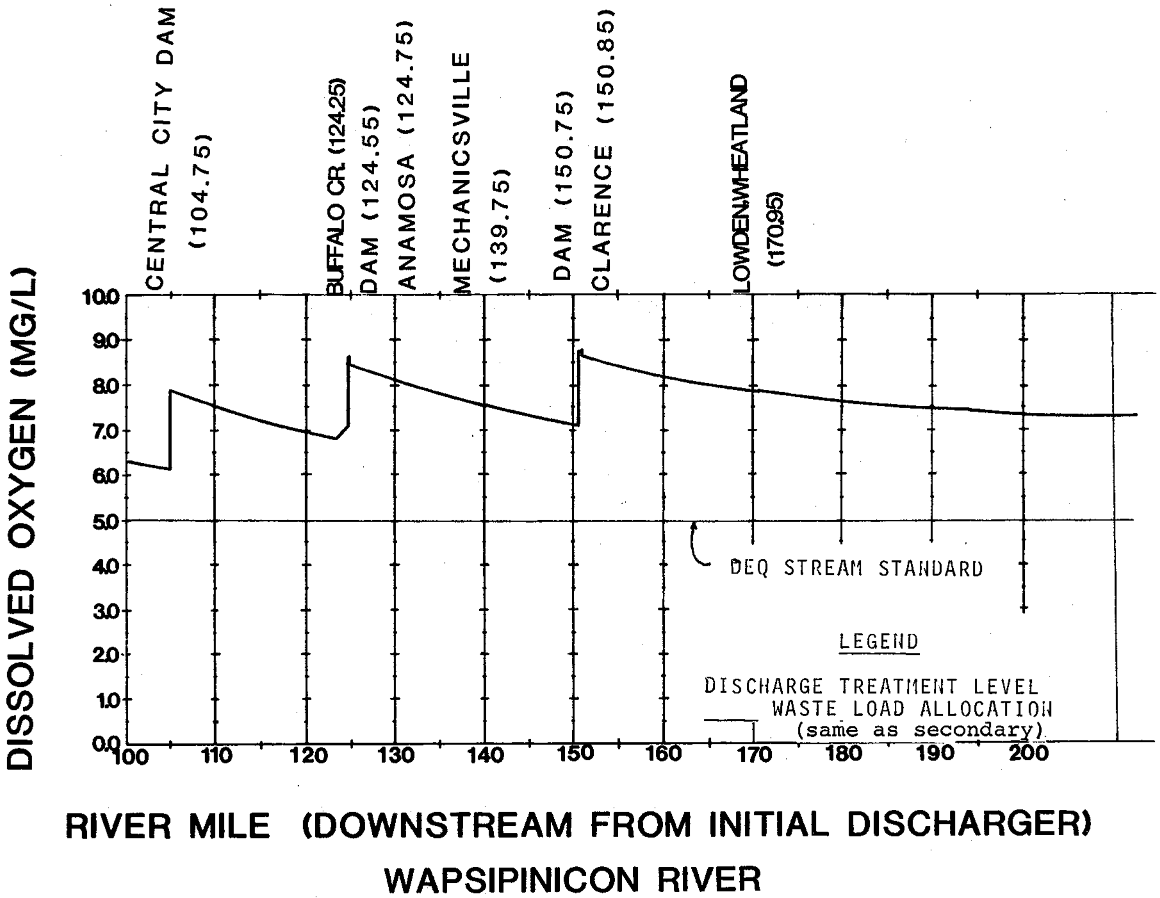
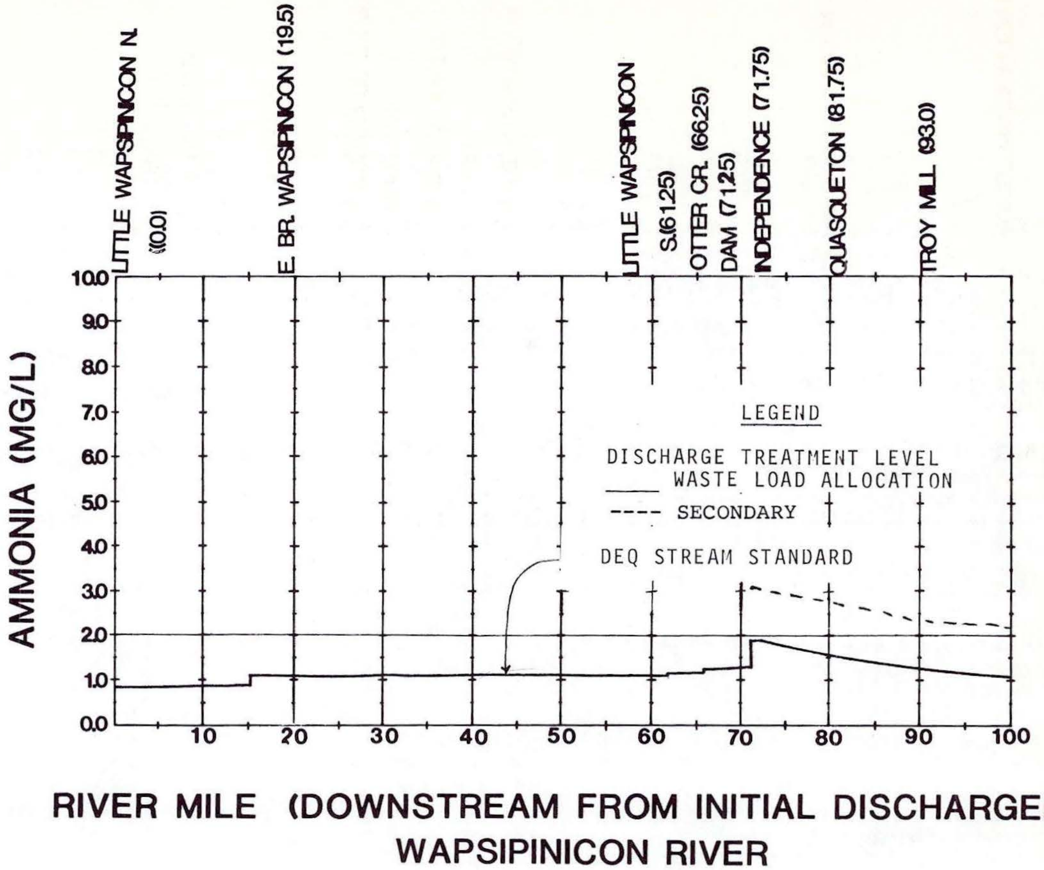


FIGURE VI-19

DISSOLVED OXYGEN CONCENTRATIONS
WAPSIPINICON RIVER
WINTER CONDITIONS



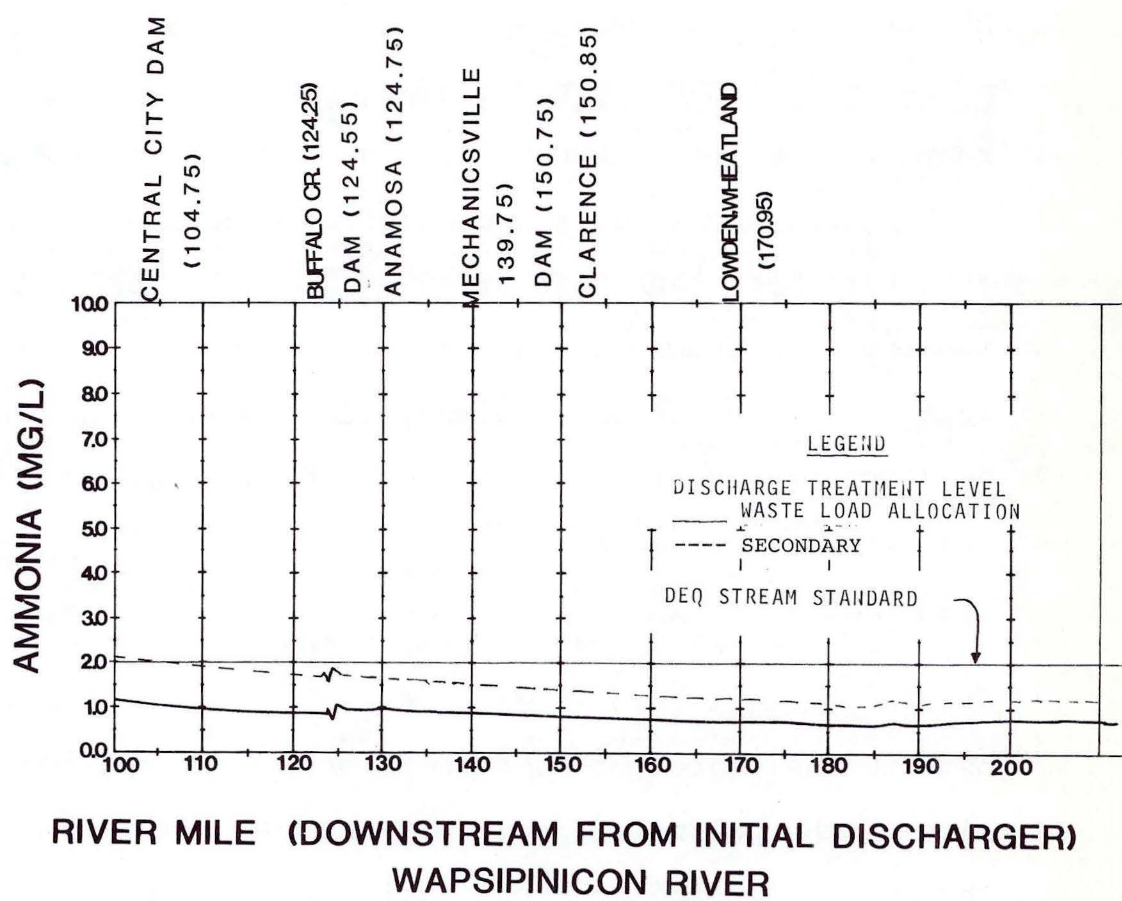


FIGURE VI-20

AMMONIA NITROGEN CONDENTRATIONS
WAPSIPINICON RIVER
WINTER CONDITIONS

expected that standards would be met even after application of secondary treatment or BPT to all point discharges to the segment.

The classifications of the stream segments in the Northeastern Iowa Basin are listed in Table VI-2. The water quality limited segments are shown in Figure VI-21. All segments not designated as water quality limited are currently considered to be effluent limited.

PRIORITY RANKINGS

Stream Segment Ranking

The Northeastern Iowa Basin has been divided into various stream segments. Each stream segment consists of surface waters that have common hydrologic characteristics and natural, physical, chemical, and biological processes. The segments have been ranked in order of abatement priority. The ranking methodology has attempted to take into account: (1) severity of pollution problems, (2) population affected, (3) need for preservation of high quality waters, and (4) national priorities.

The total points for a segment are determined from a product of the points earned in each of two factors. The formula weighs both the degree of usefulness of a segment and the severity of the pollution problem. The specific details and rationale used for the segment ranking methodology have been described in Chapter I.

Table VI-2 lists the stream segments selected, their respective priority points, and their final ranking. Figure VI-21 shows the stream segments.

Municipal Discharger Ranking Methodology

The significant municipal dischargers in the basin have been ranked to be consistent with the segment priority ranking and to be subsequently used in establishing priorities and output estimates for municipal facilities construction. The relative significance of each discharger is determined by its total points as calculated by the discharger ranking formula. The specific details and rationale used for the municipal discharger ranking methodology have been described in Chapter I.

Table VI-3 lists the municipalities in the basin, their priority points, and their final ranking.

WASTE LOAD REDUCTIONS

The waste load reductions to be achieved by the waste load allocation and providing secondary treatment are shown on Table VI-4. The waste load reductions are tabulated by stream segment. It is interesting to notice that by far the greatest load reduction takes place on the Mississippi River with its

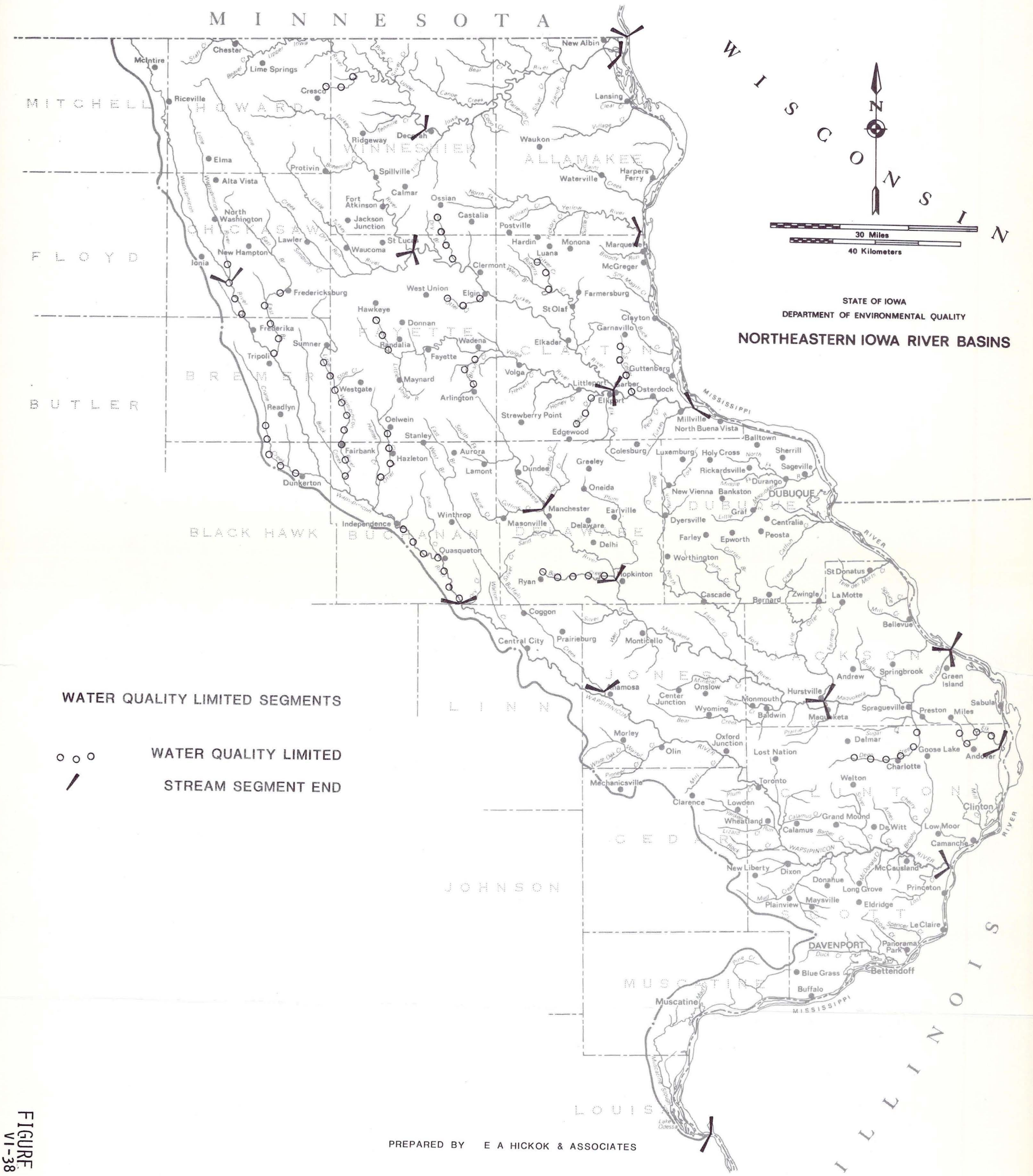


FIGURE VI-21
VI-38

more densely populated cities.

Due to a lack of data, the BOD_5 and NH_3-N values listed as being in the present discharge at critical periods have in some cases been estimated. Such estimates are noted in Table VI-4 and are designated as engineering estimates. These estimates may differ from the operational data shown in Table V-4 because all BOD_5 and NH_3-N values shown in Table V-4 are yearly averages computed from operation reports of the Effluent Quality Analysis Program (EQAP) data. The values presented in the load reduction column of Table VI-4 reflect the effluent load reduction to the stream during the winter discharge period.

As can be seen, some municipalities do not show a reduction. This may be caused by one of the following:

1. A town presently not having a discharge (e.g. individual septic systems) is projected to construct a sewer system and treatment plant.
2. A substantial increase in population or industrial flow is forecasted which would increase the present discharge.

Any of these factors could cause an increase in the BOD_5 and/or NH_3-N in the projected plant effluent.

TABLE VI-2

STREAM SEGMENT RANKING

NORTHEASTERN IOWA BASIN

Rank	River	Stream Segment	WQ/ EL*			Priority Criteria						Total Points	Priority Points
				A	B_c	B_w	C	BC	AES	POP	SQ		
1	Wapsipinicon River	Dry Creek to Confluence with Little Wapsipinicon (Chickasaw County)	WQ	2	0	1	0	1	0	1.5	6.0	36.00	21
2	Upper Iowa River	Decorah to Source	WQ	2	2	0	0	1	1	1.0	4.0	30.00	20
3	Maquoketa River	Hopkinton to Manchester	EL	2	2	0	0	1	0	1.0	2.5	26.00	19
4	Volga River	Entire Length	WQ	0	2	0	0	1	0	1.0	5.0	22.50	18
5	Mississippi River	End of Basin to Confluence with Maquoketa River	EL	2	0	1	2	1	0	2.0	2.5	21.25	17
6	Upper Iowa River	Mouth to Decorah	EL	2	2	0	0	1	1	1.0	2.5	18.75	16
7	Maquoketa River	Mouth to Maquoketa	WQ	0	2	0	0	1	0	1.0	4.0	18.00	15
8	Wapsipinicon River	Confluence with Little Wapsipinicon and above	WQ	0	2	0	0	1	0	1.0	4.0	18.00	14
9	Turkey River	Elkport to Confluence with Little Turkey River	WQ	0	0	1	0	1	0	1.0	5.0	17.5	13
10	Mississippi River	Confluence with Maquoketa River to North State Line	EL	2	0	1	0	1	0	2.0	2.5	16.25	12
11	Turkey River	Mouth to Elkport	WQ	0	2	0	0	1	0	0.5	4.0	16.00	11
12	Wapsipinicon River	Mouth to Confluence with Dry Creek	EL	2	0	1	0	1	0	1.5	2.5	15.00	10
13	Maquoketa River	Manchester to Source	WQ	2	2	0	0	1	0	0.5	4.0	15.00	9
14	Little Maquoketa R.	Entire Length	EL	0	2	0	0	1	0	1.0	2.5	11.25	8
15	Turkey River	Confluence with Little Turkey River to Source	EL	0	2	0	0	1	0	0.5	2.5	10.00	7
16	Yellow River	Entire Length	EL	0	2	0	0	1	0	0.5	2.5	10.00	6

TABLE VI-2 (cont.)

STREAM SEGMENT RANKINGS

NORTHEASTERN IOWA BASIN

Rank	River	Stream Segment	WQ/ EL*	Priority Criteria								Total Points	Priority Points
				A	B_C	B_W	C	BC	AES	POP	SQ		
17	No. Fork Maquoketa	Entire Length	EL	0	0	1	0	1	0	1.0	2.5	8.75	5
18	Maquoketa River	Maquoketa to Hopkinton	EL	0	0	1	0	1	0	1.0	2.5	8.75	4
19	Elk River	Entire Length	WQ	0	0	1	0	0	0	0.5	4.0	8.00	3
20	Little Turkey R.	Entire Length	EL	0	0	1	0	1	0	0.5	2.5	7.50	2
21	Buffalo Creek	Entire Length	EL	0	0	1	0	0	0	0.5	2.5	5.00	1

* Water Quality or Effluent Limited

TABLE VI-3

MUNICIPAL DISCHARGER RANKING

NORTHEASTERN IOWA BASIN

Rank	Municipality	Discharge Criteria A_1	D_1	B_1	$(A_1+D_1)B_1$	A_2	D_2	B_2	$(A_2+D_2)B_2$	Segment Points	Priority Points
1	Manchester	60	16	.723	54.95	60	16	.713	54.19	19	128.14
2	Dubuque	60	25	.905	76.97	50	25	.511	38.33	12	127.30
3	West Union	60	14	.907	67.09	30	12	.921	38.68	13	118.77
4	Edgewood	50	9	.778	45.89	40	9	.917	44.92	18	108.81
5	Davenport	60	25	.854	72.56	30	25	.251	13.80	17	103.36
6	Hawkeye	50	7	.833	47.5	30	5	.833	29.17	18	94.67
7	Maquoketa	60	18	.854	66.60	40	16	.23	27.44	15	94.58
8	Ryan	60	12	.828	59.62	20	9	.5	14.5	19	93.12
9	Clinton	60	25	.842	71.58	30	21	.044	2.25	17	90.83
10	Monona	50	12	.727	45.09	30	9	.818	31.91	13	90.00
11	Muscatine	60	25	.791	67.20	20	18	.00	.00	17	84.20
12	Fredericks-burg	60	14	.805	59.57	10	9	.00	.00	21	80.57
13	Troy Mills	60	7	.667	44.67	40	5	.25	11.25	21	76.92
14	Marquette	60	12	.783	56.38	30	9	.203	7.91	12	76.29
15	Arlington	30	9	.615	24	30	9	.846	33.00	18	75.00
16	Elkader	60	16	.797	60.57	30	12	.00	.00	13	73.57
17	Guttenberg	60	16	.777	59.02	1	5	.00	.00	12	71.02
18	McGregor	60	12	.595	42.84	40	9	.33	16.17	12	71.01
19	Cresco	40	14	.724	39.10	10	9	.571	10.86	20	69.96
20	Ossian	30	9	.75	29.25	20	7	.875	23.63	13	65.88
21	Hopkinton	60	14	.737	54.54	30	12	.067	2.81	4	61.35
22	Le Claire	60	16	.564	42.84	10	7	.00	.00	17	59.74
23	Postville	30	14	.606	26.66	30	14	.615	27.06	6	59.72
24	Buffalo	60	14	.57	42.20	30	9	.00	.00	17	59.20
25	Riceville	60	12	.557	40.10	30	9	.125	4.88	14	58.98
26	Waukon	40	14	.528	28.49	20	14	.487	16.56	12	57.05
27	Spragueville	30	3	.667	22.00	50	5	.333	18.32	15	55.32
28	Lime Springs	60	9	.510	35.20	10	5	.00	.00	20	55.20
29	Decorah	60	16	.443	33.67	30	16	.061	2.82	16	52.49
30	New Hampton	30	14	.00	.00	30	14	.866	38.08	14	52.08

TABLE VI-3 (cont.)

MUNICIPAL DISCHARGER RANKING

NORTHEASTERN IOWA BASIN

Rank	Municipality	Discharge Criteria								Segment Points	Priority Points
		A_1	D_1	B_1	$(A_1+D_1)B_1$	A_2	D_2	B_2	$(A_2+D_2)B_2$		
31	Clermont	60	9	.475	32.78	30	7	.143	5.29	13	51.07
32	Cascade	60	12	.345	24.84	40	12	.321	16.71	5	46.55
33	Alta Vista	50	5	.375	20.63	30	5	.333	11.66	14	46.29
34	Earlville	60	9	.393	27.11	20	7	.00	.00	19	46.11
35	Delhi	30	7	.457	16.91	20	7	.367	9.9	19	45.81
36	Calmar	60	14	.524	38.76	20	9	.00	.00	7	45.76
37	Readlyn	20	7	.563	15.2	10	3	.3	3.9	21	40.10
38	Low Moor	50	7	.375	21.38	10	1	.00	.00	17	38.38
39	Rowley	60	5	.181	11.74	40	5	.088	3.97	21	36.67
40	Garnavillo	30	7	.636	23.55	1	0	.00	.00	11	34.55
41	Quasqueton	40	7	.235	11.06	20	7	.00	.00	21	32.06
42	Elgin	50	7	.308	17.56	30	5	.00	.00	13	30.56
43	Fairbank	40	9	.179	8.75	10	5	.00	.00	21	29.75
44	New Albin	60	9	.25	17.25	40	7	.00	.00	12	29.25
45	Bellevue	40	12	.0366	1.9	40	14	.282	15.22	12	29.12
46	Strawberry Pt. N.	30	7	.20	7.4	1	0	.00	.00	18	25.40
47	De Witt	50	14	.229	14.68	1	5	.00	.00	10	24.68
48	Independence	30	16	.066	3.03	1	9	.00	.00	21	24.03
49	Oelwein	20	16	.082	2.92	20	14	.00	.00	21	23.95
50	Sumner	40	7	.00	.00	60	9	.041	2.83	21	23.83
51	Sabula	40	9	.129	6.32	20	7	.00	.00	17	23.32
52	Lowden	30	5	.375	13.13	20	3	.00	.00	10	23.13
53	Camanche	60	14	.08	5.89	50	14	.00	.00	17	22.89
54	Clarence	40	9	.25	12.25	10	5	.00	.00	10	22.25
55	Winthrop	40	9	.25	12.25	10	7	.00	.00	10	22.25
56	Preston	40	14	.128	6.91	1	5	.00	.00	15	21.91
57	Tripoli	20	9	.00	.00	1	1	.00	.00	21	21.00
58	Dunkerton	20	7	.00	.00	1	1	.00	.00	21	21.00
59	Hazelton	20	7	.00	.00	20	7	.00	.00	21	21.00
60	Westgate	0	0	.00	.00	0	0	.00	.00	21	21.00
61	Frederika	20	5	.00	.00	20	5	.00	.00	21	21.00

TABLE VI-3 (cont.)

MUNICIPAL DISCHARGER RANKING

NORTHEASTERN IOWA BASIN

Rank	Municipality	Discharge Criteria A_1	D_1	B_1	$(A_1+D_1)B_1$	A_2	D_2	B_2	$(A_2+D_2)B_2$	Segment Points	Priority Points
61	Ridgeway	0	0	.00	.00	0	0	.00	.00	20	20.00
62	Chester	20	5	.00	.00	20	5	.00	.00	20	20.00
63	Greeley	0	0	.00	.00	0	0	.00	.00	19	19.00
64	Fayette	20	9	.00	.00	10	9	.00	.00	18	18.00
65	Maynard	30	5	.00	.00	10	1	.00	.00	18	18.00
66	Volga	0	0	.00	.00	0	0	.00	.00	18	18.00
67	Wadena	20	5	.00	.00	20	5	.00	.00	18	18.00
68	Central City	30	7	.214	7.92	1	1	.00	.00	10	17.92
69	McCausland	40	7	.167	7.85	10	1	.00	.00	10	17.85
70	Lost Nation	40	7	.158	7.42	1	0	.00	.00	10	17.42
71	Blue Grass	30	9	.00	.00	10	7	.00	.00	17	17.00
72	Panorama Park	0	0	.00	.00	0	0	.00	.00	17	17.00
73	Andover	20	0	.00	.00	10	0	.00	.00	17	17.00
74	Dixon	40	5	.143	6.43	10	1	.00	.00	10	16.43
75	Oxford Jct.	30	7	.15	5.55	10	3	.00	.00	10	15.55
76	Andrew	20	5	.00	.00	1	0	.00	.00	15	15.00
77	Charlotte	0	0	.00	.00	0	0	.00	.00	15	15.00
78	Delmar	0	0	.00	.00	0	0	.00	.00	15	15.00
79	Goose Lake	30	5	.00	.00	20	3	.00	.00	15	15.00
80	Springbrook	20	1	.00	.00	20	1	.00	.00	15	15.00
81	Elma	20	7	.00	.00	20	7	.00	.00	14	14.00
82	Ionia	0	0	.00	.00	0	0	.00	.00	14	14.00
83	McIntire	0	0	.00	.00	0	0	.00	.00	14	14.00
84	Farmersburg	20	1	.00	.00	20	1	.00	.00	13	13.00
85	Castalia	0	0	.00	.00	0	0	.00	.00	13	13.00
86	Lansing	20	12	.00	.00	1	3	.00	.00	12	12.00
87	Harpers Ferry	0	0	.00	.00	0	0	.00	.00	12	12.00
88	Peosta	0	0	.00	.00	0	0	.00	.00	12	12.00
89	St. Donatus	30	5	.00	.00	20	3	.00	.00	12	12.00
90	Centralia	0	0	.00	.00	0	0	.00	.00	12	12.00

TABLE VI-3 (cont.)

MUNICIPAL DISCHARGER RANKING

NORTHEASTERN IOWA BASIN

Rank	Municipality	Discharge Criteria A_1	D_1	B_1	$(A_1+D_1)B_1$	A_2	D_2	B_2	$(A_2+D_2)B_2$	Segment Points	Priority Points
91	Waterville	0	0	.00	.00	0	0	.00	.00	12	12.00
92	Clayton	0	0	.00	.00	0	0	.00	.00	12	12.00
93	Colesburg NW	20	3	.00	.00	40	5	.00	.00	11	11.00
94	Colesburg SE	20	3	.00	.00	40	5	.00	.00	11	11.00
95	Eldridge	20	12	.00	.00	1	7	.00	.00	10	10.00
96	Anamosa	20	14	.00	.00	20	12	.00	.00	10	10.00
97	Mechanics-ville	30	9	.00	.00	20	9	.00	.00	10	10.00
98	Wheatland	20	7	.00	.00	10	5	.00	.00	10	10.00
99	Olin	20	9	.00	.00	10	3	.00	.00	10	10.00
100	Princeton	30	7	.00	.00	10	3	.00	.00	10	10.00
101	Grand Mound	30	7	.00	.00	1	0	.00	.00	10	10.00
102	Calamus	40	5	.00	.00	1	0	.00	.00	10	10.00
103	Long Grove	20	5	.00	.00	10	1	.00	.00	10	10.00
104	Donahue	20	3	.00	.00	1	0	.00	.00	10	10.00
105	Maysville	0	0	.00	.00	0	0	.00	.00	10	10.00
106	Strawberry Pt. S.	30	9	.00	.00	20	9	.00	.00	9	9.00
107	Lamont	20	7	.00	.00	20	5	.00	.00	9	9.00
108	Dundee	0	0	.00	.00	0	0	.00	.00	9	9.00
109	Farley	20	7	.00	.00	1	1	.00	.00	8	8.00
110	Sageville	0	0	.00	.00	0	0	.00	.00	8	8.00
111	Rickardsville	0	0	.00	.00	0	0	.00	.00	8	8.00
112	Sherrill E.	20	5	.00	.00	20	5	.00	.00	8	8.00
113	Sherrill S.	20	5	.00	.00	20	5	.00	.00	8	8.00
114	Monticello	40	14	.068	3.68	30	14	.00	.00	4	7.68
115	Spillville	60	5	.00	.00	40	5	.00	.00	7	7.00
116	Ft. Atkinson	0	0	.00	.00	0	0	.00	.00	7	7.00
117	Protivin	0	0	.00	.00	0	0	.00	.00	7	7.00
118	St. Lucas	0	0	.00	.00	0	0	.00	.00	7	7.00
119	Luana	20	3	.00	.00	20	3	.00	.00	6	6.00
120	Dyersville	30	14	.00	.00	20	12	.00	.00	5	5.00

TABLE VI-3 (cont.)

MUNICIPAL DISCHARGER RANKING

NORTHEASTERN IOWA BASIN

Rank	Municipality	Discharge Criteria								Segment Points	Priority Points
		A_1	D_1	B_1	$(A_1+D_1)B_1$	A_2	D_2	B_2	$(A_2+D_2)B_2$		
121	Epworth	30	9	.00	.00	10	5	.00	.00	5	5.00
122	New Vienna	30	5	.00	.00	40	7	.00	.00	5	5.00
123	Worthington	20	5	.00	.00	30	7	.00	.00	5	5.00
124	Holy Cross	40	5	.00	.00	10	1	.00	.00	5	5.00
125	La Motte	20	5	.00	.00	1	0	.00	.00	5	5.00
126	Luxemburg	0	0	.00	.00	0	0	.00	.00	5	5.00
127	Bernard	0	0	.00	.00	0	0	.00	.00	5	5.00
128	Wyoming	30	7	.00	.00	20	7	.00	.00	4	4.00
129	Monmouth	0	0	.00	.00	0	0	.00	.00	4	4.00
130	Onslow	20	5	.00	.00	20	3	.00	.00	4	4.00
131	Baldwin	0	0	.00	.00	0	0	.00	.00	4	4.00
132	Center Jct.	0	0	.00	.00	0	0	.00	.00	4	4.00
133	Miles	20	5	.00	.00	10	3	.00	.00	3	3.00
134	Lawler	20	7	.00	.00	20	7	.00	.00	2	2.00
135	Waucoma	0	0	.00	.00	0	0	.00	.00	2	2.00
136	Coggon	40	7	.00	.00	10	1	.00	.00	1	1.00
137	Prairieburg	0	0	.00	.00	0	0	.00	.00	1	1.00
138	Aurora	0	0	.00	.00	0	0	.00	.00	1	1.00

TABLE VI-4

WASTE LOAD REDUCTIONS

NORTHEASTERN IOWA BASIN

Discharger	Reference Number	Present Flow (mgd)	Present Lbs.Eff. BOD_5/NH_3	Projected (1990) Flow (mgd)	Projected (1990) Lbs.Eff. BOD_5/NH_3	Load Reduction BOD_5/NH_3
-Upper Iowa River						
Mouth to Decorah						
Decorah	M-5	.849	715/212	1.59	398/199	390/A
Total:						390/0*
Decorah to Source						
Ridgeway	M-4	.020	5[E]/3[E]	.020	CD	--/--
Cresco	M-3	.283	116/14	.380	32/6	84/8
Lime Springs	M-2	.096	49/4	.050[E]	13/7	25/A
Chester	M-1	.019[E]	5E/3[E]	.019[E]	CD	--/--
Total						109/8*
-Yellow River						
Entire Length						
Luana	M-12	.031	8[E]/4[E]	.038	CD	--/--
Postville	M-11	.188	58/30	.258	65/32	A/A
Total:						0*/0*
-Turkey River						
Mouth to Elkport						
Colesburg NW	M-50	.019	4/4	.036	CD	--/--
Colesburg SE	M-49	.018	4/4	.036	CD	--/--
Garnavillo	M-47	.040	11/0	.063	5/1	6/A
Total:						6/0*
Elkport to Confluence with L. Turkey River						
Farmersburg	M-32	.016	3/1	.020	CD	--/--
Monona	M-31	.147	66/22	.209	17/4	49/18
Elkader	M-30	.145	266/25	.240	60/30	166/A
Elgin	M-29	.052	23/7	.058	15/7	8/0
West Union	M-28	.149	182/38	.353	29/6	153/32
Clermont	M-27	.038	20/7	.065E	16/8	4/A
Castalia	M-26	NEMTP		.021	CD	--/--
Ossian	M-25	.076	24/16[E]	.076	6/1	18/15
Total:						398/65*
Confluence of L. Turkey R. to Source						
St. Lucas	M-21	No Plant		.022	CD	--/--
Ft. Atkinson	M-20	No Plant		.034	CD	--/--
Calmar	M-19	.103	93/10	.283	70/35	23/A
Spillville	M-18	.014	8/3	.036[E]	CD	--/--
Protivin	M-17	No Plant		.033	CD	--/--
Total:						23/0*
-Little Turkey River						
Entire Length						
Waucoma	M-24	No Plant		.040	CD	--/--
Lawler	M-22	.051[E]	13[E]/7[E]	.058	CD	--/--
Total:						0/0
-Volga River						
Entire Length						
Edgewood	M-44	.057	27/12	.097[E]	8/2	19/10
Strawberry Pt. N.	M-42	.024	10/0	.241[1]	CD	--/--
Volga	M-41	No Plant		.035	CD	--/--
Arlington	M-40	.055	17/8	.061	10/2	7/6
Wadena	M-39	.024[E]	6[E]/3[E]	.026[E]	CD	--/--
Fayette	M-38	.197	41/13	.371[E]	93/34	A/A
Maynard	M-35	.037	8/1	.056[E]	14/7	A/A
Hawkeye	M-34	.025	12/3	.059[E]	5/1	7/2
Total:						33/18*

Discharger	Reference Number	Present Flow (mgd)	Present Lbs.Eff. BOD_5/NH_3	Projected (1990) Flow (mgd)	Projected (1990) Lbs.Eff. BOD_5/NH_3	Load Reduction BOD_5/NH_3
-Little Maquoketa River						
Entire Length						
Sageville	M-61	No Plant		.066	CD	--/--
Farley	M-59	.076	16/1	$.213^{E}$	53/27	A/A
Richardsville	M-56	No Plant		.038	CD	--/--
Sherrill South	M-55	$.013^{E2}$	$5/3^{E2}$	$.037^{E2}$	CD	--/--
Sherrill East	M-54	See Sherrill South				
Total:						0*/0*
-Maquoketa River						
Mouth to Maquoketa						
Spragueville	M-103	.011	$3^{E}/3^{E}$	$.015^{E}$	4/2	A/1
Preston	M-102	.320	125/3	.436	CD	--/--
Delmar	M-101	No Plant		$.080^{E}$	CD	--/--
Goose Lake	M-100	$.022^{E}$	$6^{E}/2^{E}$	$.025^{E}$	CD	--/--
Charlotte	M-99	No Plant		$.059^{E}$	CD	--/--
Springbrook	M-98	$.020^{E}$	$5^{E}/3^{E}$	$.027^{E}$	CD	--/--
Maquoketa	M-97	.752	1054/151	.926	154/77	900/74
Total:						900*/74
Maquoketa to Hopkinton						
Baldwin	M-84	No Plant		$.023^{E}$	CD	--/--
Monmouth	M-83	No Plant		.035	CD	--/--
Wyoming	M-82	.054	15/6	.063	CD	--/--
Onslow	M-81	$.025^{E}$	$6^{E}/2^{E}$	$.030^{E}$	CD	--/--
Center Junction	M-80	No Plant		.020	CD	--/--
Monticello	M-79	.491	176/74	.656	164/82	11/A
Hopkinton	M-78	.177	213/30	.225	56/28	157/2
Total:						168/2
Hopkinton to Manchester						
Ryan	M-77	.207	126/17	.217	18/7	108/10
Earlville	M-75	.053	28/6	.067	17/8	9/A
Oneida	M-74	No Plant		$.007^{E}$	CD	--/--
Greeley	M-73	No Plant		$.041^{E}$	CD	--/--
Delhi	M-72	.053	$14^{E}/6^{E}$	$.067^{E}$	CD	--/--
Manchester	M-71	.581	581/223	.772	161/64	420/159
Total:						537/169*
Manchester to Source						
Dundee	M-69	No Plant		.021	CD	--/--
Lamont	M-68	$.050^{E}$	$11^{E}/4^{E}$	$.056^{E}$	CD	--/--
Strawberry Pt. S.	M-67	.150	39/11	See Strawberry Pt. N.		
Total:						0/0
-N. Fork Maquoketa River						
Entire Length						
Andrew	M-95	.024	5/0	.033	CD	--/--
LaMotte	M-94	.040	9/0	.055	CD	--/--
Bernard	M-92	No Plant		.029	CD	--/--
Epworth	M-91	.123	33/3	.239	60/30	A/A
Cascade	M-90	$.174^{E}$	$87^{E}/42^{E}$	$.225^{E}$	56/28	30/14
Worthington	M-89	.029	7/5	.055	14/7	A/A
Dyersville	M-88	.442	133/33	.663	166/83	A/A
New Vienna	M-87	.024	6/5	.045	11/6	A/A
Luxemburg	M-86	No Plant		.036	CD	--/--
Holy Cross	M-85	.020	7/1	$.056^{E}$	CD	--/--
Total:						30*/14*

Discharger	Reference Number	Present Flow (mgd)	Present Lbs. Eff. BOD_5/NH_3	Projected (1990) Flow (mgd)	Projected (1990) Lbs. Eff. BOD_5/NH_3	Load Reduction BOD_5/NH_3
-Wapsipinicon River						
Mouth to Confluence with Dry Creek						
McCausland	M-158	.035	12/1	$.026^E$	CD	--/--
De Witt	M-157	.466	218/4	$.673_E$	168/84	50/A
Grand Mound	M-155	.042	12/0	$.071^E$	CD	--/--
Long Grove	M-154	.030	7/1	.034	CD	--/--
Donahue	M-153	.018	4/0	.021	CD	--/--
Maysville	M-152	No Plant		$.019_E$	CD	--/--
Eldridge	M-151	.335	74/6	$.542_E$	CD	--/--
Dixon	M-149	.020	7/1	$.032^E$	CD	--/--
New Liberty	M-148	No Plant		$.016_E$	CD	--/--
Calamus	M-147	.020	7/0	$.053^E$	CD	--/--
Wheatland	M-146	.067	14/4	.076	19/10	A/A
Lowden	M-145	$.018_E$	6/2	$.019_E$	5/2	1/0
Lost Nation	M-144	$.055_E$	$19^E/1^E$	$.062^E$	CD	--/--
Oxford Junction	M-142	$.067^E$	$17^E/2^E$	.078	CD	--/--
Clarence	M-141	.070	24/3	.073	18/9	6/A
Olin	M-140	.089	21/2	.104	CD	--/--
Mechanicsville	M-139	.113	30/10	.119	30/15	O/A
Anamosa	M-137	.534	111/40	.534	134/67	A/A
Central City	M-132	.045	14/1	.045	11/6	3/A
Troy Mills	M-131	.014	$12^E/4^E$	.022	6/3	6/1
Total:						66*/1*
Dry Creek to Confluence with Little Wapsipinicon River						
Rowley	M-167	0.015_E	-/-	--	CD	--/--
Quasqueton	M-130	$.046^E$	$17^E/6^E$	$.052^E$	CD	--/--
Winthrop	M-129	.071	26/4	.080	20/10	6/A
Independence	M-128	1.29	410/11	1.53	383/89	27/A
Hazelton	M-127	.050	12/6	.056	14/7	A/A
Oelwein	M-126	1.69_E	409/127	1.95_E	325/163	84/A
Fairbank	M-125	$.081^E$	$28^E/4^E$	$.091^E$	CD	--/--
Westgate	M-124	No Plant		$.023_E$	CD	--/--
Sumner	M-123	$.141_E$	17/20	$.230^E$	58/19	A/1
Dunkerton	M-122	$.056^E$	$14^E/1^E$	$.087^E$	CD	--/--
Readlyn	M-121	.076	16/2	$.082_E$	7/1	9/1
Fredericksburg	M-120	.212	182/11	$.425^E$	35/18	147/A
Tripoli	M-119	$.123_E$	27/1	.161	CD	--/--
Frederika	M-118	$.019^E$	$5^E/3^E$	.021	CD	--/--
Total:						271*/2*
Confluence with Little Wapsipinicon River and Above						
New Hampton	M-117	.784	242/144	.978	244/15	A/128
Alta Vista	M-115	.017	7/3	.019	5/2	2/1
Elma	M-114	.068	15/6	.068	17/9	A/0
Ionia	M-113	No Plant		.030	CD	--/--
Riceville	M-112	.140	79/20	.140	CD	--/--
McIntire	M-111	No Plant		.023	CD	--/--
Total:						2*/129
-Buffalo Creek						
Entire Length						
Prairieburg	M-136	No Plant		.029	CD	--/--
Coggon	M-135	.044	15/1	.068	17/9	A/A
Aurora	M-134	No Plant		.026	CD	--/--
Stanley	M-133	No Plant		.017	CD	--/--
Total:						0*/0*
-Paint Creek						
Entire Length						
Waukon	M-9	.888	311/104	$.900^E$	80/27	231/77

Discharger	Reference Number	Present Flow (mgd)	Present Lbs.Eff. BOD_5/NH_3	Projected (1990) Flow (mgd)	Projected (1990) Lbs.Eff. BOD_5/NH_3	Load Reduction BOD_5/NH_3
-Elk River						
Entire Length						
Andover	M-107	.006	1/0	.008	CD	--/--
Miles	M-106	.039	8/2	.053	9/2	A/0
Total:						0*/0
-Mississippi River						
End of Basin to Confluence with Maquoketa River						
Muscatine	M-166	5.76	8,359/624	6.99	1,750/875	6,609/A
Blue Grass	M-165	.097	27/5	.204	CD	--/--
Buffalo	M-164	.137	121/23	.201	50/25	71/A
Davenport	M-163	17.12	30,690/2,998	17.96	4,494/2,246	26,196/752
Bettendorf	M-162	To Davenport STP				
Panorama Park	M-161	No Plant		.025	CD	--/--
LeClaire	M-160	.252	$259^E/6^E$	$.454^E$	114/57	145/A
Princeton	M-159	.039	11/2	$.072^E$	CD	--/--
Low Moor	M-110	$.035^E$	16/1	$.039^E$	CD	--/--
Camanche	M-109	.405	226/104	$.833^E$	208/104	18/0
Clinton	M-108	7.99	14,527/1,199	9.16	2,292/1,146	12,234/53
Sabula	M-105	.078	31/7	.106	27/14	4/A
Total:						45,277/805*
Confluence with Maquoketa River to North State Line						
Bellevue	M-66	.234	82/55	$.315^E$	79/39	3/16
St. Donatus	M-65	$.016^E$	$5^E/1^E$	$.022^E$	CD	--/--
Peosta	M-64	No Plant		.023	CD	--/--
Centralia	M-63	No Plant		.020	CD	--/--
Dubuque	M-62	9.800	29,505/2,861	11.18	2,798/1,399	26,707/1,462
Balltown	M-53	No Plant		$.015^E$	CD	--/--
Guttenburg	M-16	.342	573/6	$.327^E$	82/41	491/A
McGregor	M-14	.086	66/20	.106	27/13	39/7
Marquette	M-13	.069	97/14	.085	21/20	76/4
Harpers Ferry	M-8	No Plant		.026	CD	--/--
Lansing	M-7	.140	28/1	$.162^E$	41/20	A/A
New Albin	M-6	.056	45/12	$.074^E$	19/9	26/3
Total:						27,342*/1,492*

LEGEND

"A" Minor load increase due to increased population growth or new STP being constructed with increased flows, or due to unreliable operating data being reported.

"CD" Controlled discharge

"E" Engineering estimate

(1) Includes Strawberry Point South

(2) Includes Sherrill East

"*" Apparent load reduction based on available information

"PS" Partial Storage

REFERENCES

1. Supporting Document for Iowa Water Quality Management Plans, Iowa Department of Environmental Quality, Water Quality Management Division, Des Moines, Iowa, 1976.

CHAPTER VII

NONPOINT POLLUTION SOURCES

NORTHEASTERN IOWA BASIN

Wastes from nonpoint (area) sources, mainly the fields and other lands of the basin, vary tremendously with respect to time and place of flow into the basin's rivers.

During times of dry weather, the contribution of area sources to streams and other water bodies is minimal. At such times wastes accumulate on the land. A light rain will carry some of these wastes into streams, while a heavier rain will generally carry heavier amounts. Further, variation of the location of input waste and total amount injected will occur with the distribution of rainfall over an area. Simply stated, contamination of waters from area sources is a function of the weather.

Area source impact is a function of the amount of material that has been accumulated on the land as a function of the duration of dry weather, the amount and intensity of rain, and the distribution of rain. A light, spotty rain after a long wet period will inject only small amounts of wastes at a few spots along a stream, while heavy, widespread downpours occurring after a long drought, especially in certain soil types, can inject massive amounts of wastes over the entire lengths of streams, completely overtaxing the streams assimilative capacity. This happens in spite of the increased quantities of water from the heavy rains.

At such rainy times, the problems of agricultural wastes may be compounded by discharges of combined storm and sewer systems and runoff from urban streets and lots.

There is much less information on area sources than there is on point sources. Data are lacking on such because of difficulties in monitoring relatively small concentrations over expansive areas, ecomonic factors, and probably cultural attitudes.

Area sources can be grouped into three major categories: general rural fields and woodlands, animal feedlots and operations, and urban area sources. Feedlots in some cases approach being point sources. However, it is often difficult to draw a distinct line between a feedlot and general feeding operations of middle- and smaller-sized farms. Even large feedlots can be uncharacteristic of point sources, such as when remote from streams, for their materials may be altered or spread over a large area before reaching a water body.

Land Use

About 96 percent of the land in the Northeastern Iowa Basin is rural. This rural land, for purposes here, is divided into four general categories: cropland, pasture, forest and "other" land.

Cropland consists of tilled land or land being prepared for tillage, temporarily idle land that is usually used to raise crops, land in "soil improvement", land in cover crops not harvested or pastured, and hay land permanently used for forage.

Pasture is grassland or other lands primarily used for grazing.

Forest is land that has at least 10% tree cover and is capable of producing timber or other forest products.

Lands other than these (in the "other" category) consist of such regions as farmsteads, roads, animal feeding operations, ditch banks, hedge and fence rows, rural residences, investment tracts, marshes not used for grazing, borrow pits, and gravel pits.

Estimates of land use in each of the basins and hydrological units were made using information from the "Iowa Conservation Needs Committee" (1).

Table VII-1 lists the acreages of land use in the Northeastern Iowa Basin by hydrologic unit. Note that in each unit, the nearly overwhelming land use is cropland.

Contaminants From Area Sources

The most serious contaminants of water bodies in the Northeastern Basin are phosphorus and nitrogen, sediments,

TABLE VII-1

LAND USE CLASSIFICATION

NORTHEASTERN IOWA BASIN

Hydrologic Unit	Land Use In Acres							
	Cropland	Pasture	Forest	Federal	Urban	Smaller Water	Other	Total
Wapsipinicon River	1,254,757	144,207	106,106	5,213	89,287	2,268	46,860	1,641,14
Maquoketa River	815,171	134,626	144,572	10,482	47,017	541	31,291	1,172,67
Yellow River	82,869	21,098	44,408	3,389	4,162	33	2,486	155,02
Upper Iowa River	330,234	74,243	83,214	3,717	13,447	6	11,277	512,41
Other	1,327,852	285,199	302,771	21,210	85,028	1,973	48,752	2,049,60
Total	3,810,883	659,373	681,071	44,011	238,951	4,821	140,666	5,530,85

ammonia nitrogen, suspended organic solids, BOD and COD materials. Pesticides and herbicides are a potential problem. Plant materials may pose special problems in the case of reservoir creation.

Phosphorus and Nitrogen

Phosphorus is especially important to water bodies because it is usually the critical nutrient element for algae growth. The impact of phosphorus is especially severe on lakes and impoundments, as well as in quiescent waters, such as bayous along the Mississippi. The problem with algae blooms has been the subject of much study in recent times.

The effects of phosphorus and other nutrients have been a subject of investigation in the Northeastern Iowa Basin. In the headwaters of the Buffalo Bill Watershed (2) a stream that flows into the Wapsipinicon in Scott County was studied. As will be noted later in the discussion on animal feedlots, large quantities of phosphorus are found in mammal wastes. Animal feedlots were found to be a significant source of phosphorus in the watershed after heavy rains.

Artificial fertilizers are also a source of phosphorus and nitrogen from area sources, although phosphorus from fertilizers does not have the impact of phosphorus from point sources, since fertilizer phosphorus has a high affinity for soil particles, and does not readily dissolve in waters.

Through increase of algae population, phosphorus leads to increases in biological oxygen demand (BOD) due to decomposition of the cells that die. During the night, algae respiration significantly lowers the amount of dissolved oxygen in the water. The growth of the algae increases the turbidity and suspended solids levels, causing other variations such as alteration of the temperature structure, which, in turn, may affect other life forms and physical processes. Further, algae often impart tastes and odors to water which makes it obnoxious for recreation, and, for some persons, undrinkable even when treated.

Nitrogen can be, in some instances, the limiting element to the production of algae. However, in the Northeastern basins, phosphorus is the key element to algae problems.

Sediments

Sediments have a negative impact on water quality. Not only do they fill streambeds, but they increase turbidity, which, in turn alters temperature structure and thus the biological composition of the water body. They also serve as carriers of phosphates and organic materials.

Sediments mainly enter streams during the short, intense showers that occur throughout the Northeastern basins during the warm season.

Ammonia Nitrogen

Animals are rich sources of ammonia nitrogen, which results from the hydrolysis of urea. The impact of ammonia is severe where cattle or other farm animals have direct access to a stream, enabling direct injection of the material into the waters. Ammonia problems are dramatically lessened where a good distance exists between animals and streams. Where adequate distance and erosion control methods are implemented, ammonia has little impact.

Since ammonia has high affinity for soil particles, its injection to streams occurs most strongly at times of heavy rain and surface runoff.

Pesticides and Herbicides

Pesticides and herbicides constitute a potential hazard to water quality. Massive rains after widespread applications of pesticides and herbicides could easily result in the injection of vast quantities of this material to streams. Fortunately, pesticides and herbicides quickly dissipate as a threat to water quality, so that within a few days after application they no longer constitute a major threat to contamination. Moreover, even a moderate rainfall soon after the application of these materials renders them virtually useless as killers of pests and unwanted plants. Thus, farmers and sprayers, in their own economic interest, seek to avoid application when rain threatens. Research projects, such as the Buffalo Bill Watershed study, have failed to gather data on pesticides and herbicides following rain because of the care that is taken by applicators.

Suspended Solids

Organic suspended solids from animal feedlots are responsible for the formation of sludge along the banks of streams and lakes. Unlike sediment from sheet erosion, they cause odor problems and are a repulsive element in the waters. Organic solids deprive the water bodies of oxygen, and often are responsible for killing desirable organisms and bringing about increases in undesirable life forms.

BOD and COD

Miscellaneous other animal waste ingredients producing high biological oxygen demand (BOD) and chemical oxygen demand (COD) are a further serious source of damage to water quality. Impact of these materials may also be especially great after heavy rains.

Special Reservoir Problems

When reservoir sites are flooded, land plants die and organic residues begin to decompose below the rising waters. Nutrients are released and algae and other micro-organisms flourish in the nutrient enriched environment. Ten to fifteen years are normally required before biodegradable substances are decomposed and the reservoir becomes stabilized.

Although much research has been conducted dealing with the limnology of impoundments, a great deal of uncertainty still exists in predicting the influence of reservoirs and reservoir operation on water quality. The interrelationships between the various chemical and biological factors within a large body of water are extremely complex. Climatic changes, variations in the terrestrial environment, and other special conditions unique to each individual impoundment make it extremely difficult to determine the exact conditions that will occur in a given reservoir. Normally, reservoirs with extensive shallow areas tend to support algae populations and are prone to develop taste and odor problems. Where reservoirs are used to store flood waters, the level is normally lowered during the summer, thus destroying stratification during the most critical period of the year when rates of decomposition are high and algae blooms are common. This is very helpful in preventing the development of extensive algae blooms in the shallow areas.

GENERAL RURAL RUNOFF

The Northeastern Iowa Basin contains virtually no lakes because of the well-developed drainage system. The effects of runoff on water quality in this part of the State, therefore, relate essentially to streams.

Runoff problems in northeastern Iowa center around the widespread use of phosphorus and nitrate fertilizer. Less important, but still to be regarded, are silt and pesticide-herbicides. Because these materials are transported by relatively fast-flowing streams, their impact is greatest along the quiescent waters of the Mississippi.

However, these materials pose some problems within the basin. The small ponds and impoundments that do exist are precious locally because of their relative scarcity. The Mississippi is an important source of recreation and other water related activities. The potential for damage to the streams and the aquatic life therein from pesticides-herbicides looms as a threat on the day that may come if heavy applications are followed by heavy rains.

An estimate of nutrient pollution from phosphorus and nitrogen has been made based on techniques detailed in the Supporting Document (3). A total of about 19,000 tons of nitrogen and 570 tons of phosphorus are estimated to enter streams in the Northeastern Iowa Basin each year. Table VII-2 delineates the estimate by hydrological units. The Wapsipinicon Basin constitutes the heaviest single load of nutrients, followed by the Maquoketa Basin.

The Supporting Document recommends remedial procedures to reduce wasteloads from agricultural cropland. Basically, the Supporting Document recommends that the soundest approach to pollution reduction involves soil conservation and sound management of fertilizers. The 1970 Conservation Needs Inventory was used to summarize treatment measures necessary to reduce surface runoff and limit soil losses to levels established by the Soil Conservation Districts (Table VII-3). The associated implementation costs were then developed based

TABLE VII-2

ESTIMATED NUTRIENT LOADINGS FROM CROPLAND

NORTHEASTERN IOWA BASIN

Hydrologic Unit	Cropland (acres)	Nitrogen (ton/year)	Phosphorus (ton/year)
Wapsipinicon River	1,254,757	6,274	188
Maquoketa River	815,171	4,076	122
Yellow River	82,869	414	12
Upper Iowa River	330,234	1,651	50
Other	1,327,852	6,639	199
Total	3,810,883	19,054	571

TABLE VII-3

RUNOFF CONTROL MEASURES REQUIRED

NORTHEASTERN IOWA BASIN

Hydrologic Unit	Cropland Acres: Terracing Stripcropping	Cropland Acres: Grade Stabilization	Pasture Acres: Diversions	Pasture Acres: Land Conversions	Pasture Acres: Critical Area Planting	Pasture Acres: Grassland Management	Acres Woodland Managemen
Wapsipinicon	256,394	139,311	37,188	1,295	12,966	3,998	72,295
Maquoketa	278,870	80,541	21,964	1,906	16,747	1,654	114,697
Yellow	50,498	114	3,504	14	1,942	440	36,658
Upper Iowa	148,018	23,317	4,647	584	6,387	2,739	64,496
Other	483,692	101,310	23,494	1,269	12,555	8,674	397,469
Total	1,217,472	344,593	90,797	5,068	50,597	17,505	685,615

on these needs and cost estimates provided by the Soil Conservation Service (Table VII-4). The cost of treatment measures to reduce runoff from cropland was by far the largest cost segment since cropland would be more susceptible to runoff due to limited soil cover. Annual costs for the various types of treatment are also listed in Table VII-4. Total capital costs are shown in Table VII-5 and summarized on Table VII-6. The annual costs are also shown on Table VII-6. The total capital cost of the runoff control measures for the Northeastern Iowa Basin is almost 309 million dollars.

ANIMAL FEEDING OPERATIONS

Livestock constitute another important source of stream contamination. For the most part, farm animals are mostly mammals, which, like people, have vastly expanded in total number far beyond the balance they had with other life forms in prehistoric times. Mammals, unfortunately, have a general characteristic of being large contributors of wastes relative to other animal forms. Because of the large mammal population now present in the Northeastern Iowa Basin, mostly swine, cattle, and sheep, a pollution problem is present that did not exist a century or so ago. As stated in the introduction, animal wastes enter streams mainly in times of runoff.

Table VII-7 gives estimates of the population of cattle, swine, sheep and also poultry in the various hydrological units in 1971 (4). Swine constitute, by far, the greatest number of

TABLE VII-4

ANNUAL UNIT COSTS FOR STATEWIDE CONTROLS

~~NORTHEASTERN IOWA BASIN~~

Land Use	Total Cost	Total Acres	Capital Cost/Acre	Annual Cost/Acre
Cropland				
Stripcropping and Terracing	$824,677,000	7,932,499	$ 103.96	$5.00
Grade Stabilization	$638,440,000	1,873,037	$ 340.86	$1.50
Pasture				
Diversions	$ 7,003,000	610,660	$ 11.47	$5.00
Land Conversions	$ 29,647,000	16,682	$1,777.18	$2.00
Critical Area Planting	$ 8,002,000	715,003	$ 11.19	$1.00
Grassland Management	$ 9,296,000	229,332	$ 40.54	$1.00
Woodland				
Woodland Management	$160,080,000	2,055,435	$ 77.88	$2.00
	$1,677,145,000	13,432,648		

TABLE VII-5

CAPITAL RUNOFF CONTROL COSTS BY SUBBASIN

NORTHEASTERN IOWA BASIN

	Cropland		Pasture					
Hydrologic Unit	Terracing Stripcropping	Grade Stabilization	Diversions	Land Conversions	Critical Area Planting	Grassland Management	Woodland Management	Total
Wapsipinicon	$ 26,655,184	$ 27,485,294	$ 426,469	$2,301,454	$145,110	$162,059	$ 5,630,430	$ 82,806,000
Maquoketa	$ 28,991,830	$ 27,453,059	$ 251,881	$3,387,314	$187,425	$ 67,045	$ 8,932,754	$ 69,271,308
Yellow	$ 5,249,863	$ 38,858	$ 40,184	$ 24,881	$ 21,734	$ 17,835	$ 2,854,974	$ 8,248,329
Upper Iowa	$ 15,388,219	$ 7,947,790	$ 53,291	$1,037,876	$ 71,481	$111,026	$ 5,023,034	$ 29,633,717
Other	$ 50,285,496	$ 34,532,342	$ 269,427	$2,255,248	$140,510	$351,602	$30,955,412	$118,790,037
Total	$126,570,593	$117,457,343	$1,041,253	$9,006,773	$566,260	$709,567	$53,396,604	$308,748,393

TABLE VII-6

GENERAL RUNOFF TREATMENT COSTS*

NORTHEASTERN IOWA BASIN

Hydrologic Unit	Total Costs		
	Capital	Annual Operation and Maintenance	Annual**
Wapsipinicon River	$ 82,806,000	$1,840,000	$ 9,657,000
Maquoketa River	69,271,000	1,875,000	8,414,000
Yellow River	8,248,000	346,000	1,125,000
Upper Iowa River	29,633,000	1,252,000	4,049,000
Other	118,790,000	3,505,000	14,719,000
Total	$308,748,000	$8,818,000	$37,964,000

* 1974 Dollars

** Represents capital costs ammortized at 7% plus recurring costs

TABLE VII-7

ANIMAL DISTRIBUTION

NORTHEASTERN IOWA BASIN

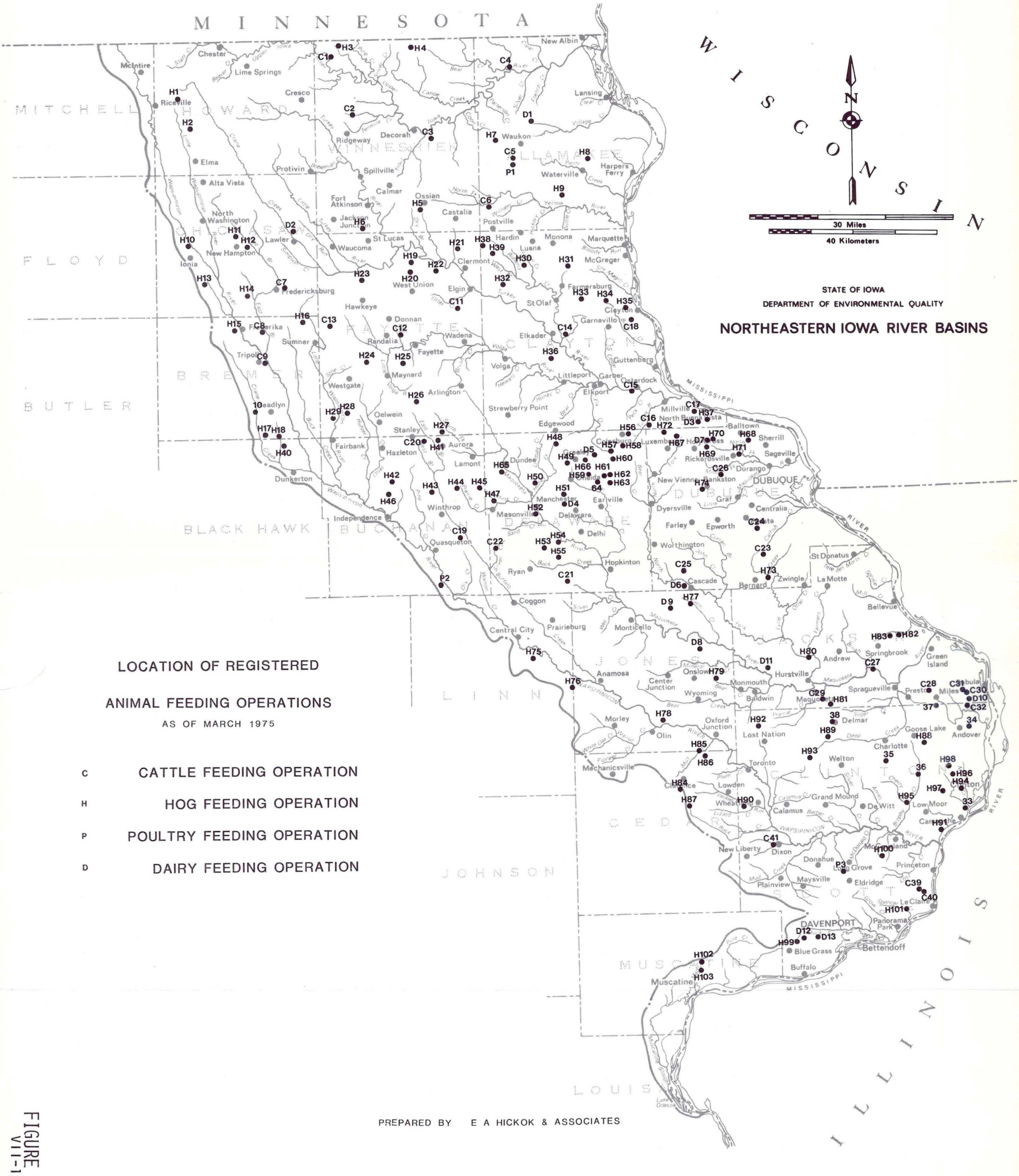
Hydrologic Unit	Cattle	Swine	Sheep	Poultry
Wapsipinicon River	168,889	1,034,216	15,126	635,055
Maquoketa River	118,337	879,840	12,891	294,424
Yellow River	3,654	67,410	436	42,724
Upper Iowa River	14,716	239,049	2,461	212,867
Other	117,821	1,128,203	8,763	621,459
Total	423,417	3,348,718	39,677	1,806,529

animals in the basin, with their numbers exceeding the totals for all other animals combined.

Animal feedlots are the most easily identified of all sources of stream contamination by farm livestock. This is because they are relatively large and concentrated, and thus, highly visible and monitorable. Figure VII-1 gives the locations of registered animal feedlots in the basin, and Table VII-8 gives a list of the feedlots. The table also lists the type of controls that each feedlot had effected.

The Supporting Document gives details on the pollution waste characteristics of animals. According to the Supporting Document, the example is given that 300 cattle will produce about 300 pounds of BOD_5 (a measure of impact on dissolved oxygen in waters) per day. That amount, according to the Document, is 5 times that produced by a person. However, animal feedlots do not discharge their wastes to streams directly or continuously. Periods of high runoff move the contaminants from their deposition site to receiving waters. At such times the load on the stream can exceed that of 1,500 people.

The quantity of contaminant load actually reaching different streams from different livestock operations is quite variable. Type of lot surface, slope, precipitation, amount and distribution soil condition, distance to stream, terrain, concentration of animals, all influence the impact of waste discharges.



LOCATION OF REGISTERED
ANIMAL FEEDING OPERATIONS
AS OF MARCH 1975

C CATTLE FEEDING OPERATION
H HOG FEEDING OPERATION
P POULTRY FEEDING OPERATION
D DAIRY FEEDING OPERATION

FIGURE VII-1

TABLE VII- 8

ANIMAL FEEDING OPERATIONS

NORTHEASTERN IOWA BASIN

Registration No.	County	No. Of Animals	Ref. No.	Type Controls*
		HOG FEEDING OPERATIONS		
2-03-00-4-01	Allamakee	400	H- 8	SL
" 02		2,700	H- 9	SL
" 03		300	H- 7	ST
2-07-00-4-05	Blackhawk	380	H-40	RC
2-09-00-4-01	Bremer	144	H-16	ST
" 03		1,000	H-15	SL
" 04		2,650	H-17	NC
" 05		1,180	H-18	ST
2-10-00-4-01	Buchanan	960	H-41	ST
" 07		280	H-43	ST
" 08		340	H-45	ST
" 09		600	H-44	ST
" 11		400	H-46	SL
" 15		22	H-42	ST
2-16-00-4-06	Cedar	32	H-84	ST
" 10		2,190	H-85	SL
" 11		1,000	H-86	ST
" 14		756	H-87	SL
2-19-00-4-01	Chickasaw	NA	H-12	NA
" 02		400	H-11	ST
" 03		350	H-10	ST
" 05		2,840	H-14	ST
" 06		490	H-13	ST
2-22-00-4-01	Clayton	400	H-35	ST
" 02		312	H-30	ST
" 03		340	H-32	ST
" 04		325	H-34	ST
" 05		470	H-31	ST
" 06		800	H-36	NC
" 07		550	H-37	ST
" 08		180	H-39	ST

TABLE VII-8 (cont.)

Registration No.	County	No. Of Animals	Ref. No.	Type Controls*
2-22-00-4-09	Clayton	224	H-38	ST
" 10		400	H-33	ST
2-23-00-4-01	Clinton	24	H-88	ST
" 02		16	H-89	ST
" 03		825	H-90	ST
" 04		300	H-91	ST
" 05		800	H-92	RC
" 06		240	H-93	ST
" 07		400	H-94	ST
" 08		450	H-95	ST
" 09		324	H-96	ST
" 10		480	H-97	ST
" 11		2,440	H-98	ST
2-28-00-4-02	Delaware	20	H-65	ST
" 03		280	H-54	ST
" 04		350	H-59	ST
" 05		300	H-66	ST
" 06		380	H-62	ST
" 07		280	H-61	ST
" 08		480	H-58	ST
" 09		224	H-49	ST
" 10		300	H-47	ST
" 11		280	H-63	ST
" 12		250	H-52	ST
" 13		28	H-64	ST
" 14		25	H-53	ST
" 15		480	H-55	ST
" 16		260	H-60	SL
" 17		462	H-56	ST
" 18		1,400	H-50	ST
" 19		480	H-48	ST
" 20		480	H-51	ST
" 21		400	H-57	ST
2-31-00-4-01	Dubuque	100	H-74	ST
" 02		480	H-67	ST
" 03		20	H-68	ST
" 04		320	H-69	ST
" 05		170	H-70	ST
" 06		320	H-71	ST

TABLE VII- 8 (cont.)

Registration No.	County	No. Of Animals	Ref. No.	Type Controls*
2-31-00-4-07	Dubuque	250	H-72	ST
" 08		232	H-73	ST
2-33-00-4-01	Fayette	200	H-28	ST
" 02		600	H-21	ST
" 03		20	H-27	ST
" 04		275	H-29	ST
" 05		480	H-22	ST
" 06		730	H-24	ST
" 07		225	H-20	ST
" 08		480	H-25	ST
" 09		200	H-19	ST
" 10		250	H-23	ST
" 11		560	H-26	ST
2-45-00-4-01	Howard	350	H- 2	ST
" 02		400	H- 1	ST
2-49-00-4-01	Jackson	345	H-80	ST
" 02		480	H-81	ST
" 03		500	H-82	ST
" 04		500	H-83	ST
2-53-00-4-01	Jones	200	H-77	ST
" 02		1,810	H-78	SL
" 03		1,170	H-79	SL
2-57-00-4-01	Linn	73	H-76	ST
" 02		375	H-75	ST
2-70-00-4-01	Muscatine	400	H-102	ST
" 02		1,170	H-103	SL
2-82-00-4-01	Scott	400	H-99	ST
" 02		1,655	H-100	SL
" 03		1,500	H-101	ST
2-96-00-4-01	Winneshiek	226	H- 6	ST
" 02		450	H- 5	ST
" 03		1,000	H- 3	SL
" 04		150	H- 4	RC

TABLE VII-8 (cont.)

Registration No.	County	No. Of Animals	Ref. No.	Type Controls*
	CATTLE FEEDING OPERATIONS			
2-03-00-0-01	Allamakee	1,000	C- 5	RC
" 02		360	C- 4	ST
" 03		280	C- 6	RC
2-09-00-0-02	Bremer	200	C- 9	RC
" 03		40	C- 8	ST
" 04		50	C-10	ST
2-10-00-0-01	Buchanan	450	C-19	ST
" 02		300	C-20	ST
2-19-00-0-02	Chickasaw	400	C- 7	NC
2-22-00-0-01	Clayton	1,200	C-16	NC
" 02		400	C-15	RC
" 03		600	C-14	ST
" 04		NA	C-18	NA
" 05		400	C-17	SB
2-23-00-0-01	Clinton	200	C-32	RC
" 02		140	C-33	ST
" 03		125	C-34	RC
" 04		500	C-35	RC
" 06		500	C-36	ST
" 07		320	C-37	ST
" 08		320	C-38	ST
2-28-00-0-01	Delaware	980	C-22	RC
" 02		500	C-21	RC
2-31-00-0-01	Dubuque	NA	C-24	RC
" 02		240	C-25	RC
" 03		700	C-26	RC
" 04		960	C-23	ST
2-33-00-0-01	Fayette	NA	C-12	RC
" 02		200	C-11	RC
" 03		500	C-13	ST

TABLE VII-8 (cont.)

Registration No.	County	No. Of Animals	Ref. No.	Type Controls*
2-49-00-3-01	Jackson	175	C-27	RC
" 02		250	C-28	RC
" 03		200	C-29	RC
" 04		150	C-30	RC
" 05		160	C-31	NA
2-82-00-0-01	Scott	220	C-39	ST
" 02		420	C-40	SL
" 03		100	C-41	RC
2-96-00-0-01	Winneshiek	300	C- 2	RC
" 02		40	C- 3	RC
" 03		500	C- 1	RC
	DAIRY FEEDING OPERATIONS			
2-03-00-3-01	Allamakee	70	D- 1	ST
2-19-00-3-01	Chickasaw	70	D- 2	ST
2-22-00-3-01	Clayton	60	D- 3	ST
2-28-00-3-01	Delaware	112	D- 4	ST
" 02		225	D- 5	ST
2-31-00-3-01	Dubuque	120	D- 6	ST
" 02		64	D- 7	ST
2-49-00-3-01	Jackson	100	D- 9	SL
" 02		200	D- 8	SL
2-53-00-3-01	Jones	85	D-10	ST
" 02		50	D-11	SL
2-82-00-3-01	Scott	80	D-12	ST
" 02		40	D-13	ST
	POULTRY FEEDING OPERATIONS			
2-03-00-8-01	Allamakee	30,000	P- 1	SB

TABLE VII-8 (cont.)

Registration No.	County	No. Of Animals	Ref. No.	Type Controls*
2-10-00-8-00	Buchanan	75,000	P- 2	SL
2-82-00-0-01	Scott	12,000	P- 3	ST

* SB - Storage Basin
ST - Below Building Storage- or tank
NA - Not Available
RC - Runoff Controls
SL - Lagoon
NC - No Control

Cattle densities in the Northeastern Iowa Basin range from a low of .02 head per acre in the basins of the Yellow River Basin to a high of .103 per head per acre in the Wapsipinicon River Basin. Hog densities vary between .43 head per acre in the Yellow River Basin to .75 in the Maquoketa River Basin. With the small animal densities in the Northeastern Iowa Basin, quantitive calculations of contaminant loads from feeding operations were not warranted. As indicated in Table VII-8 registered feeding operations with a cumulative capacity for 14,380 cattle are designated at 41 locations. The remaining cattle are spread over about 5 million acres of agricultural land.

The Supporting Document gives detailed pollution abatement methods for feeding operations. Generally, for swine and cattle operations, recommendation is made to design or re-design the feedlot or operation to isolate it from runoff waters to streams. Disposal of the wastes into debris basins and retention basins is recommended in the Document, with ultimate disposal on agricultural land. Disposal of poultry wastes in dry form onto agricultural land is also recommended.

Table VII-9 gives the estimated capital costs, in 1974 dollars, for treatment of cattle and swine operations in each hydrological unit of the basin. The Supporting Document details the methods used in arriving at these costs.

TABLE VII-9

LIVESTOCK TREATMENT COST

NORTHEASTERN IOWA BASIN

Hydrologic Unit	Capital Cost*		
	Cattle	Swine	Total
Wapsipinicon River	$ 658,210	$2,729,645	$ 3,387,855
Maquoketa River	461,195	2,322,195	2,783,390
Yellow River	14,205	177,960	192,165
Upper Iowa River	57,350	630,930	688,280
Other	459,185	2,977,705	3,436,890
Total	$1,650,145	$8,838,435	$10,488,580

* 1974 Dollars

URBAN NONPOINT WASTES

Although runoff from different urban areas has certain common features, such runoff often has characteristics that are unique to different communities, or portions of communities. One common feature of urban runoff is that it differs substantially from rural runoff. The Supporting Document describes urban runoff characteristics and problems in detail.

Wastes from sources such as, for example, automobiles occur in every community, although the size, traffic, and physical features of the community may cause wide variation in the nature of the wastes reaching streams. Certain communities may have unique industries that result in special urban runoff characteristics. Unusual contaminants may enter streams via deposition from airborne emissions and spillage from loading and unloading processes.

Estimates of cost of treatment of urban runoff wastes have been made for this basin. These costs are given for this basin in Table VII-10. The urban storm water treatment costs were determined from a model considering dollars as a function of population and acreage. Values for each basin were determined by summing values for all communities located in each basin. The annual recurring costs were calculated at an annualized capital cost of 7% over 20 years, plus operating and maintenance cost at 12¢ per 1000 gallons per year.

TABLE VII-10

URBAN STORMWATER TREATMENT COSTS*

NORTHEASTERN IOWA BASIN

Hydrologic Unit	Capitol Cost	Annual** Operation and Maintenance Cost	Total*** Annual Cost
Wapsipinicon River	$ 67,110,000	$ 4,027,000	$ 10,362,000
Maquoketa River	48,455,000	2,907,000	7,481,000
Yellow River	2,640,000	158,000	407,000
Upper Iowa River	16,280,000	977,000	2,514,000
Other	376,430,000	22,586,000	58,121,000
Total:	$510,915,000	$ 30,655,000	$ 78,885,000

*1974 Dollars
** 6% of total capital cost
***Annual operation and maintenance cost and capital cost amortized at 7% for 20 years.

COST SUMMARY

The supporting Document gives a generally complete statement on the problem of nonpoint source runoff and the rationale behind the pollution abatement methodology recommended. Table VII-11 gives a summary of treatment capital costs needed to implement nonpoint pollution abatement in the Northeastern Iowa Basin. Although urban areas are but a tiny fraction of the total land area of the basin, well over half the cost of runoff pollution abatement in the basin must be borne by urban runoff treatment programs.

Note, however, that treatment of rural runoff is greater in all basins except "other", while in the "other" category urban treatment ranks far ahead of monies needed for pollution abatement. The "other" category does include most of the larger cities in the basin, which are generally on the Mississippi River, e.g., Dubuque, Davenport, Clinton and Muscatine.

SUMMARY AND CONCLUSIONS

Nonpoint sources contribute to stream contamination through discharge of their materials during times of runoff. This occurs with the more significant rains and seasonally during the spring snowmelt.

Three principal area sources of contaminants in runoff waters are agricultural croplands, animal feedlots, and urban lands. The Supporting Document recommends procedures for abating

TABLE VII-11

SUMMARY NON-POINT TREATMENT CAPITAL COSTS

NORTHEASTERN IOWA BASIN

Hydrologic Unit	General Runoff	Livestock	Urban
Wapsipinicon River	$ 82,806,000	$ 3,387,855	$ 67,110,000
Maquoketa River	69,271,000	2,783,390	48,455,000
Yellow River	8,248,000	192,165	2,640,000
Upper Iowa	29,633,000	688,280	16,280,000
Other	118,790,000	3,436,890	376,430,000
Total	$308,748,000	$10,488,580	$510,915,000
Grand Total			$830,151,580

pollution from these three sources. Outside of the large cities, the abatement of contamination from agricultural croplands is the most costly endeavor in this basin. However, pollution abatement of runoff waters will be very costly in the large cities along the Mississippi River.

REFERENCES

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CHAPTER VIII

NEEDS AND COMPLIANCE SCHEDULES

NORTHEASTERN IOWA BASIN

ASSESSMENT OF NEEDS

Municipal Needs

The waste load allocations in Table VI-1 were compared to the present discharges (Table V-4). Facilities which could not meet their waste load allocation were evaluated as to their need for additional treatment capacity. Physical needs for effective municipal sewage control can be classified into:

1. New sewer systems and treatment facilities for certain unsewered communities.
2. Upgrading to adequate secondary treatment where the present treatment level is either primary or inadequate secondary.
3. Infiltration and/or inflow (I/I) removal.
4. Advanced treatment under selective circumstances.
5. Adequate sludge disposal.

An estimation of these needs and their associated cost has been developed for the municipalities in the Northeastern Iowa Basin as shown on Table VIII-1. Several sources have been used to estimate costs. Some of these are listed below in order of priority.

1. Grant applications, based on preliminary engineering estimates or final construction costs.

TABLE VIII-1

MUNICIPAL

ASSESSMENT OF NEEDS

AND

SCHEDULE OF COMPLIANCE

Rank	Discharger Ref. #	Waste Load Allocation: 1990 Flow*	Waste Load Allocation: Concentration BOD_5/NH_3	Waste Load Allocation: lbs.Eff. BOD_5/NH_3	Treatment	Needs: 1974 Dollars	Collection	1974 Dollars	Schedule of Compliance: Facility Plans	Schedule of Compliance: Final Plans	Schedule of Compliance: Completion Date
1	Manchester M-71	1.0	30/15	250/125	upgrade to secondary	800,000	---	---		12/1/75	4/1/77
2	Dubuque M-62	11.18	30/15	2798/1399	upgrade to secondary	C/ 15,914,000	---	---	---	---	1/
3	West Union M-28	.353	10/2	29/6	advanced waste treatment	C/ 1,871,000	---	---	---	---	1/
4	Edgewood M-44	.097E	10/2	8/2	advanced waste treatment	E/ 412,000	---	---	4/1/76	12/1/76	2/1/78
5	Davenport M-163	17.96	30/15	4494/2246	upgrade to secondary	GA/ 46,375,000	---	---	---	---	1/
6	Hawkeye M-34	.059E	10/2	5/1	advanced waste treatment	E/ 293,000	---	---	2/1/77	12/1/77	2/1/79
7	Maquoketa M-97	.926	20/15	154/77	upgrade to secondary	GA/ 1,176,000	---	---	---	12/1/75	8/1/77
8	Ryan M-77	.217	10/4	18/7	advanced waste treatment	E/ 717,000	---	---	---	---	---

*MGD

TABLE VIII-1
MUNICIPAL
ASSESSMENT OF NEEDS
AND
SCHEDULE OF COMPLIANCE

		Waste Load Allocation			Needs				Schedule of Compliance		
Rank	Discharger Ref. #	1990 Flow	Concentration BOD_5/NH_3	lbs.Eff. BOD_5/NH_3	Treatment	1974 Dollars	Collection	1974 Dollars	Facility Plans	Final Plans	Completion Date
9	Clinton M-108	9.16	30/15	2292/1146	upgrade to secondary	GA/ 7,360,000	---	---	---	---	1/
10	Monona M-31	.209E	10/2	17/4	advanced waste treatment	E/ 705,000	---	---	8///76	6/1/77	12/1/78
11	Muscatine M-166	6.99	30/15	1750/875	upgrade to secondary	C/ 16,053,000	---	---	---	---	1/
12	Fredericksburg M-120	.425E	10/5	35/18	advanced waste treatment	E/ 736,000	I/I analysis	NS/ 46,000	9/1/76	6/1/77	5/1/79
13	Troy Mills M-131	.022	30/15	6/3	upgrade to secondary	E/ 123,000	I/I analysis	NS/ 4,000	5/1/76	2/1/77	2/1/79
14	Marquette M-13	.085	30/15	21/10	upgrade to secondary	GA/ 314,000	---	---	---	---	12/1/76
15	Arlington M-40	.061	19/4	10/2	advanced waste treatment	E/ 305,000	---	---	5/1/76	1/1/77	10/1/78
16	Elkader M-30	.240	30/15	60/30	upgrade to secondary	GA/ 695,000	---	---	---	2/1/76	8/1/77
17	Guttenberg M-16	.327E	30/15	82/41	upgrade to secondary	GA/ 1,329,000	---	---	---	4/1/76	10/1/77
18	McGregor M-14	.106	30/15	27/14	upgrade to secondary	E/ 299,000	---	---	10/1/76	7/1/77	2/1/79

TABLE VIII-1
MUNICIPAL
ASSESSMENT OF NEEDS
ADN
SCHEDULE OF COMPLIANCE

Rank	Discharger Ref. #	Waste Load Allocation: 1990 Flow	Waste Load Allocation: Concentration BOD_5/NH_3	Waste Load Allocation: lbs.Eff. BOD_5/NH_3	Needs: Treatment	Needs: 1974 Dollars	Needs: Collection	Needs: 1974 Dollars	Schedule of Compliance: Facility Plans	Schedule of Compliance: Final PLans	Schedule of Compliance: Completion Date
19	Cresco M-3	.380	10/2	32/6	advanced waste treatment	E/ 601,000	---	---	7/1/76	7/1/77	2/1/79
20	Ossian M-25	.076	10/2	6/1	advanced waste treatment	E/ 353,000	---	---	---	---	---
21	Hopkinton M-78	.225	30/15	56/28	None	0	---	---	---	---	---
22	LeClaire M-160	.454E	30/15	114/57	upgrade to secondary	GA/ 1,996,000	System Imprvmts.	E/ 1,411,000	4/1/76	1/1/77	10/1/78
23	Postville M-11	.258	30/15	65/32	upgrade to secondary	NS/ 534,000	I/I analysis & collectors	NS/ 112,000	2/1/77	2/1/78	10/1/79
24	Buffalo M-164	.201	30/15	50/25	upgrade to secondary	E/ 472,000	---	---	---	1/1/76	6/1/77
25	Riceville M-112	.140	---	C.D.	add 1 cell	E/ 124,000	---	---	---	---	---
26	Waukon M-9	.900E	11/4	80/27	advanced waste treatment	E/ 1,028,000	---	---	10/1/76	6/1/77	7/1/79
27	Spragueville M-103	.013	30/15	3/15	No needs	0	---	---	---	---	---
28	Lime Springs M-2	.050E	30/15	13/7	upgrade to secondary	E/ 179,000	---	---	3/1/76	12/1/77	6/1/78
29	Decorah M-5	1.59	30/15	398/199	upgrade to secondary	E/ 736,000	---	---	---	8/1/76	9/1/77

TABLE VIII-1
MUNICIPAL
ASSESSMENT OF NEEDS
AND
SCHEDULE OF COMPLIANCE

Rank	Discharger Ref. #	Waste Load Allocation: 1990 Flow	Waste Load Allocation: Concentration BOD_5/NH_3	Waste Load Allocation: lbs. Eff. BOD_5/NH_3	Treatment	Needs: 197 Dollars	Needs: Collection	Needs: 1974 Dollars	Schedule of Compliance: Facility Plans	Schedule of Compliance: Final Plans	Schedule of Compliance: Completion Date
30	New Hampton M-117	.974	30/2	244/16	upgrade to advanced	C/GA/ 1,413,000	---	---	2/1/77	2/1/78	11/1/79
31	Clermont M-27	.065E	30/15	16/8	upgrade to secondary	E/ 215,000	---	---	9/1/76	6/1/77	11/1/78
32	Cascade M-90	.225E	30/15	56/28	upgrade to secondary	NS/ 96,000	I/I analysis	NS/ 5,000	2/1/76	12/1/76	1/1/78
33	Alta Vista M-115	.019	30/15	5/2	upgrade to secondary	E/ 78,000	---	---	1/1/77	9/1/77	1/1/79
34	Earlville M-75	.067	30/15	17/8	upgrade to secondary	E/ 221,000	---	---	9/1/76	6/1/77	11/1/78
35	Delhi M-72	.067E	---	C.D.	add 1 cell	E/ 87,000	---	---	---	---	---
36	Calmar M-19	.283	30/15	70/35	upgrade to secondary	E/ 598,000	---	---	---	---	---
37	Readlyn M-121	.082	10/2	7/1	advanced waste treatment	E/ 371,000	---	---	12/1/76	1/1/78	7/1/79
38	Low Moor M-110	.039E	---	C.D.	upgrade to secondary	NS/ 88,000	I/I analysis	NS/ 17,000	4/1/77	4/1/78	8/1/79
39	Rowley M-167	0.030	---	C.D.	add 2 cells	E/ 90,000	---	---	---	3/31/77	5/30/77
40	Garnavillo M-47	.063	10/2	5/1	advanced waste treatment	GA/ 224,000	---	---	---	3/1/76	10/1/77
41	Quasqueton M-130	.052E	30/15	13/7	add 1 cell	NS/ 104,000	I/I analysis	NS/ 6,000	---	---	---
42	Elgin M-29	.058E	30/15	15/7	upgrade to secondary	E/ 203,000	---	---	---	---	---

TABLE VIII-1
MUNICIPAL
ASSESSMENT OF NEEDS
AND
SCHEDULE OF COMPLIANCE

Rank	Discharger Ref. #	1990 Flow*	Waste Load Allocation: Concentration BOD_5/NH_3	Waste Load Allocation: lbs. Eff. BOD_5/NH_3	Treatment	Needs: 1974 Dollars	Collection	1974 Dollars	Schedule of Compliance: Facility Plans	Final Plans	Completion Date
43	Fairbank M-125	.091E	---	C.D.	add 1 cell	E/ 111,000	I/I analysis	NS/ 41,000	11/1/76	8/1/77	11/1/78
44	New Albin M-6	.074E	30/15	19/9	upgrade to secondary	E/ 239,000	---	---	---	---	---
45	Bellevue M-66	.315E	30/15	79/40	upgrade to secondary	E/ 646,000	---	---	7/1/76	4/1/77	11/1/78
46	Strawberry Pt. M-42	N.241	---	C.D.	add 1 cell	E/ 260,000	---	---	---	---	---
47	DeWitt M-157	.673	30/15	168/84	upgrade to secondary	E/ 1,076,000	---	---	3/1/76	12/1/76	1/1/78
48	Independence M-128	2.08	30/6	520/104	advanced waste treatment	GA/ 3,394,000	---	---	11/1/75	9/1/76	11/1/77
49	Oelwein M-126	1.95	20/10	325/163	advanced waste treatment	GA/ 840,000	---	---	---	---	---
50	Sumner M-123	.230E	30/10	58/19	advanced waste treatment	E/ 634,000	---	---	11/1/76	10/1/77	8/1/79
51	Sabula M-105	.106	30/15	27/14	upgrade to secondary	E/ 305,000	---	---	12/1/75	9/1/76	6/1/78
52	Lowden M-145	.019	30/15	5/2	no needs	---	---	---	---	---	---
53	Camanche M-109	.833E	30/15	208/104	upgrade to secondary	C/ 691,000	---	---	---	---	1/
54	Clarence M-141	.073	30/15	18/9	upgrade to secondary	E/ 239,000	---	---	---	---	---

TABLE VIII-1
MUNICIPAL
ASSESSMENT OF NEEDS
AND
SCHEDULE OF COMPLIANCE

Rank	Discharger Ref. #	1990 Flow	Waste Load Allocation: Concentration BOD_5/NH_3	Waste Load Allocation: lbs.Eff. BOD_5/NH_3	Treatment	Needs: 1974 Dollars	Collection	1974 Dollars	Schedule of Compliance: Facility Plans	Schedule of Compliance: Final Plans	Schedule of Compliance: Completion Date
55	Winthrop M-129	.080	30/15	20/10	upgrade to secondary	E/ 251,000	---	---	---	---	---
56	Preston M-102	.436	---	C.D.	add 1 cell	E/ 332,000	---	---	9/1/76	6/1/77	8/1/78
57	Tripoli M-119	.161	---	C.D.	add 1 cell	E/ 96,000	---	---	---	---	---
58	Dunkerton M-122	.087E	---	C.D.	add 1 cell	E/ 89,000	---	---	---	---	---
59	Hazelton M-127	.056	30/15	14/7	upgrade to secondary	E/ 50,000	---	---	---	---	---
60	Westgate M-124	.023	---	C.D.	construct lagoons	E/ 142,000	sewer syst.	E/ 287,000	---	---	---
61	Frederika M-118	.021	---	C.D.	add 1 cell	E/ 70,000	---	---	---	---	---
62	Ridgeway M-4	.020	---	C.D.	add 1 cell	E/ 70,000	---	---	---	---	---
63	Chester M-1	.019E	---	C.D.	construct lagoons	GA/ 123,000	---	---	---	---	---
64	Greeley M-73	.041E	---	C.D.	construct lagoons	GA/ 164,000	---	---	---	---	---1/
65	Fayette M-38	.371E	30/11	93/34	advanced waste treatment	E/ 143,000	I/I analysis	NS/ 3,000	---	---	---
66	Maynard M-35	.056E	30/15	14/7	upgrade to secondary	E/ 197,000	---	---	---	---	---

TABLE VIII-1
MUNICIPAL
ASSESSMENT OF NEEDS
AND
SCHEDULE OF COMPLIANCE

Rank	Discharger Ref. #	1990 Flow*	Waste Load Allocation: Concentration BOD_5/NH_3	Waste Load Allocation: lbs.Eff. BOD_5/NH_3	Needs: Treatment	Needs: 1974 Dollars	Needs: Collection	Needs: 1974 Dollars	Schedule of Compliance: Facility Plans	Schedule of Compliance: Final Plans	Schedule of Compliance: Completion Date
67	Volga M-41	.035	---	C.D.	construct lagoons	E/ 153,000	sewer syst.	E/ 359,000	---	---	---
68	Wadena M-39	.026E	---	C.D.	construct lagoons	C/ 101,000	---	---	---	---	---
69	Central City M-132	.045	30/15	11/6	upgrade to secondary	E/ 317,000	I/I analysis	NS/ 5,000	---	---	---
70	McCausland M-158	.026E	---	C.D.	add 2 cells	E/ 69,000	I/I analysis & sewers	NS/ 84,000	4/1/77	4/1/78	10/1/79
71	Lost Nation M-144	.062E	---	C.D.	add 1 cell	E/ 66,000	---	---	---	---	---
72	Blue Grass M-165	.204	---	C.D.	add 1 cell	E/ 166,000	---	---	---	---	---
73	Panorama Park M-161	.025	---	C.D.	construct lagoons	E/ 146,000	sewer syst.	299,000	---	---	---
74	Andover M-107	.008	---	C.D.	no needs	---	---	---	---	---	---
75	Dixon M-149	.032E	---	C.D.	add 1 cell	E/ 67,000	I/I analysis	NS/ 3,000	---	---	---
76	Oxford Jct. M-142	.078E	---	C.D.	add 1 cell	E/ 78,000	---	---	---	---	---
77	Andrew M-95	.033	---	C.D.	no needs	---	---	---	---	---	---
78	Charlotte M-99	.059E	---	C.D.	construct lagoons	GA/ 201,000	sewer syst.	E/ 550,000	---	---	---
79	Delmar M-101	.08	---	C.D.	construct lagoons	GA/ 151,000	sewer syst.	E/ 669,000	---	---	---

TABLE VIII-1
MUNICIPAL
ASSESSMENT OF NEEDS
AND
SCHEDULE OF COMPLIANCE

Rank	Discharger Ref. #	1990 Flow*	Waste Load Allocation: Concentration BOD_5/NH_3	Waste Load Allocation: lbs.Eff. BOD_5/NH_3	Treatment	Needs: 1974 Dollars	Needs: Collection	Needs: 1974 Dollars	Schedule of Compliance: Facility Plans	Schedule of Compliance: Final Plans	Schedule of Compliance: Completion Date
80	Goose Lake M-100	.025E	---	C.D.	add 1 cell	E/ 63,000	---	---	---	---	---
81	Springbrook M-98	.027E	---	C.D.	seal lagoons add 2 cells	E/ 92,000	---	---	---	---	---
82	Elma M-114	.068	30/15	17/9	no needs	---	---	---	---	---	---
83	Ionia M-113	.030	---	C.D.	construct lagoons	GA/ 199,000	sewer syst.	E/ 335,000	---	---	1/
84	McIntire M-111	.023	---	C.D.	construct lagoons	E/ 143,000	sewer syst.	E/ 263,000	---	---	---
85	Farmersburg M-32	.020	---	C.D.	add 1 cell	E/ 74,000	---	---	---	---	---
86	Castalia M-26	.021	---	C.D.	construct lagoons	E/ 141,000	sewer syst.	E/ 251,000	---	---	---
87	Lansing M-7	.162E	30/15	41/20	no needs	---	---	---	---	---	---
88	Harpers Ferry M-8	.026	---	C.D.	construct lagoons	E/ 145,000	sewer syst.	E/ 299,000	---	---	---
89	Peosta M-64	.023	---	C.D.	construct lagoons	E/ 144,000	sewer syst.	E/ 299,000	---	---	---
90	St. Donatus M-65	.022E	---	C.D.	add 1 cell	E/ 72,000	---	---	---	---	---
91	Centralia M-63	.020	---	C.D.	construct lagoons	E/ 141,000	sewer syst.	E/ 251,000	---	---	---

TABLE VIII-1
MUNICIPAL
ASSESSMENT OF NEEDS
AND
SCHEDULE OF COMPLIANCE

		Waste Load Allocation				Needs			Schedule of Compliance		
Rank	Discharger Ref. #	1990 Flow	Concentration BOD_5/NH_3	lbs.Eff. BOD_5/NH_3	Treatment	1974 Dollars	Collection	1974 Dollars	Facility Plans	Final Plans	Completion Date
92	Waterville M-10	---	---	---	maintain septic tanks	---	---	---	---	---	---
93	Clayton M-15	---	---	---	maintain septic tanks	---	---	---	---	---	---
94	Colesburg NW M-50	.072	---	C.D.	add 1 cell	E/ 80,000	I/I analysis	NS/ 6,000	---	---	---
95	Colesburg SE M-49	.072	---	C.D.	add 1 cell	E/ 73,000	---	---	---	---	---
96	Eldridge M-151	.542E	---	C.D.	add 1 cell	E/ 469,000	I/I analysis & new sewers	NS/ 1,404,000	2/1/77	1/1/78	2/1/79
97	Anamosa M-137	.534	30/15	134/67	chlorination to meet secondary	40,000	I/I analysis	5,000	---	---	---
98	Mechanicsville M-139	.119	30/15	30/15	upgrade to secondary	E/ 329,000	---	---	---	---	---
99	Wheatland M-146	.076	30/15	19/10	no needs	---	---	---	---	---	---
100	Olin M-140	.104	---	C.D.	add 1 cell	NS/ 105,000	I/I analysis & sewer separ-ation	NS/ 78,000	---	---	---
101	Princeton M-159	.072E	---	C.D.	add 1 cell	E/ 73,000	I/I analysis	NS/ 6,000	---	---	---
102	Grand Mound M-155	.071E	---	C.D.	add 1 cell	E/ 72,000	---	---	---	---	---
103	Calamus M-147	.053E	---	C.D.	add 1 cell	E/ 78,000	---	---	---	---	---
104	Long Grove M-154	.034	---	C.D.	upgrade to secondary	NS/ 179,000	I/I analysis & new sewers	NS/ 148,000	4/1/77	4/1/78	9/1/79

TABLE VIII-1
MUNICIPAL
ASSESSMENT OF NEEDS
AND
SCHEDULE OF COMPLIANCE

Rank	Discharger Ref. #	1990 Flow*	Waste Load Allocation: Concentration BOD_5/NH_3	Waste Load Allocation: lbs.Eff. BOD_5/NH_3	Treatment	Needs: 1974 Dollars	Needs: Collection	Needs: 1974 Dollars	Schedule of Compliance: Facility Plans	Schedule of Compliance: Final Plans	Schedule of Compliance: Completion Date
105	Donahue M-153	.021	30/15	5/3	upgrade to secondary	NS/ 119,000	added sewers	NS/ 36,000	---	---	---
106	Maysville M-152	.019	---	C.D.	construct lagoons	E/ 141,000	sewer syst.	NS/ 383,000	---	---	---
107	Strawberry Pt.S.	(see Strawberry Point N. - ranked 47)									
108	Lamont M-68	.056E	---	C.D.	add 1 cell	E/ 75,000	---	---	---	---	---
109	Dundee M-69	.021	---	C.D.	construct lagoons	GA/ 79,000	sewer syst.	E/ 251,000	---	---	---
110	Farley M-59	.213E	---	C.D.	add 1 cell	E/ 114,000	---	---	---	---	---
111	Sageville M-61	.066	---	C.D.	construct lagoons	E/ 178,000	sewer syst.	E/ 574,000	---	---	---
112	Rickardsville M-56	.038	---	C.D.	construct lagoons	E/ 156,000	sewer syst.	E/ 383,000	---	---	---
113	Sherrill East M-54	.037	---	C.D.	add 2 cells	E/ 68,000	---	---	---	---	---
114	Sherrill South M-55	.037	---	C.D.	add 2 cells	E/ 72,000	---	---	---	---	---
115	Monticello M-79	.656	30/15	164/82	upgrade to secondary	E/ 359,000	---	---	10/1/76	8/1/77	3/1/79
116	Spillville M-18	.036	---	C.D.	add 1 cell	E/ 77,000	---	---	2/1/77	1/1/78	11/1/79
117	Fort Atkinson M-20	.034	---	C.D.	construct lagoons	E/ 153,000	sewer syst.	E/ 359,000	---	---	---

TABLE VIII-1
MUNICIPAL
ASSESSMENT OF NEEDS
AND
SCHEDULE OF COMPLIANCE

		Waste Load Allocation				Needs			Schedule of Compliance		
Rank	Discharger Ref. #	1990 Flow	Concentration BOD_5/NH_3	lbs.Eff. BOD_5/NH_3	Treatment	1974 Dollars	Collection	1974 Dollars	Facility Plans	Final Plans	Completion Date
118	Protivin M-17	.033	---	C.D.	construct lagoons	E/ 182,000	sewer syst.	E/ 359,000	3/1/76	12/1/76	2/1/78
119	St. Lucas M-21	.022	---	C.D.	construct lagoons	E/ 141,000	sewer syst.	E/ 263,000	---	---	---
120	Luana M-12	.038	---	C.D.	no needs	---	---	---	---	---	---
121	Dyersville M-88	.663	30/15	166/83	upgrade to secondary	E/ 1,076,000	---	---	8/1/77	---	---
122	Epworth M-91	.239	30/15	60/30	upgrade to secondary	GA/ 300,000	---	---	10/1/75	6/1/76	10/1/77
123	New Vienna M-87	.045	30/15	11/6	upgrade to secondary	E/ 161,000	---	---	---	---	---
124	Worthington M-89	.055	30/15	14/7	upgrade to secondary	E/ 197,000	---	---	---	---	---
125	Holy Cross M-85	.056E	---	C.D.	add 1 cell	E/ 85,000	collectors	NS/ 24,000	---	---	---
126	LaMotte M-94	.055	---	C.D.	add 1 cell	E/ 85,000	---	---	---	---	---
127	Luxemburg M-86	.036	---	C.D.	construct lagoons	E/ 155,000	new system	E/ 371,000	---	---	---
128	Bernard M-92	.029	---	C.D.	construct lagoons	E/ 150,000	sewer syst.	E/ 323,000	---	---	---
129	Wyoming M-82	.063	---	C.D.	add 1 cell	GA/ 197,000	---	---	---	---	---
130	Monmouth M-83	.035	---	C.D.	construct lagoons	E/ 154,000	sewer syst.	E/ 365,000	---	---	---

TABLE VIII-1
MUNICIPAL
ASSESSMENT OF NEEDS
AND
SCHEDULE OF COMPLIANCE

Rank	Discharger Ref. #	Waste Load Allocation: 1990 Flow	Waste Load Allocation: Concentration BOD_5/NH_3	Waste Load Allocation: lbs.Eff. BOD_5/NH_3	Treatment	Needs: 1974 Dollars	Needs: Collection	Needs: 1974 Dollars	Schedule of Compliance: Facility Plans	Schedule of Compliance: Final Plans	Schedule of Compliance: Completion Date
131	Onslow M-81	.030E	---	C.D.	add 1 cell	E/ 74,000	---	---	---	---	---
132	Baldwin M-84	.023E	---	C.D.	construct lagoons	GA/ 77,000	sewer syst.	E/ 299,000	---	---	---
133	Center Jct. M-80	.020	---	C.D.	construct lagoons	E/ 141,000	sewer syst.	E/ 251,000	---	---	---
134	Miles M-106	.053	20/7	9/2	advanced waste treatment	E/ 275,000	---	---	---	---	---
135	Lawler M-22	.058	---	C.D.	add 1 cell	E/ 86,000	---	---	---	---	---
136	Waucoma M-24	.040	---	C.D.	construct lagoons	E/ 157,000	sewer syst.	406,000	---	---	---
137	Coggon M-135	.068	30/15	17/9	upgrade to secondary	E/ 227,000	I/I analysis	E/ 4,000	1/1/77	1/1/78	6/1/79
138	Prairieburg M-136	.029	---	C.D.	construct lagoons	E/ 159,000	sewer syst.	E/ 323,000	---	---	---
139	Aurora M-134	.026	---	C.D.	construct lagoons	GA/ 54,600	sewer syst.	E/ 311,000	---	---	1/

LEGEND

"C" Construction cost from Federal Grant records

"CD" Controlled Discharge

"E" Engineering Estimate

"GA" Cost from Federal Grant Applications

"NS" Cost from 1974 Municipal Needs Survey

1/ Under Construction

Facilities presently without a compliance schedule will be given dates as deemed necessary.

2. 1974 Needs Survey.

3. EPA cost curves supplied for the 1974 Needs Survey.

4. State cost curves based on comparable construction costs.

All of the costs were updated to September, 1974, dollars based on the EPA construction indices (1).

New Systems - Of the 163 incorporated municipalities in the basin, 39 do not have a sewage system. These communities are presently served by individual residence septic tanks and tile drain fields. Some of these communities have a disposal problem causing either water pollution, or a health hazard, or both. This may be caused either by old systems in need of repair or replacement, or because of unsuitable site conditions such as a high ground water table, local limestone deposits, or poor soil conditions.

Most unsewered communities have a waste water disposal problem, but whether it is cost effective to construct a sewer system and treatment plant or to replace or repair existing individual septic tank systems is difficult to estimate without a detailed engineering report.

For the purpose of this study it was assumed to be cost effective to continue using individual residence septic tank systems in those communities with projected 1990 populations of less than 200. It may also be cost-effective for certain towns with populations somewhat greater than 200 to continue the use of individual septic systems. However, increased potential for possible groundwater contamination and related health problems from the use of individual septic systems by larger communities must also be weighed in a cost-effectiveness evaluation. As a result, communities with projected 1990 populations greater than 200 were assumed to have a need for a sewer system and treatment facilities while communities with projected populations of less than 200 were assumed to have no needs.

Upgrade to Secondary Treatment - Twelve communities in the Northeastern Iowa Basin have only primary treatment. All other municipal facilities provide what is commonly referred to as secondary treatment. The Act requires that all municipal treatment facilities shall, by July 1, 1977, have treatment equivalent to secondary treatment. Many municipal secondary plants, however, cannot presently, or with projected 1990 flow, meet the new EPA and the DEQ definition of secondary treatment. When compared with the quantative definition, forty-one municipalities are estimated to have a need to upgrade their facilities to secondary treatment.

Upgrade to Advanced Treatment - The waste load allocations analyses have pointed out several locations where treatment more stringent than secondary will be required if water quality standards are to be met. Because the new waste load allocations will be incorporated into discharge permits, eighteen municipalities now have the need for advanced treatment facilities.

Infiltration and/or Inflow Removal - Many municipalities have infiltration and/or inflow (I/I) problems. To estimate the cost to correct I/I problems in an individual case requires detailed information concerning the systems. Without such information an accurate cost estimation is difficult. Some municipalities have been studied by consulting engineers and correction costs estimated. In addition, the 1974 Needs Survey of Municipal Wastewater Treatment Plants provides the estimated cost to study and correct I/I for a 20 percent random sampling of Iowa municipalities. For those municipalities for which an I/I correction cost estimate was available, the cost for study and correction was updated and included in the costs column of the table of needs. For those municipalities where no estimate was available for I/I correction, no costs are included because of the difficulty in making an accurate estimate without detailed information about the system. It should be realized, therefore, that the total municipal needs for the basin will be greater than what is predicted in Table VIII-I.

Most cost estimates assume that, for a given facility, it is cost effective to remove I/I rather than treat it. If it is known from engineering studies that it is cost-effective to treat I/I, those costs are included with treatment plant costs.

Sludge Disposal - Sludge disposal is a major concern at any wastewater treatment plant. A secondary municipal treatment plant produces approximately 1726 lbs. of dry solids per million gallons of water treated, or approximately 173 lbs. per 1000 people per day. When an additional contribution comes from industrial wastes, sewage sludge can become the second largest disposal problem facing a municipality next only to garbage disposal.

Unfortunately, the job of designing a sludge disposal system, historically, seems to have been done backwards (2). The conditioning and handling design was often completed before much thought was given to actual method and site of final disposal. A more logical method of design is to first choose the final disposal method and location and then work back from that point to the most cost-effective process for getting the sludge in the best condition to accommodate the mechanics of actual disposal.

Most municipal treatment facilities in the basin handle their sludge in similar manners. After settling to concentrate solids the sludge is stabilized either by aerobic or anaerobic digestion. Digested sludge is then usually either dried mechanically or on drying beds and finally hauled either to a landfill or farmland.

Farmland is the more common disposal location since many landfills, because of their location or equipment, cannot accept sewage sludge either wet or dry. Currently there are **eleven** approved landfills in the basin, Greater effort must be made to educate the farmer to the benefits of accepting treated sewage sludge for land application. Even though some sludges contain traces of toxic metals from plating industries making them undesirable for application to certain crops, most grain crops are not influenced by these metals and with proper controls can serve as application sites.

If weather is conducive for equipment to get into the fields wet digested sludge is often applied directly to farmlands. In fact, nearly all municipalities have sludge treatment equipment although most presently apply wet digested sludge directly to farmland allowing the sludge treatment equipment to lie idle. Drying beds, for example, often become relegated to a backup status as a method of sludge handling. This is done so as to reserve their entire capacity for the wet spring season when farm fields become inaccessible.

Land disposal of sludge has the advantage of being one of the simplest methods during winter months. It is also generally one of the most cost-effective methods.

Table VIII-2 gives an indication of sludge disposal costs found in Ohio.

One community in the state is presently experimenting with a method of combined sludge and garbage composting. In this process the ultimate disposal of the sludge would be as a salable soil conditioning agent. No conclusive results are as yet available from the project.

TABLE VIII-2

AVERAGE DISPOSAL COSTS (PER TON OF DRY SOLIDS)

Sludge Handling Method	Costs*
Vacuum filters, centrifuges	$34.41
Direct land application of liquid (Hauling by contract)	31.93
Drying beds (On-site storage for private individual hauling may reduce cost)	14.34
Direct land application of liquid (By city-owned trucks)	7.73

* Costs do not include digestion

Costs to upgrade or to add additional sludge handling capacity that may be required under the Basin plan have not been estimated for the municipalities in the Basin. This is because a detailed knowledge of the existing facilities, not presently available, is needed for an accurate estimate. Also in many cases, the cost should be small when compared with that to upgrade the existing treatment. This is, therefore, another reason why the total municipal need for the basin will be greater than what is predicted in Table VIII-1.

Summary of Municipal Needs - Table VIII-1 is a compilation of municipal treatment facility needs for the Northeastern Iowa Basin. In this table, are listed projected 1990 flows along with concentrations and pounds of BOD_5 amd ammonia nitrogen allowed in the effluent at critical periods for the 1990 discharge, the treatment and collection needs and a compliance schedule for meeting the waste load allocations. A permit will be issued by the DEQ to the municipalities which will assure compliance with the basin plan. Table VIII-1 is arranged by rank, i.e., the highest ranking discharger to the lowest.

Table VIII-3 summarizes the basin municipal treatment facility needs and the related investment requirements for the Basin.

Industrial Needs

Iowa has become increasingly more industrialized. Many industries are agriculturally oriented, such as meat packing and processing, dairy and cheese processing, fertilizer and pesticide production, wet grain milling and rendering. All of these are "wet" industries (using large quantities of water) and produce inordinately large amounts of waste which are difficult to treat by conventional methods. In the Northeastern Iowa Basin most of the industries discharge to municipal treatment facilities. Sometimes they cause an overload condition upon the municipal plant.

Some industries have their own treatment facilities, such as Chemplex Company, Clinton Corn Processing Company, Collis

TABLE VIII-3

SUMMARY OF MUNICIPAL TREATMENT NEEDS

NORTHEASTERN IOWA BASIN

Treatment Type Need	Number of Municipalities	1974 Dollars
Three cell lagoon	29	$ 4,171,600
Add 2 lagoon cells	5	391,000
Add 1 lagoon cell	32	3,672,000
Advanced Waste Treatment	18	14,315,000
Upgrade to Secondary	44	102,852,000
Maintain septic tanks	29	0
No need	8	0
Collection System needs	47	12,531,000
Total	212	137,932,600

Company, E.I. du Pont de Nemours Company and Hawkeye Chemical Company all of Clinton; John Deere and Company, Dubuque; Associated Milk Producers, Inc., Arlington, Meinerz Creamery, Fredericksburg; Mississippi Valley Milk Producers Association, Luana; and Monsanto Company at Muscatine. Two other industries are planning to connect to municipal systems.

The DEQ, through the State Operation Permit Program, in coordination with the Federal NPDES Discharge Permit Program will regulate industrial dischargers. Effluent limits are set according to the waste load allocations. BPT is the minimum allowable allocation.

Table VIII-4 lists the significant industrial discharges in the Basin, their present discharge, waste load allocation, projected need, and a compliance schedule. A permit will be issued by the DEQ to the industry, which will assure compliance with the Basin plan.

According to the schedules of compliance for the significant industrial dischargers, a reduction of industrial waste loads of 59% and 96% of BOD_5 and ammonia nitrogen, respectively, is expected. This reduction is estimated to cost the industries approximately 23 million dollars. This cost estimation was derived from a DEQ survey of the significant industries where available, or by the use of the municipal treatment cost curves.

Semipublic

The major semipublic wastewater disposal problem is water

TABLE VIII-4

TREATMENT NEEDS AND SCHEDULE OF COMPLIANCE
FOR
MAJOR INDUSTRIAL DISCHARGERS*

NORTHEASTERN IOWA BASIN

Industrial Discharger	Present Flow (mgd)	Present BOD_5	Eff. Lbs. NH_3	7-1-77 BOD_5	Eff. Lbs. NH_3	Treatment Needs	Schedule of Compliance: Facility Plan	Schedule of Compliance: Final Plan	Schedule of Compliance: Completion Date
Associated Milk Producers, Inc., Arlington I-42	N/A	N/A	N/A	99 (7)	20 (7)	Needs are not anticipated to be large; lack of data precludes determination	1/1/75	7/1/75	10/1/76
Chemplex Co., Clinton I-70	1.29	1,223	21	409	-	Additional BOD_5 reduction	-	-	6/30/76
Clinton Corn Processing Co., Clinton I-63	55.0	63,000	-	5,000	- (1)	Additional BOD_5 reduction	- (New plant to be completed 4/15/75)	-	9/30/74
Collis Co., Clinton I-73	.437	Ni=1.8 Cr^{+6}=1.0 Cr=2.0 Tot. Cn=0.2 Amenable Cn=0.6 TSS=72 Zn=2.3		Ni=1.8 Cr^{+6}=.2 Cr=1.8 Tot.Cn=1.8 Amenable Cn=0.2 TSS=72 Zn=1.8		Additional heavy metals removal	1/1/76	1/1/77	7/1/77
E.I. du Pont de Nemours Co., Clinton I-64	12.00	2,640	- (2)	2,640	-	No needs-modifications already made	-	9/1/75 4/1/76 (10)	7/1/79
John Deere & Co., Dubuque I-38	31.93	2,329	-	2,329	- (3)	Various in-plant additions and modifications to comply with (3)	7/1/75	1/1/76	6/30/77
Grain Processing Corp., Muscatine I-115	17.14	66,820	-	57,596 (4)	-	Additional BOD_5 removal; connect to municipal STP	Complete connection in 1976		

TABLE VIII-4

TREATMENT NEEDS AND SCHEDULE OF COMPLIANCE
FOR
MAJOR INDUSTRIAL DISCHARGERS*

NORTHEASTERN IOWA BASIN

Industrial Discharger	Present Flow (mgd)	Present Eff.Lbs.		7-1-77 Eff. Lbs.		Treatment Needs	Schedule of Compliance		
		BOD_5	NH_3	BOD_5	NH_3		Facility Plans	Final Plans	Completion Date
Hawkeye Chemical Co., Clinton I-68	1.85	-	10,000 (5)	- (6)	406 (5)	Additional NH_3 removal	6/1/75	4/1/77	7/1/77
Meinerz Creamery, Fredericksburg I-79	.206	7,362 (8)	No Data -	29 (7)	9 (7)	Additional BOD_5 and NH_3 removal	2/15/75	5/1/75	-
Mississippi Valley Milk Producers Assoc. Luana I-13	.150	188	2	22	-	Additional BOD_5 reduction	-	-	12/31/79
Monsanto Co., Muscatine I-120	7.41	11,335	866	1,025	-	Additional BOD_5 removal	4/1/75	8/1/75	-
Polaris Plating Co., Elkader I-21	.020	pH=7.4 Tss=.38 Cn=.21 Cr^{+6}= .01mg/l Cu=.02 Cr=.006 Ni=.40 Zn=.40		pH=6-9 (9) Tss=3.3 Cn=.17 Cr^{+6}=.05mg/l Cu=.17 Cr=.17 Ni=.17 Zn=.17		Additional heavy metals removal; connect to city STP with proper pre-treatment	1/1/75	7/1/75	-

"*" As defined by IDEQ

(1) Limits on pH temperature, Tss, grease and oil also applicable

(2) Limits on COD and Tss also applicable

(3) Limits on Cr, Zn, Pb, phenol,grease and oil also applicable

(4) Limits as of 7/1/75

(5) Includes organic and NO_3 nitrogen

N/A Not available

(6) Limits on Cr, grease and oil also applicable

(7) Waste Load allocations

(8) Average value for 1974

(9) All values are limits for 7/1/76

(10) Schedule for sludge handling facilities

treatment plants. Many of these plants use lime (calcium hydroxide) to soften the water before distribution. The sludge created poses a significant disposal problem.

Most facilities lagoon the sludge, but this does not answer the final disposal problem of what to do when the lagoons are full. Some plants discharge their lime sludge directly to the river. These plants are currently studying methods to eliminate such discharges.

Lime sludge does have an economic value if handling problems can be overcome. The sludge can be used for landfill, or as a pH buffer on farmland which has acidic soil. Recently concrete manufacturers have expressed an interest in the material, since it is one of the major ingredients in their product.

As pressure is brought to bear on water treatment plants from Government agencies and landowners located adjacent to sludge lagoons, lime sludge disposal will receive greater attention.

An estimate of semipublic needs and related costs to meet the Basin's plan has not been performed due to a lack of information detailing the facilities.

Nonpoint Source Needs

Nonpoint source of pollution have been divided into the three main areas of: general rural runoff, animal feeding operations, and urban nonpoint sources. Each of the three areas has been discussed in Chapter VII and in greater detail in the Supporting Document.

General Rural Runoff - The major pollution parameters in general rural runoff have been classified as sediment, nutrients, and organics. Sediment is usually the parameter of most significance.

Nutrients can also be of major significance especially if they will affect near-by lakes or impoundments. Runoff from cropland is a major source of nutrients. Nutrient pollution abatement is accomplished through improved methods of fertilizer application and implementation of the same measures used to control soil loss.

Except where runoff occurs from animal feeding operations, organics are usually of relatively minor importance, especially when compared with the contribution from municipalities.

Physical needs for abating general rural runoff pollution reduce to those methods employed for controlling soil loss. These methods have been discussed in some detail in Chapter VII of the plan. An estimate to implement such control measures in the Northeastern Iowa Basin was presented. The estimated capital investments are approximately 309 million dollars.

Animal Feeding Operations - The major pollutants from animal feeding operations are suspended solids, nutrients, and organics. Physical needs to control these sources of pollution have been summarized as including debris basins and retention basins, with land application for final disposal. These methods have been discussed in some detail in Chapter VII of this plan. An estimate to implement such control measures in the Northeastern Iowa Basin was presented. The estimated capital investments are approximately 10.5 million dollars.

Urban Nonpoint Sources - An estimate of the physical needs and costs involved in the correction, containment, and/or treatment of urban runoff was prepared and is presented by hydrologic units. The estimated capital investments are approximately $511 million dollars. These estimates are approximations but they do reflect the magnitude of the problem. This is an area of the basin plan that will receive greater emphasis in future revisions.

Summary of Needs

The total dollar need to meet the objectives of this basin plan for the Northeastern Iowa Basin is estimated to exceed 990 million dollars. This amount is broken down in Table VIII-5.

TABLE VIII-5

SUMMARY OF NEEDS

NORTHEASTERN IOWA BASIN

Need	Approximate Dollars*
Municipal Treatment	$ 125,401,600
Municipal Collection and Combined Sewer Overflow Correction	12,531,000
Industrial Treatment (Significant Industries)	23,155,000
Animal Feeding Operation Controls	10,489,000
Soil Loss Control	308,748,000
Urban Storm Water Runoff Controls	510,915,000
TOTAL	$ 991,239,000

REFERENCES

1. Sewage Treatment Plant and Sewer Construction Cost Index, U.S. EPA Office of Water Program Operations, Municipal Construction Division.

2. Manson, R.J. and Merrit, C.A., "Land Application of Liquid Municipal Wastewater Sludge", Water Pollution Control Federation Journal, Vol. 47, No. 1, January 1975.

3. Supporting Document For Iowa Water Quality Management Plans, Iowa Department of Environmental Quality, Water Quality Management Division, Des Moines, Iowa, 1976

CHAPTER IX

CONCLUSIONS AND RECOMMENDATIONS

NORTHEASTERN IOWA BASIN

As stated in the introduction, the objective of this Basin plan is to provide the framework for achieving the protection and maintenance of surface and groundwater quality in the Northeastern Iowa Basin. Its implementation will help in attaining that objective.

CONCLUSIONS

Several significant conclusions have been identified during the development of this plan.

These include:

1. The Northeastern Iowa Basin currently has 164 incorporated municipalities with a total population of 378,041. The population of these municipalities is projected to increase by 25 percent to 473,431 by 1990.
2. Of the incorporated municipalities, 129 currently have collection and treatment facilities and 39 communities have no central sewage system. Many of the treatment facilities are not presently achieving secondary treatment.
3. Waste stabilization lagoons serve 33 percent of the municipalities and a large number of industries within the basin.

4. Waste load allocations have shown that a significant number of dischargers will be required to provide advanced waste treatment to meet water quality standards at the 7-day, 1-in-10 year low streamflow. Waste load allocations have been made on the Upper Iowa, Yellow, Turkey, Maquoketa, Wapsipinicon and Elk Rivers and Paint Creek.

5. The Upper Iowa River in Minnesota is classified as 2B and 3B waters (warm water fish and industrial comsumption, respectively) and in addition also carries several general stream classifications applicable to all streams. The positions of the river within the State of Iowa carries the classification A and B (cold water) A and B (warm water). In addition, effluent standards for discharges to the river vary between the two states.

6. Most industries should be able to meet the July 1, 1977 requirements of the Act. A high percentage of municipalities will also meet this deadline, however, extended construction schedules and lack of adequate grant funding will result in some municipalities not meeting the deadline. The 1983 goal requiring all streams to be of suitable water quality to be fishable

and swimmable can be met if Federal funding is continued.

8. The Basin plan has demonstrated (Chapter VIII) a need in the Northeastern Iowa Basin for municipal treatment and collection facilities which may exceed a cost of 137 million dollars.

9. The evaluation of adequacy and improvement needs for municipal wastewater treatment facilities has been hampered by a current lack of available information on the status of combined sanitary/storm sewers and on the extent of sewer infiltration. It would appear, in several instances, that treatment facilities are either overloaded or over-designed because of basic sewerage problems which deserve more direct attention.

10. At present, there is no organized information available as a base for evaluating the sewer and treatment needs of unsewered communities or private point source dischargers. In cases where obvious water quality problems are identified, sewer and treatment facilities are recommended to replace individual on-site disposal systems. But, for planning purposes, information should be developed regarding soil characteristics, groundwater pollution

potential, etc. to screen out those communities or point source dischargers with definable needs for municipal sewage and sewerage treatment systems.

11. Current methods for estimating municipal project costs are non-systematic. An adequate basis of historical cost data and other correlary information with which to develop a much improved method for project cost estimation should be established.

12. There are several planning areas where currently available information is inadequate. In many instances, the basic data are available in one form or another, but manpower and/or time limitations did not allow for their proper processing or application to the planning study. In other instances, the required data base is simply lacking and must be built up over a period of time. The more significant areas of planning information deficiency are briefly described below:

    a. Current information appears, in several instances, to be incomplete, out-dated and lacking in important descriptive details. A comprehensive state-wide survey of industrial wastewater sources may be invaluable to support both basin planning and routine water pollution control activities.

b. Comprehensive, up-to-date estimates of 5-day BOD loading and discharge volume for all municipal and industrial sources within each basin is inadequate for planning purposes. Some of the required information is potentially available from the DEQ's EQAP files, but should be augmented and up-dated by new survey data. A screening process for data should be instituted to minimize erroneous entries or obviously inconsistent data.

c. Complete, authoritative estimates of nutrient loadings (i.e. phosphorus and nitrogen) into streams and lakes from point and area sources within each basin would be valuable. Collectively, the DEQ staff has a good working knowledge of problem areas and causative factors. However, such information has not yet been systematically collated and evaluated for basin planning purposes.

d. Estimates of low-flow probabilities and assimilitative capacities for minor streams in the basin do not exist. The flow characteristics along selected reaches of larger rivers and tributaries have been measured and modeled in terms of assimilative capacity. More extensive modeling of Iowa's major river systems is required for use as a base in estimating future waste loads within all basins and watersheds. There is a definite need for authoritative estimates of low-flow probability and assimilative capacity for the minor streams: as there is no quantitative basis for evaluating the significance of waste loadings into local receiving waters.

13. Sediment, which often carries other pollutants with it, is a significant pollution parameter in Iowa. Proper land and water management can minimize soil erosion. Efforts should be made to continue and increase the use of established soil conservation practices. A few of these practices involve only alternate land management with greater benefit resulting from the same monetary outlay. This can also be true for certain pollutants carried with sediment. Pesticides in the environment can be reduced by using soil conservation practices and fertilizer loss can be minimized by application methods which assure efficient uptake by crops. Farmers, developers communities, counties, and individuals can all help in these and many other ways.

14. Land disposal of digested municipal sewage sludge is the most economical ultimate disposal method currently utilized in the planning area. However, problems have arisen as a result of the unpermitted practice of disposing of sludge in sanitary landfills, and careless practices in farmland disposal.

RECOMMENDATIONS

The following recommendations are made for further consideration and study:

1. Additional qualitative stream monitoring (BOD_5, dissolved oxygen, ammonia) during low flow conditions should be undertaken to refine the waste load allocation. For minor streams, low flow probabilities and determinations of assimilative capacity should be made.

2. Those communities faced with advance waste treatment requirements should include where soil and other conditions permit, as part of their Step 1 Facilities Plan, an evaluation of land application techniques, oriented toward utilization of the treated wastewater as a valuable agricultural resource.

3. Complete retention lagoons rather than small mechanical treatment plants should be considered for fulfilling waste treatment facility needs where applicable, in view of the national goal of zero discharge of pollutants by 1985. In Step I Facilities

Plans, appropriate consideration should be given to joint treatment possibilities for municipalities and industries. In addition, the Facilities Plan should include an evaluation of upgraded treatment alternatives versus other alternatives such as relocating discharge points, flow regulation, etc. The communities, assisted by the Department of Environmental Quality, are responsible for considering this in their plan alternatives.

4. Detailed subsurface investigations should precede the site selection for waste stabilization lagoons in Allamakee, Chickasaw, Clayton, Floyd, Howard, Mitchell and Winneshiek counties to account for the presence of sink holes or solution channels in areas underlain by limestone or dolomite. The Facilities Plan is the appropriate place for inclusion of such evaluations.

5. There is a definite need to make waste load allocation studies during other than low flow conditions, at such times when contributions from nonpoint sources could be relatively large compared to point sources. Agricultural and natural pollution loadings should be systematically estimated on a watershed unit basis for each basin. Concentrated analysis should be directed toward specific water quality problem areas

where eutrophication and high bacterial concentrations are associated with such nonpoint sources.

An expanded pilot study similar to that done in the Buffalo Bill Creek Watershed, for assessing nonpoint source pollutant contributions should be undertaken. This study should evaluate the contributions of sediments, nutrients and pesticides from agricultural areas, compare the relative contributions from various conservation practices, and suggest remedial measures.

6. Additional study should be made of non-conventional waste source problems such as radioactive wastes, thermal pollution, and potential pollution problems from stored liquids.

7. Consideration should be given toward designating one new 208 area-wide planning region for Davenport and environs.

8. The states of Iowa and Minnesota should arrive at mutually agreeable stream classifications and effluent standards for those portions of the waterway within each of their borders.

9. Additional monitoring stations for measuring sediment loads should be chosen and additional data gathered to further quantify the magnitude of this problem.

10. Non-structural management measures that can enhance and protect water quality should be given careful consideration by all levels of government, business interests and private citizens.

Some such measures include:

a. Improved operation and maintenance of all waste treatment systems. Small communities may be able to accomplish this goal by sharing qualified operators and laboratory facilities. In addition, wastewater plant operator training should receive emphasis.

b. Land use planning and zoning decisions should include considerations of water quality. This is particularly important where lake shore development occurs.

c. Local government should consider the impact on water quality before making commitments for new development or industry.

d. Tillage practices should be selected that will minimize soil erosion.

e. Agricultural chemicals should be applied at rates and times that will minimize runoff of fertilizers and herbicides.

f. The design of any new or expanded industrial or commercial facilities should give careful consideration to minimize the amount of waste products that will be discharged from that facility.

g. Recycling should be encouraged and selected even when marginally cost-effective on the assumption that the cost of all natural resources will increase in the future.

h. Strict enforcement of local ordinances should be practiced. Such ordinances should include provision for rigid inspection of all new sewer construction and connections.

i. County Boards of Health should adopt and enforce individual waste disposal system regulations promulgated by the State Health Department.

j. Sanitary districts should be established to provide sewerage services to unincorporated areas.

k. It is known that urban runoff contains metals and other pollutants, but their impact on downstream water uses needs further studies. Urban runoff can be controlled by storage and treatment. Economic feasibility studies should be performed for all major municipalities.

l. Land disposal of digested municipal sewage sludge is the most economical ultimate disposal method presently used. Departmental policy should address this disposal problem. A program could be mounted to educate the farmer of the economic advantages of accepting this material.

m. At the community and county level, zoning and land use planning should be used to assure an orderly and efficient development of unsewered areas.

n. Woodland management practices should be selected that will minimize soil erosion.

11. Structural measures will, of course, also help to protect water quality. Many of the structural measures required in the basin are outlined in the needs table.

12. The State Water Plan, which is currently under development, should give careful consideration to water quality. Consideration should also be given to limiting use classifications in water quality limited segments.

CHAPTER X - REVIEW AND REVISION

PUBLIC HEARING PROCEDURE

Public hearings are specified by the Federal Water Pollution Control Act Amendments of 1972 as part of the procedure for establishing a water quality management plan for river basins. In accordance with Section 101(e) of the Act, public participation was required on significant elements of the planning process.

Statements or presentations given at public hearings were required to be retained in writing for the record. Verbal comments and written statements were specified to be limited to the Water Quality Management Plan. Written statements were requested to be submitted to DEQ at least one week prior to the hearing. Additional statements, filed within ten days after the scheduled hearing, were also considered part of the record.

"Reasonable Notice" was given to the public by prominent advertisement, indicating time, date, place, and availability of proposed plan, 30 days prior to the date of each hearing. Complete records of such hearings are kept and a transcript made available on payment of fee.

WATER QUALITY STANDARDS REVIEW

The Federal Act specifies that at least every three years, starting from date of enactment of the 1972 Amendments, the Iowa Water Quality Commission hold public hearings for purpose of review, and/or revision, of the Iowa Water Quality Standards. The 303(e) process, including this basin plan developed as part of the process, is used to assist in making any necessary revisions of Iowa Water Quality Standards. The Iowa Water Quality Standards are scheduled for revision in 1976.

BASIN PLAN REVISION

This Basin Plan is Phase I of the annual continuing planning process as required by section 303(3) of the Act. This basin plan will be revised under Phase II in such manner as is necessary to maintain its viability. Thereafter, this Basin Plan will be reviewed annually and revision will be made if warranted. Revision to the wasteload allocations, compliance schedules, or construction grant needs and priorities will be based on the most current and accurate data available.

BASIN PLAN HEARING

A public hearing concerning the adoption of the proposed Northeastern Iowa Basin Water Quality Management Plan was conducted by the Department of Environmental Quality. The hearing was held December 30, 1975, at 7:30 p.m. at the Ninth Street Fire Station, Ninth St. and Central, Dubuque, Iowa. A copy of the public notice announcing the hearing appears in this chapter.

Identified in the following list are persons who attended the hearing:

Name	Representing
Bruce Dixon	WDBQ Radio
Ronald G. Haugland	Shive-Hattery & Assoc.
Ralph J. Russell, P.E.	Howard R. Green Co.
Eldon S. Molitor	Self
Kenneth K. Kuilesen	Self
Roger Halverson	State Representative
Dale Tieden	State Senator
Mark Sutton	Upper Ia. River Preserv. Assoc.
Dale E. Reiser	Upper Ia. Pres. Assoc, Inc. & Allamakee NFO
Ing Opheim	Self
Jerry E. Green	East Central Intergovernmental Assoc.
Gene Carolan	Self
C. J. Anderson	Upper Ia. River Land Owner
Arthur J. Roth, Jr.	City of Dubuque
John L. White	City of Dubuque
Jannan J. Malanaphy	Self
Earl J. Kerken	SCS
Robert Fay	Bartels, LeMay, Mars & Fay Engr. Co.
Dave Miller	KWWL TV
Kerien Fitzpatrick	Chemplex Co.
D. J. Carlson	Interstate Power Co.
Charles A. Cate	Cullen, Kilby, Carolan & Assoc.
Dave Boeding	Self

Name	Representing
J. Charles Boeding	Self
Thomas F. Walz	City of Dubuque
Paul F. Horsfall	City of Dubuque
Bill Knee	Telegraph Herald
John A. Schupanitz	Upper Ia. River Pres. Assoc.
Donald Ward	Self
Mrs. Mark Sutton	Upper Ia. River Pres. Assoc.
Mr. & Mrs. Geo. W. Smith	Selves
Jerry Rattenborg	DEQ
Larry Keehner	Clayton Co. Farm Bureau
Bob Gee	INRC
Mrs. Gene Carolan	Upper Ia. River Pres. Assoc.
John Beckman	City of Maquoketa
Earl Green	Miss. Valley Milk Producers
Arthur Hackett	KDIN Radio
Milton Overson	Upper Ia. River Pres. Assoc.
Karl E. Biari	East Central Intergov't Assoc.
Norman Wenck	E. A. Hickok & Assoc.
Mr. & Mrs. Alvin Gapp	Selves
Victor Byrnes	Farm Bureau, Allamakee
Ron Blumhagen	Clayton Co. Farm Bureau
Hugh Conway	Environmental

iowa department of environmental quality

NOTICE OF PUBLIC HEARING

The Iowa Department of Environmental Quality (DEQ) will hold public hearing concerning the adoption of the proposed Water Quality Management Plan for the Northeastern Iowa Basin on December 30, 1975 at 7:30 p.m. at the 9th St. Fire Station 9th St & Central, Dubuque, Iowa. In event of inclement weather condition, the hearing will be held one week later, on January 6, 1976, same time, same place.

The Water Quality Management Plan is specifically directed toward satisfying the requirements of Section 303(e) of the Federal Water Pollution Control Act, as amended, Public Law 92-500, 86 Statute 849 (1972); (33 United States Code Annotated 1313(e). The purpose of the Water Quality Management Plan is to identify the water quality problems of the Northeastern Iowa Basin and to set forth a program to correct the problems.

The public hearing (held pursuant to Subsection 455B.32(7) of the Code of Iowa and 40 Code of Federal Regulation Part 131.502 (Federal Register, Volume 39, 19643, June 3, 1974) will give the public opportunities for expression of views to DEQ as well as provide for total public disclosure of the Water Quality Management Plan.

Oral and written statements presented at the hearing will be retained in the written record of the hearing. Statements should be limited to the subject matter of the Water Quality Management Plan for the Northeastern Iowa Basin. Time limits may be set on oral presentations at the discretion of the hearing officer so that all wishing to speak may be heard. Written statements may be submitted to DEQ prior to the hearing and at the hearing. Written statements received within ten days after the hearing will also be considered part of the hearing record. Complete records of the hearing will be kept and transcripts will be available upon payment of a duplication fee. The final Water Quality Management Plan will include a description of any major objections raised during the period for public comment and the disposition of such objections. The plan will become effective after approval by the Iowa Water Quality Commission, the Governor of Iowa and the U.S. Environmental Protection Agency.

A copy of the proposed plan will be available for inspection in the City Clerk's Office in the county seat of each county located in, or partially in, the Northeastern Iowa Basin. Copies will also be available for inspection in the DEQ regional offices located in Manchester, Mason City, Spencer, Washington and Council Bluffs, and in the main office in Des Moines. Written statements and requests for additional information should be addressed to the Water Quality Management Division, Iowa Department of Environmental Quality, 3920 Delaware, P.O. Box 3326, Des Moines, Iowa 50316, telephone 515/265-8134.

WATER QUALITY MANAGEMENT DIVISION

Joseph E. Obr, P.E., Director

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The substantive comments (both written and oral) for all six basin plans presented at the hearings and/or directly submitted to the DEQ office in Des Moines, have been compiled. Responses made by the DEQ staff were then presented to the Iowa Water Quality Commission. Those commenting on the plan included federal and state agencies, county and local governments and agencies, industrial organizations, local citizens and special interest groups. Many of these comments have been adopted or substantially justified by change, deletion from, or additions to the basin plans. The Commission approved the plans and copies along with the comments and responses were sent to the Region VII office for EPA's approval. Oral and written statements presented at the hearings are available at the DEQ office for inspection. Copies may be obtained from the DEQ for a reproduction fee.

The DEQ has revised the plans in responses to issues raised, which could be resolved easily and not slow the progress of the study. If, however, it cannot readily be resolved and is a major issue, the issue will be addressed in Phase II of the planning process.

The water quality standards and the stream classifications will be reviewed in 1976. The DEQ, in cooperation with the Iowa Conservation Commission, will evaluate stream use and classification. The chemical and physical parameters listed in the standards will also be subject to review. Public hearings will be held prior to commission approval.

The stream segment and discharger ranking methodology, as required by Sec. 303(e) of the Act, may be the basis for future construction grant funding. Before any future grant priority list is compiled, which may be based on new priority formulas, the methodology will be reviewed and public hearings held. The discharger ranking used in the basin plans basically assumes that dischargers creating the greatest impact on water quality will be addressed more quickly than dischargers with less impact. This methodology will be expanded before it is used for the construction grant ranking.

New data regarding the seven-day ten-year low flow is now available and new population projections are expected. This will necessitate updating many waste load allocations in the Phase II planning program.

As stated earlier, 303(e) basin planning, or Phase I, mainly addressed point source pollution abatement. Under EPA (Phase II) guidelines, states are required to fully address nonpoint source pollution and to develop abatement programs to handle the problem. Phase II planning will continue to include point source waste load allocations and time schedules, and will update the municipal needs tables. Much of this will concern locating errors, or be tied to stream reclassification, new low flow data or standards revision.

The goal of Phase II planning is to reassess controls and needs of combined sewer replacement, feedlot control, urban runoff, and rural nonpoint pollution and to assign implementation programs.

GLOSSARY

Activated sludge is a completely aerobic treatment process by which wastewater is fed continuously into an aerated tank where microorganisms metabolize the organic material. The biological floc is settled in a final clarifier and may be recirculated to the aeration basin. Ninety to ninety-five percent BOD removal can be achieved.

Aerobic denotes biological processes in which oxygen is used for the decomposition of organic material.

Anaerobic denotes biological processes in which organic matter is decomposed in an environment devoid of free oxygen.

Biochemical oxygen demand (BOD) is the quantity of oxygen utilized in the biochemical oxidation of organic matter in a specified time and at a specified temperature.

Combined sewer is designed to carry sanitary sewage, industrial wastes, and storm runoff in a single conduit.

Disinfection of water or wastewater is a method of reducing pathogens or objectionable microorganisms by means of chemicals or other acceptable means.

Dissolved oxygen is the concentration of oxygen dissolved in a liquid. If affects biological changes brought about by aerobic or anaerobic organisms, and is an important environmental factor for growth and reproduction of fish and other aquatic organisms. Determination of dissolved oxygen also serves as the basis of the BOD test.

Gaging station is a particular site on a stream, canal, lake, or reservoir where systematic observations of gage height or discharge are obtained.

Holding or storage pit is a covered container into which wastewater flows until it can be pumped out and taken to a treatment facility.

Industrial wastewater is the wastewater which originates in industrial processing, cooling, or washing operations.

Infiltration is the groundwater which gains entrance to sewers through joints or improper connections.

Intermediate treatment involves additional settling of the wastewater and may incorporate chemicals to aid the settling process. Normally 50 percent BOD removal may be obtained through this process.

Intermittent stream is a stream with 7-day, 10-year low flow less than 0.1 cubic feet per second.

Lagoon or stabilization pond is generally a shallow geometrical pond which treats pretreated or untreated sewage biologically. Wastewater is retained in the pond for treatment and a clarified effluent is discharged after a specific detention time.

Main sewer is a conduit to which one or more branch sewers are tributary.

Outfall sewer receives the wastewater from a collection system and carries it to a point of final discharge.

pH is the negative logarithm of the hydrogen ion concentration. A pH below 7 indicates an acid condition and a pH above 7 indicates an alkaline condition.

Population equivalent measures the strength of a wastewater in terms of an equivalent number of persons, using an average 0.17 pounds of oxygen demand per person per day in domestic wastewater.

Pretreatment of industrial waste refers to treatment, usually primary, given to the wastewater before it is discharged into a sanitary sewer for secondary treatment.

Primary treatment involves only screening and physical settling of the wastewater. Approximately 30 percent of the BOD can be removed through this process.

Sampling station is a particular site on a stream, lake, canal, or reservoir where systematic samples of water are taken for analysis for physical, chemical, or biological parameters.

Sanitary sewer is a conduit designed to carry sanitary sewage. However, in many cases, it will also carry industrial wastes produced in the area it serves.

Secondary treatment conventionally involves biological treatment of wastewater to reduce the BOD by 85 percent or more. These biological processes usually involve trickling filters, stabilization ponds, or activated sludge processes. Recently, straight physical-chemical processes have been considered secondary treatment on the basis of their BOD removal efficiency.

Septic tank allows solids to settle out of a waste and permits a clarified effluent to be discharged to a ground seepage system. The solids are broken down anaerobically, and the residue must be pumped out periodically.

Sewage disposal applies to the act of disposing of sewage by any method. It may be done with or without any previous treatment of the wastewater.

Sewage treatment refers to any artificial process to which wastewater is subjected in order to remove or alter its objectionable constituents so as to render it less dangerous or offensive.

Sewage treatment plant is a comprehensive term encompassing an arrangement of devices and structures for treatment domestic and industrial wastewater and sludge.

Sewerage is a system of sewers and appurtenances for the collection, transportation, pumping, and treatment of domestic and industrial wastewaters.

Solids are all matter except water contained in a liquid. They may be suspended or dissolved solids.

Storm runoff is the wastewater flowing due to rain water, snowmelt, or other surface runoff.

Trickling filter systems consist of a bed of crushed rock, or other media, coated with biological films, through which primary effluent is passed for secondary treatment. The filter may be followed by a final settling basin, and recirculation through the filter may be employed for better removal. Up to 90 percent BOD removal can be achieved through trickling filter systems in ideal situations.

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