

Phase 1  
**REPORT**



The Water Partnership of Northwest Missouri is a coalition of local and regional stakeholders working to identify a long-term affordable, abundant high-quality water supply for the citizens of Northwest Missouri.

The partnership includes county, municipal and water system representatives, Northwest Missouri State University, University of Missouri Extension and the Missouri Department of Natural Resources.

For more information on the Water Partnership of Northwest Missouri, contact:

Missouri Department of Natural Resources  
**Northwest Missouri Satellite Office**  
Northwest Missouri State University- Environmental Services  
800 University Dr.  
Maryville, MO 64468-6015  
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*“The Water Partnership of Northwest Missouri has been fortunate to have the services of an outstanding group of volunteers. Their understanding of the water issues facing the region and their dedication to finding solutions has enabled Phase I goals to be realized. As the project enters Phase II, several members have indicated their willingness to continue to serve. The Partnership will also be recruiting new faces to further energize the project.”*

*Harlan Higginbotham,  
Chairman*

For more information on the Water Partnership  
of Northwest Missouri visit  
<http://water.nwmorcog.org>



*For more than 40 years I have worked with the public water systems in north Missouri and witnessed the struggles as residents saw their wells and water reservoirs decrease in productivity or become totally useless. I believe that the proposed regional water plan presents a breath of fresh air and a never before available opportunity for the water systems of the area to solve a multitude of problems with source water and problems meeting standards for finished water.*

*Bill Hills, Consultant*



Throughout Missouri's history, communities have always developed, and flourished, in areas with the best access to resources – with water being among the most important of those resources. American Indian cultures thrived along its rivers before the westward European expansion. Those pioneers also looked first to the rivers for settlement, setting the foundations for what are now our largest cities, St. Louis and Kansas City and our state capital, Jefferson City.

Just as it was in the early days of Missouri's history, access to water remains a critical element in the life and prosperity of our communities. Over time technology has allowed people to move farther from surface water sources, like rivers and lakes, by using wells to take advantage of groundwater sources. However the state's varied geography means some areas have abundant access to groundwater, while other regions do not.

#### **Northwest Missouri**

In northwest Missouri, the most reliable sources of water are the Missouri River, wells fed by the Missouri River alluvium and federally built water supply reservoirs. Communities without access to one of these sources frequently draw their water from less reliable wells or smaller locally built reservoirs that cannot be counted on to provide adequate water supplies during times of prolonged drought. Insufficient water supplies hamper industrial and commercial development, which, in turn, hampers healthy community growth.

Without the growing tax base that accompanies economic growth, many water systems have not been able to adequately maintain their facilities. Many face costly upgrades in the near future in order to meet increasingly strict water quality standards. As competition for state and federal funds becomes tight, many smaller community systems may find themselves without the resources to continue to serve their customers.

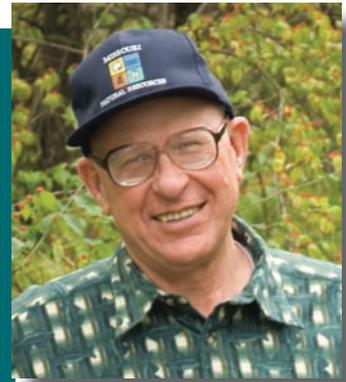
It was following one of those prolonged dry periods in 2003, that representatives from a 12-county area of northwest Missouri came together to form the Water Partnership for Northwest Missouri. The partnership was created to develop a regional water supply plan for the northwest region. Its members, which include elected officials, water system managers, economic development coordinators and community planners, come from Andrew, Atchison, Buchanan, Caldwell, Clinton, Daviess, DeKalb, Gentry, Harrison, Holt, Nodaway and Worth counties.

The goal of the partnership is to explore options for a regional water plan that provides a long-term, affordable, high-quality water supply that takes advantage of existing infrastructure while maintaining local control over the distribution systems. Initial studies have identified several existing regional water systems in the 12 counties that could serve in a long-range plan. These systems have the capacity to continue to meet the needs of their current service area as well as the needs of neighboring communities.

This report will detail many of the findings of the partnership and discuss the best course of action to address the long-term water needs of northwest Missouri. This course of action, referred to in this report as Sketch No. 7, remains simply an idea – a proposal reached as the result of more than two years of work. The details, as many as are known, will be discussed in this report. Other details, including costs, specific routes for the suggested transmission lines and operational specifics, will be dealt with during the next phase of the process.

### **Water Transmission, Not Distribution**

The key factor to remember is that all recommendations focus on water transmission and not water distribution. Transmission deals with getting water from a reliable source to local water facilities, while distribution involves moving that water from the local water plant to the customer. Local water facilities - under local control and in many cases continuing to rely primarily on local water resources - are an important part of the plan.



*The connection between reliable water and economic growth is undeniable. Communities will grow or stagnate in direct proportion to their access to this vital resource. Money to help meet these needs is scarce, and the competition is intense. Those communities that take a cooperative approach to finding long-term solutions to critical needs are the ones that are most likely to succeed. In northwest Missouri securing adequate supplies of quality water is a regional issue that requires a regional solution.*

*Doyle Childers  
Director of the Missouri  
Department of  
Natural Resources*





*“Northwest Missouri will simply not grow without an abundant water supply. The Water Partnership is important because it helps the region examine and address future drinking water challenges that impact all Northwest Missourians.”*

*Tye Parsons,  
Director of the NWMO  
Regions Council of  
Governments*

## Partnership History

In March 2005, with northwest Missouri only one short year removed from a 14-month drought that kept most of the region enacting water conservation measures, the Northwest Missouri Regional Council of Governments approached the Department of Natural Resources about helping to develop a strategy to address the water needs of its five member counties. Those counties, Atchison, Holt, Gentry, Nodaway and Worth, were among the hardest hit by the drought. A number of issues were identified at that meeting, but ultimately participants decided it would be most effective to bring all interested parties together for a water summit to identify all the needs and resources of the region.

In July of that year, council representatives met with Department of Natural Resources Director Doyle Childers to solicit department help in developing such a plan. Director Childers promised department support contingent on two factors: that the effort be locally driven and focused on developing a long-term regional plan. Subsequent meetings lead to the expansion of the area to the current 12 counties listed earlier.

The first regional water symposium was held in November 2005 on the campus of Northwest Missouri State University, which had become a partner in the process. The department awarded the the university a \$113,000 planning grant to launch the effort. In support, the department also opened a satellite office on the campus. This conference led to the establishment in January 2006 of the body now known as the Water Partnership of Northwest Missouri. Representatives from each of the 12 counties were chosen to represent their communities and several advisors were chosen to work with the partnership.





By October the partnership's engineering subcommittee completed its "baseline study," an analysis of the 83 water systems operating within the partnership's 12 counties. Using the information from the baseline study, the partnership identified seven water systems "that have the capacity to continue to meet the demands of their service area and serve other nearby communities." These systems were to become key elements in the partnership's suggested plan.

## Sketch No. 7 and Declaration of Unity

In February 2007, the partnership, following the recommendation of the engineering subcommittee, unanimously endorsed the proposal known as Sketch No. 7.

United behind the newly endorsed plan, the partnership in March held town hall meetings in each of the 12 counties to introduce Sketch No. 7 to and discuss it with community leaders and residents alike.

Community support for Sketch No. 7 continued to grow and in July at the partnership's third water symposium, the group unanimously approved the Declaration of Unity (see back cover). Also at the symposium, the Department of Natural Resources awarded the university a \$150,000 grant to continue the regional water planning process and a \$50,000 grant to apply toward a preliminary engineering study.

## PHASE ONE PLANNING MEMBERS, SUPPORT STAFF & ADVISORS

**CHAIRMAN**, Harlan Higginbotham

### COUNTY REPRESENTATIVES MEMBERS

ANDREW COUNTY	Dale Watson
ATCHISON COUNTY	Curtis Hedrick
BUCHANAN COUNTY	Norman H. Ellis
CALDWELL COUNTY	Marvin Nickell
CLINTON COUNTY	Phil Lammers
DAVISS COUNTY	Zac Johnson
DEKALB COUNTY	Michael D. Jacobs (Huey)
GENTRY COUNTY	Manley Tillison
HARRISON COUNTY	(Currently Vacant)
HOLT COUNTY	Wayne Voltmer
NODAWAY COUNTY	Bob Stiens
WORTH COUNTY	Richard "Dick" VanVector

### MEMBER(S) WITH SPECIAL EXPERTISE

Kenneth Minter

### REGIONAL PLANNING COMMISSIONS

#### PARTNERSHIP MEMBERS

#### GREEN HILLS REGIONAL PLANNING COMMISSION

Randy Railsback, Executive Director

Lance Rains (Alternate)

#### NORTHWEST MISSOURI REGIONAL COUNCIL OF GOVERNMENTS

Tye Parsons, Director

#### MO-KAN REGIONAL COUNCIL

Tom Bliss

### STAFF AND ADVISORS TO THE WATER PARTNERSHIP

PHASE I COORDINATOR Marsha Boone

CONSULTANT William E. Hills

OTHER DNR SUPPORT Breck E. Summerford, P.E.

David L. Williams

Steve A. McIntosh

#### UNIVERSITY OF MISSOURI EXTENSION COMMUNITY DEVELOPMENT

Beverly Maltsberger

#### NATURAL RESOURCE CONSERVATION SERVICES (NRCS)

Anita Dunham

#### US DEPARTMENT OF AGRICULTURE

Stan Wolfe

#### MISSOURI DEPARTMENT OF ECONOMIC DEVELOPMENT

Terry Maglich



*"I hope to use my experience on the Partnership to establish a plan for Northwest Missouri that will lay the groundwork to provide every community in the region with an abundant, safe and affordable source of drinking water."*

*Phil Lammers,  
Clinton County*

## Selected Plan - Sketch No. 7

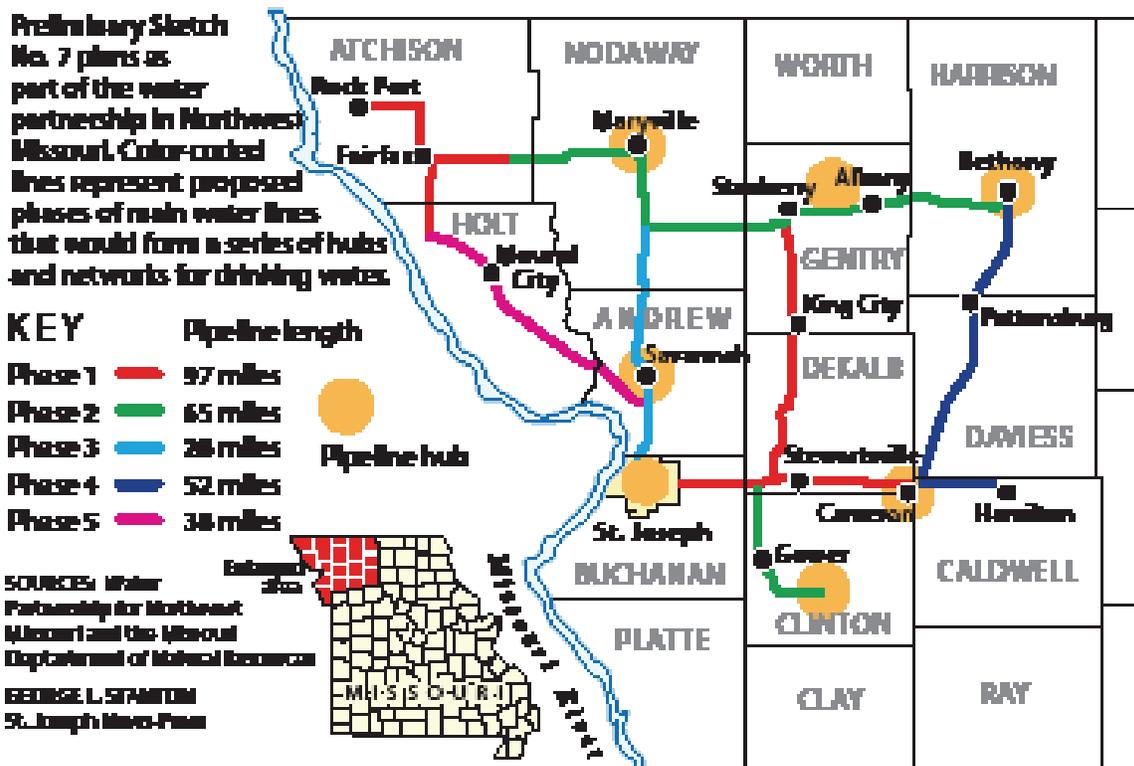
The Water Partnership for Northwest Missouri studied a number of regional water plan options (see Appendix C, Other Sketches) before making the recommendation known as Sketch No. 7, a combination of several of the other options considered. The goal of Sketch No. 7 is to develop a regional water system that will provide for transmitting large quantities of water throughout the 12-county area. One important feature of this plan is how it incorporates existing facilities and current developments.

The water will be transported to and between the region's major sources and the seven hubs identified in the baseline study: Cameron, Bethany, Maryville, Missouri-American Water Company, Middle Fork Water Company, Plattsburg and Savannah. The water will be transported through large transmission lines, with the cities and water districts adjoining the transmission lines being allowed to obtain water through a master meter.

Cities and water districts will then serve their individual customers through their own existing, and hopefully expanded, water distribution systems. These water systems will continue to function as individual political subdivisions, being managerially and financially responsible for providing all distribution piping necessary to serve individual customers.

In time, a number of small ground water systems will likely decide to discontinue the use of their own water source. This will be due to reduced well capacity, increased need that the source would not support, need for water treatment facility expansion or replacement, or it because of the cost efficiency of purchasing treated water from another source.

The following elements of Sketch No. 7 are intended to generate water and transport water to and between cities, water districts and wholesale water commissions.





### **Building on Existing Strengths**

**Maximize Seven Water System Hubs** – The plan includes the seven water systems that have been designated by the partnership as “hubs” for future water. These systems, which already provide for existing customers, possess enough capacity and operational proficiencies to serve nearby communities and/or supply additional water for economic development in the near future.

### **Parallel Developments**

Even as the planning surrounding Sketch No. 7 continues, several communities and public water systems are proceeding with projects that will eventually play an important role in Sketch No. 7.

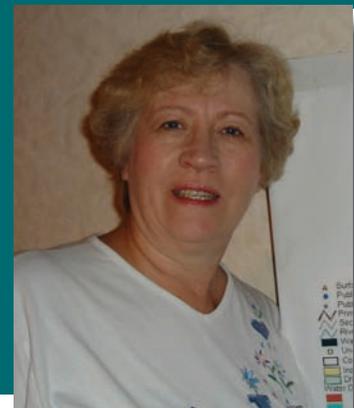
In April 2007 an important element of Sketch No. 7 began to take shape. Atchison County PWSD #1 voted to expand the water district’s boundaries to serve the entire county. While taken separately from the partnership process, this step is important to support future expansion of a regional water system.

Atchison County Wholesale Water Commission is planning to develop a well field in the Missouri River alluvium, and is building a new, easily expandable, water treatment plant near Rock Port. This project is somewhat urgent to meet present demands for supply water and to service the proposed ethanol plant to be located near Phelps City. The initial facility will be built with sufficient capacity to serve Rock Port, Atchison County PWSD #1, Tarkio, Fairfax, Craig and the proposed ethanol plant.

Despite the support of Cameron city officials, in August the voters of Cameron voted down what would have been another significant step in the process, a water transmission line that would have made water from Missouri-American Water Company in St. Joseph available to the town. During the drought of 2002-2003, city officials believe the town was down to a 40-day supply of water from its current system. While this was the third time voters rejected the proposal, officials have committed to finding a long-term solution to Cameron’s water needs.

*“In the 1970 edition of the “Comprehensive Plan for Water and Sewer Development for the Northwest Missouri Region” the author noted “the need for a spirit of cooperation between water districts, and between municipalities and districts has been emphasized.” The formation of the Atchison County Wholesale Water Commission signifies that same spirit of cooperation.”*

*Kyra Mills,  
Atchison County Wholesale  
Water Commission*





*“I have always been concerned with water conservation, having been raised in the drought of the 1930’s and am currently concerned about water for every resident at a reasonable cost as well as supplies for any business growth that might come into the area.”*

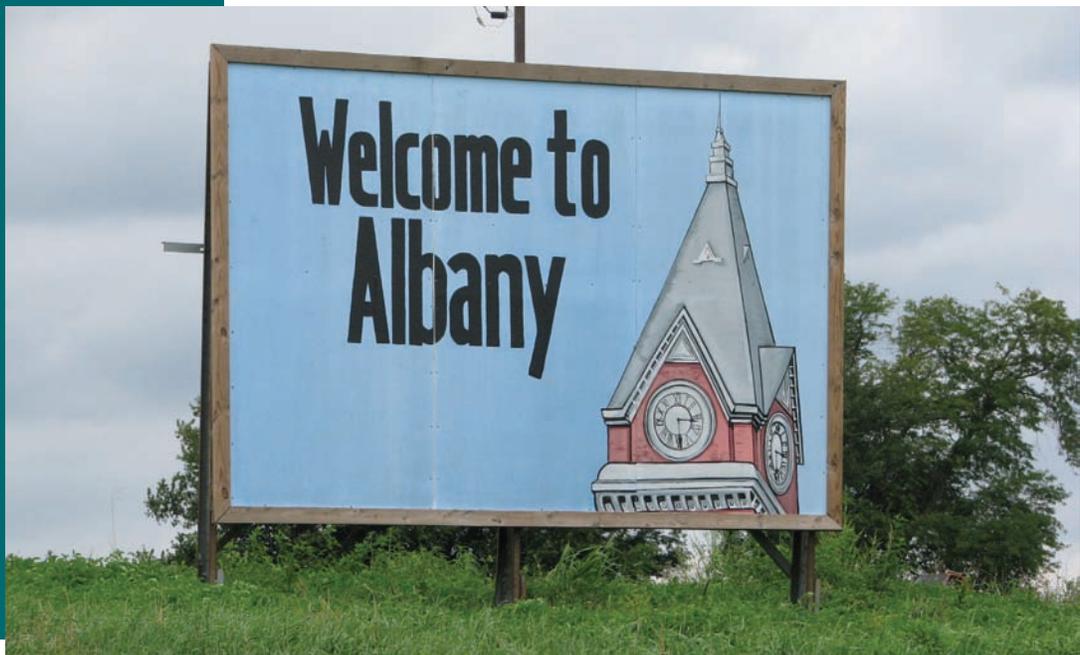
*Marvin Nickell,  
Caldwell County*

- **Support Cameron Transmission Main** - Support the city of Cameron in its efforts to construct a large transmission main from Cameron to St. Joseph. The main could transport as much as 5 million gallons of water per day from Missouri-American Water Company.
- **Complete the Little Otter Creek Project** – When built this Caldwell County lake and water treatment plant will have a firm yield of 1.3 million gallons per day. This element of the plan may not be needed if the large transmission main built to Cameron can be extended to serve Caldwell County.
- **Northwest Missouri Wholesale Water Commission** - The Water Partnership requested that the commission endorse and works closely with the partnership’s planning effort. Since the partnership has determined that the real need is for water transmission rather than a new source water facility, the commission has been encouraged to consider investing in a series of large transmission mains which were identified in Sketch No. 7. In July 2007, the commission responded by sending the partnership a letter stating its commitment to the planning process and offering their organization as the entity to begin developing portions of the transmission mains to provide wholesale water services to twelve counties. The partnership will consider the commission’s offer during phase II planning.

## What’s Next

### Water Partnerships Recommendations for Phase II

From the first contact between local officials and the Department of Natural Resources to the publishing of this report, everything that has happened to date is considered phase one of the effort to provide northwest Missouri with reliable, safe and affordable drinking water. If this is the start of a process, then it is reasonable to ask, “Now what?” Over the course of the next several years, a number of steps will be taken simultaneously to advance the concept of a regional water transmission system.





### **Governance Structure**

Finally, the community leaders throughout the region will need to decide how this regional water system will be managed - whether by an existing body that accepts the additional responsibility of managing a system serving all 12 counties or by a new body assembled specifically for this task. Such a body will play an important role in helping the region secure and manage the funding that will be needed to complete the project. It is at this point that the project will evolve from being a locally inspired and guided effort to one that is exclusively managed at the local level.

### **Preliminary Engineering Report**

The second phase will begin with an engineering feasibility study of the project based on the generalities set forth in Sketch No. 7. While the plan seems relatively detailed, there are a lot of questions that cannot be answered without a more in depth engineering assessment.

Such a report will examine the recommended sources for the system. How much water can be expected from the major suppliers like Missouri-American Water Company and the Atchison County Wholesale Water Commission? How much will each of the main hubs contribute? Or each of the smaller water systems?

While the water partnership has done population and water usage projections, these estimates will be re-evaluated by the engineering firm doing the study. Estimating future populations and usage will allow the engineer to determine the size of the transmission lines.

Similarly, maps developed by the water partnership include maps of Sketch No. 7 with transmission lines located primarily along the established highways between the identified hubs.

However the lines' actual routes could change due to engineering considerations. Other considerations to be determined by the feasibility study include the size and potential location of pumping stations and storage.

All of these factors will determine the ultimate cost of building

*“Regarding future water source and water supply, northwest Missouri is now positioned in one of the most critical times ever faced. The majority of the current 83 public water supplies are either effected by, or associated with, aged infrastructure. The known life expectancy of many of the water treatment plants and distribution systems has been well exceeded. Opportunities for financial assistance (grants) to these communities are not readily available. It is so important that all citizens living in the 12-county area come together in cooperative spirit and support the Water Partnership work now being done.”*

*David L. Williams,  
Water Specialist*



*“As an administrator I am charged with planning for the unknown, and while I encourage all communities to do all they can to provide water from sources close to home, there will always be the occasion to help a neighbor in need as well as ask for help during an emergency. If we can all agree on an overall master plan for the future then we will be able to do a better job in the long run of optimizing public funds. The growth of the Great Northwest demands wise investment in our water resources and cooperation.”*

*Tony Stonecypher,  
Bethany City Administrator*



and running the system. It will be important in establishing project financing and the timetable for the phases.

Also, no one really knows what will happen once any portion of the project is funded and under construction. This might trigger interest of others and could result in an accelerated time schedule or a change in the order of the phases.

In addition to the Department of Natural Resources funding announced at the July 2007 symposium, the U.S. Army Corps of Engineers has been approached for additional funding of the study. Local water systems and the 12 county commissions will also be asked to contribute.

#### **Public Support: From Planning to Implementation**

While an engineering study deals with hard facts, figures and timelines, all of those can change depending on public opinion. A community that embraces the benefits of reliable water might rally to have their town served earlier than originally planned, while a community that fights growth and progress might find itself bypassed.

That is why public education is so important in the second phase of this project. The residents of northwest Missouri deserve to make the decisions surrounding this effort based on facts and reason, not fear and rumor. Most of us have an understanding of our local water system that begins and ends at our kitchen sink. However, providing safe, reliable water is much more complicated and expensive than we realize. (see Real Cost of Water, page 14)

Education also includes helping citizens understand the important role they play in conserving and protecting our drinking water supplies so that abundant and safe water is available for generations to come.

The Water Partnership will hold a series of roundtable discussions with city managers, county commissioners and business leaders to discuss Sketch No. 7, the real cost of water and the economic benefits of safe, reliable drinking water.

A second series of town hall meetings will be held throughout the region to engage the public.

Public education will also include educating water system managers and operators about the future of public water systems in northwest. Even if Sketch No. 7 is never realized, water systems will be facing changes as state and federal requirements for water quality become more stringent and the costs associated with meeting those requirements begin to rise. To meet this need, the University of Missouri Extension will contract with Northwest Missouri State University to conduct training for water system operators, managers and board members on issues related to maintaining and expanding a system's technical, managerial and financial capacities. (See "Capacity Development," Appendix D)

## Economic Impact of Abundant Water

As mentioned earlier, safe and reliable drinking water has always been an important component in the economic health of a community. Many communities have missed out on opportunities because they could not promise interested industries a reliable



*“Adequate infrastructure is crucial to the economic development of Northwest Missouri. One piece of this necessary infrastructure is the availability of good quality water. Without the availability of a sufficient water supply to meet our needs, our communities will continue to struggle with supporting the growth of our current businesses and attracting new industries to the area.”*

*Amy Ryan, Commercial  
Banking Representative*



WATER SOURCE	COST	COST PER 1,000 GALLON
18oz. Bottled Water	\$1.24	\$7,940.00
Bottled Gallon of Water	\$0.72	\$720.00
Gallon of Tap Water	\$.020	\$20.00

## THE REAL COST OF WATER

By law, Missourians enjoy the right to the use of the state's water free of charge. So why, then, do we get a bill every month from our local water company or water and sewer district?

The short answer is that – while the water is free of charge – accessing, treating and transporting it all costs money. These are the costs that typically get passed along to consumers. Frequently, however, even these costs do not reflect the “real” cost of water.

Beyond the operational costs, water systems are also incurring costs related to the depreciation of their equipment and facilities – costs that frequently are not passed on to customers – and the projected costs of meeting future needs. While these are not costs for which water system managers write annual checks, they are costs that will come due eventually.

By failing to include these costs in their regular rates, many systems are eventually caught without the resources to replace significant portions of their infrastructure or to invest in the needed equipment to meet the latest drinking water standard.

source of water. In northwest Missouri this lack of economic health has manifested itself in a decline in population. From 2005 to 2006, nine of the 12 counties represented in the Water Partnership had communities that experienced population losses.

According to an water usage and population analysis conducted by the Water Resources Center, northeast Missouri communities served by the Clarence Cannon Wholesale Water Commission experienced an average annual growth rate of 2.6 percent during the same period the communities mentioned above were losing population. Such growth could be expected in the communities of northwest Missouri that were served by a regional system providing safe and reliable drinking water.

## Northwest Missouri Water Usage

**Water usage in the Public Water Systems averages approximately 77 gallons per person per day.**

**There are 83 community public water systems in the 12 counties - 43 purchase treated water.**

**At one time, 24 of the 43 systems that purchase water had their own source of water - two were abandoned reservoir systems and 22 were abandoned well systems.**





## APPENDIX

- A. Phase 1 Water Partnership of Northwest Missouri Members, Support Staff and Advisors Biographies
- B. News Clippings
- C. List of Proposed Sketches
- D. Capacity Development
- E. Water Demand Projections
- F. Northwest Missouri Public Water Supply Map
- G. County Water Statistics

# Appendix A

## Phase 1 - Water Partnership of Northwest Missouri: Members, Support Staff and Advisors Biographies

Chairman,  
Harlan Higginbotham  
higghs@embarqmail.com

25818 270 St.  
Maryville, MO 64468

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816-383-1643 (C)

Harlan has experience in wastewater and water testing dating back to 1975. He has consulted with numerous cities and private entities during that period of time. He retired from Northwest Missouri State University in 1999 as professor emeritus of chemistry and taught for 35 years. He has lived in northwest Missouri for 64 of the past 69 years. Harlan volunteered for the Partnership because, "It was an opportunity to serve the region in a meaningful way, and I hope that we can find and agree on a regional plan that best serves the twelve county region."

### COUNTY REPRESENTATIVES MEMBERS

#### ANDREW COUNTY

Dale Watson  
waterpl@ponyexpress.net

402 Court St.  
Savannah, MO 64485

Phone: 816-324-7529  
816-261-2105 (C)  
Fax: 816-324-5997

Dale has experience in water testing, regulations, water treatment, backflow, water tower maintenance, and distribution maintenance. He has been involved in the planning, construction, and start up of a 100 gpm iron removal plant and is involved

with the planning of a 2 mgd water lime softening plant that is to be built. He is running a combination 1.5 mgd ground water lime softening and surface water treatment facility. He is a member of AWWA, MWWC, and MRWA. In the past, he was a water and wastewater superintendent for Maitland, Mo., from 1980 to 1987. He is the water plant superintendent for Savannah, Mo., starting this position in 1987. He has lived in northwest Missouri for 53 years. His involvement with the Partnership is, "A need for clean, safe drinking water for everyone in northwest Missouri, at a fair price and service with a recognizable face."

#### ATCHISON COUNTY

Curtis Hedrick

superu@tarkio.net (W)  
cgchedrick@socket.net (H)

519 Main St.  
Tarkio, MO 64491

Phone: 660-736-4812 (W)  
660-623-0312 (W Cell)  
Fax: 660-736-5666

Curtis has experience with water related issues having worked in the water industry for approximately 19 years. He possesses an A Level Water Operators Certificate, DSIII Distribution Certificate, and a D Level Wastewater Operator Certificate. His duties include operation of a .75 MGD water plant and maintaining distribution system for Tarkio, Mo. After high school, Curtis attended one year of college, and then went to work at the Tarkio Water Company, working for them six and a half years before going into

law enforcement. After almost ten years as a full-time police officer, he worked for the Tarkio Water Company, now known as the Tarkio Board of Public Works, as a Distribution Manager. In 2005, he was promoted to Superintendent of Utilities. Curtis would like to assist with finding a, "Solution to the problems of sustaining an abundant supply of good quality water for northwest Missouri."

#### BUCHANAN COUNTY

Norman H. Ellis

nordot@lvnworth.com

21590 Johnson Drive,  
Bean Lake  
Rushville, MO 64484-9422

Phone: 816-573-5656 (H)  
913-367-2647 (W)

Norman has been vice-president of PWSD #1 of Buchanan County for five years. He has also been vice-chairman of the Northwest Wholesale Water Commission. He is retired from the U.S. Government, F.A.A. He has lived in northwest Missouri all of his life (75 years). He volunteered to be a part of the Partnership because, "I would like to see an affordable water supply in northwest Missouri."

#### CALDWELL COUNTY

Marvin Nickell

mmnick@cameron.net

Box 323  
Hamilton, MO 64644

Phone: 816-583-2678

Marvin is currently president for the Little Otter Creek Watershed Project. They are in their sixth year and currently

purchasing land for a 362-acre lake and a water plant for Caldwell County for the next 25 years. He was a vocational agriculture teacher for ten years and a financial planner with American Express for 42 years. He has resided in northwest Missouri for the past 80 years. Marvin says, "I have always been concerned with water conservation, having been raised in the drought years of the 1930's, and am currently concerned about water for every resident at a reasonable cost as well as supplies for any business growth that might come into the area."

### **CLINTON COUNTY**

**Phil Lammers**

manager@cameronmo.com

205 Main St.  
Cameron, MO 64429

Phone: 816-632-2177  
Fax: 816-632-1067

Phil is the city Manager/Administrator (Credentialed Manager) of Cameron, having the oversight responsibility for a municipal water system for 18 years. For the last 16 years, that oversight has been complicated with drought, production capacity, and environmental issues. He served on the governor's committee to assist in water resource research at the University of Missouri-Columbia. He has resided in northwest Missouri for 18 years. More recently, he served on a streamline committee to assist DNR/EIERA with simplifying the State Revolving Fund (SRF) Loan Program. Cameron received the first Drinking Water SRF loan in the state. Phil volunteered for the Partnership because, "I am convinced that solving the problem of abundant water for northwest Missouri is going to happen on a regional level. I hope

to use my experience on the Partnership to establish a plan for northwest Missouri that will lay the groundwork to provide every community in northwest Missouri with an abundant, safe, and affordable source of drinking water."

### **DAVISS COUNTY**

**Zac Johnson**

zjohnson@gallatinmo.com

112 E. Grand  
Gallatin, MO 64640

Phone: 660-663-2011

Zac currently holds the position of Gallatin City Administrator. He has previous employment as Maryville's GIS & Planning manager and as a GIS analyst with the Missouri Department of Economic Development. He has been a resident of Missouri all of his life. He volunteered to serve on the Partnership because, "Water is an important issue in Daviess County."

### **DEKALB COUNTY**

**Michael D. Jacobs (Huey)**

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302 N. Main  
Clarksdale, MO 64430

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816-261-0062 (C)  
Fax: 816-393-5313

Huey has 12 years experience with water-related issues working two and a half years in construction, and six years with the City of Stewartville, Mo. He has worked for PWS#1 Dekalb County for four years. Huey has lived in northwest Missouri for 43 years. He volunteered to serve on the Partnership because, "It is my passion to help serve water to as many people as need it." He hopes the planning efforts will help people that need water get it as soon as possible.

### **GENTRY COUNTY**

**Manley Tillison**

jmtjmt@mchsi.com

1301 S. Van Buren  
Albany, MO 64402

Phone: 660-726-3314

Manley's experience includes 27 years with the Public Water Supply #1 in Gentry County. Currently he is retired, previously working with the Midland Empire Girl Scouts. He has resided in northwest Missouri for 46 years. He volunteered to serve on the Partnership because of the "water needs for county residents."

### **HARRISON COUNTY**

**(Currently Vacant)**

### **HOLT COUNTY**

**Wayne Voltmer**

waynebeverly@socket.net

21998 Driftwood Drive  
Craig, MO 64437

Phone: 660-442-3707  
Fax: 660-442-5326

Wayne has worked for economic development for Holt County as presiding commissioner and found that the biggest roadblock was not enough good usable water. He has been the presiding commissioner of Holt County for eight years and has farmed for 40 years and realizes how important water is. He has lived in northwest Missouri his entire life. He volunteered to serve on the Partnership because he wants to see the region grow.

### **NODAWAY COUNTY**

**Bob Stiens**

nodcom@earthlink.net (W)  
BJStiens@unitedsky.net (H)

37975 282 St.  
Ravenwood, MO 64479

Phone: 660-937-3180 (H)  
660-541-2925 (C)

Bob has no direct experience with water related issues, but as a county commissioner, he wants the water needs of Nodaway County to be met. He is currently a farmer and has been a county commissioner for two years. He has lived in the area for 55 years.

#### **WORTH COUNTY**

**Richard "Dick" VanVactor**  
ddvan@grantcity.net

3 West Farwell  
P.O. Box 278  
Grant City, MO 64456

Phone: 660-564-3585  
660-254-0519 (C)

During the late 1970s and early 1980s, Richard served on the Grant City Council as water department councilman. He is currently retired after selling VanVactor Lumber Company in Grant City, and has resided in northwest Missouri for 58 years. Richard volunteered for the Partnership because, "The need for water will continue to be a concern for everyone and we cannot wait until the last minute to solve a long range problem. I would like to see a viable solution to the supply of water throughout northwest Missouri and that it will be implemented."

#### **MEMBER(S) WITH SPECIAL EXPERTISE**

**Kenneth Minter**  
theoaks@heartland.net

30227 220th St.  
Maryville, MO 64468

Phone: 660-582-4387 (H)

Kenneth's research experience is related to the biology of surface waters, dynamics of water quality and biology in oil refinery lagoons.

While teaching, he used streams, ponds, and lagoons as a laboratory. He is retired from NWMSU, Department of Biology, professor of biology and has resided in area since August 1963. Kenneth volunteered for the Partnership because, "As a limnologist (aquatic ecologist), I am concerned about water quality as related to surface waters. This, of course, is directly related to our water supply."

#### **REGIONAL PLANNING COMMISSION Green Hills Regional Planning Commission**

**Randy Railsback**  
randy@ghrpc.org

1104 Main  
Trenton, MO 64683

Phone: 660-359-5636 ext. 11

Randy Railsback has more than 20 years experience in rural community and economic development having received nationwide attention for innovative community development practices. Randy served as the executive director of the Northwest Regional Council of Governments in Maryville, Mo. for eleven and a half years and has been the executive director of the Green Hills Regional Planning Commission located in Trenton, Mo., for the past four years. His professional affiliations include president of the Missouri Rural Opportunity Council and of the Missouri Association of Council of Governments. He has memberships in the Missouri Economic Development Council, the state Board for Small Business Development Centers, the Northwest Workforce Investment Board, the Heartland Community Foundation Board, the Federal Home Lone Bank

Board of Directors, and the Bank Midwest Community Reinvestment Corporation Board.

**Lance Rains (Alternate)**  
lance@ghrpc.org

1104 Main St.  
Trenton, MO 64683

Phone: 660-359-5636

Lance has been working for the 11 counties of Green Hills Regional Planning Commission since 1993. He specializes in water and sewer grant funding through the USDA RD, DNR and CDBG funding agencies. GHRPC staff has been involved in the successful administration of 35 water and sewer grants since 1992 in which communities and water districts have increased their capacities to serve the public. He is currently working with eight different communities on "open" water and sewer projects for the Regional Planning Commission. Lance is also working with 28 other communities in the 11 county area of GHRPC on more proposed water and sewer projects.

#### **MO-KAN REGIONAL COUNCIL**

**Tom Bliss**  
tom@mo-kan.org  
1302 Faraon St.  
St. Joseph, MO 64501

Phone: 816-233-3144 (W)  
Fax: 816-223-8498

Tom has worked extensively with several communities in northwest Missouri in regards to water and wastewater issues, with the majority of the experience with funding such projects and providing technical information. He is currently employed by Mo-Kan Regional Council. Tom has lived in

area for eight years. Tom volunteers for the Partnership because, "This initiative is vital for northwest Missouri for a number of reasons; most notably, providing clean water to its residents. My hope is that this planning effort will result in a more effective and efficient use of limited public resources."

## **NORTHWEST MISSOURI REGIONAL COUNCIL OF GOVERNMENTS**

**Tye Parsons, Director**  
tye@nwmorcog.org

114 West Third St.  
Maryville, MO 64468

As director of the five-county regional planning commission in far northwest Missouri, Tye knows first-hand the vitally important role that clean, abundant drinking water plays in the long term economic development of the region. Tye's experience in rural water issues is related to project funding and coordination, particularly when multiple jurisdictions are involved. He has lived in the region for the better part of 11 years, and is a graduate of Northwest Missouri State University. "Northwest Missouri will simply not grow without an abundant water supply. The Water Partnership Team is important because it helps the region examine and address future drinking water challenges that impact all northwest Missourians."

## **STAFF & ADVISORS TO THE WATER PARTNERSHIP**

### **PHASE I COORDINATOR**

**Marsha Boone**  
marsha.boone@dnr.mo.gov

Department of Natural Resources, Community Assistance Office, Water Partnership Director

1101 Riverside Dr.  
Jefferson City, MO 65101

Phone: 573-526-1318  
Fax: 573-751-6755

Marsha joined the department in 2005 as director of the Community Assistance Office, which helps communities access grant funding and assistance with local/regional planning and environmental compliance. In addition, she serves as project coordinator for the Water Partnership and its planning efforts. Marsha's professional background includes 10 years as a communications consultant and professional photographer, four years as director of a non-profit group coordinating hundreds of volunteers in community planning and local service delivery, and consultation and volunteer work for environmental educational/support programs. "I believe in the power of local people to organize and do what needs to be done. Folks in northwest Missouri are determined to secure a good, reliable source of water for their families' wellbeing and economic future. It's the best gift anyone could give."

### **CONSULTANT**

**William E. Hills**  
bcivever@yahoo.com

13860 Cole Trails  
Platte City, MO 64079

Phone: 660-562-1013 (W)  
816-431-6459

Bill worked as an engineer for the State Health Department and then the Department of Natural Resources for 44 years. Bill worked with public water supplies during that entire time, inspecting facilities, providing operator training, and providing in plant operator

assistance. He also worked with cities and water districts in promoting new water systems and helping to develop sources of water. Bill worked with various regional planning commissions and reviewed many water and wastewater projects seeking grant funding from various sources. Bill held various positions during those 44 years including supervising the public drinking water staff for 40 years, the wastewater staff for three years and served two years as regional director of the Department of Natural Resources Kansas City Regional Office. He retired from the department in 2004.

## **OTHER DNR SUPPORT**

**Steve A. McIntosh**  
steve.mcintosh@dnr.mo.gov

Missouri Department of Natural Resources, Water Resources Center

1101 Riverside Drive  
Jefferson City, Missouri 65101

Phone: 573-751-7823 (W)  
660-425-1953 (C)

Steve has 29 years of water resources experience. The Texas Department of Water Resources employed Steve for monitoring streams, lakes, and water pollution treatment facilities. Steve was a staff hydrologist, Oklahoma area hydrologist, and regional loan officer for a total of eight years with the US Bureau of Reclamation. He served 15 years as the Water Resources Program Director in Jefferson City and is presently a water resources planning and wetlands coordinator. Steve is providing the Water Partnership with drought, water availability and planning information. He is a fourth generation land steward in northwest Missouri.

“The region’s lack of modern infrastructure has severely hamstrung the local economy, creates an out migration of human resources, and causes unreasonable personal stress on people and the environment.”

[David L. Williams](#)

[david.williams@dnr.mo.gov](mailto:david.williams@dnr.mo.gov)

Water Specialist, Public Drinking Water Branch, Field Services Division, Northwest Missouri Satellite Office

Phone: (660) 562-1876 (W)

(816) 718 -8221 (C)

Fax: (660) 562-1878

David has served as a water specialist with the Department of Natural Resources for 11 years. He has been assigned to the satellite office since November 2005. His primary responsibilities are providing classroom style training to water system operators and providing on-site technical assistance to all the public water supplies in northwest Missouri. Before his position with the department, he served as a regional district manager for a large water utility. David’s water related work experience totals 37 years. He is dedicated in being an active part of those now trying to assure an ample supply of premium quality water for northwest Missouri’s long-range future.

[Breck E. Summerford, PE](#)

[breck.summerford@dnr.mo.gov](mailto:breck.summerford@dnr.mo.gov)

Public Drinking Water Infrastructure Chief, Permits and Engineering Section

1101 Riverside Dr.

Jefferson City, MO 65101

Phone: 573-751-1127 (W)

Breck has more than 27 years of experience working with public drinking water systems

in Missouri. He began with the Department of Natural Resources by working with public water systems that were out of compliance with the Missouri Public Drinking Water Law and Regulations, in an effort to bring these public water systems into compliance. In 1986, Breck was assigned to oversee the public water system construction in Missouri. Any and all public water system construction projects in Missouri must be reviewed and issued a construction approval by the department’s Public Drinking Water Branch. By ensuring public water systems are designed and constructed properly, we are protecting the public health of those persons served by these public water systems.

#### **MISSOURI DEPARTMENT OF ECONOMIC DEVELOPMENT**

[Terry Maglich](#)

P.O. Box 118

Jefferson City, MO 65102

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#### **UNIVERSITY MISSOURI EXTENSION - COMMUNITY DEVELOPMENT**

[Beverly Maltsburger](#)

[maltsbergerb@missouri.edu](mailto:maltsbergerb@missouri.edu)

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St. Joseph, MO 64507

Phone: 816-279-1691 (W)

Fax: 816-279-3982

Bev’s experience with water-related issues includes membership of the University of Missouri Water Quality Focus Team. She is also co-author of the Maysville Watershed Protection Plan and Water System Grant Application. She is currently employed with the University of Missouri Extension and has lived in northwest

Missouri for 30 years. She volunteered because she wants to see northwest Missouri have access to a safe and plentiful water supply across the region.

#### **NATURAL RESOURCE CONSERVATION SERVICES (NRCS)**

[Anita Dunham](#)

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23 West Main St.

Kingston, MO 64506

Phone: 816-586-2061

#### **US DEPARTMENT OF AGRICULTURE**

[Stan Wolfe](#)

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3915 Oakland Ave.

St. Joseph, MO 64506-4920

# Appendix B

## Newspaper Clippings Regarding the Water Partnership of Northwest Missouri

### Water partnership unveils plan

By CLINTON THOMAS  
clthomas@missouri.edu  
St. Joseph News-Press

MARYVILLE, Mo. — The Water Partnership for Northwest Missouri has a plan to secure a safe, steady water supply for its corner of the state.

Now, the plan also needs some funding.

The partnership president is Skehan Nodaway, a legislator and government official from 12 counties in Northwest Missouri Thursday at Northwest Missouri State University.

Since the group formed in 2005, it has studied all 83 water districts in Andrew, Atchison, Buchanan, Caldwell, Clinton, Howell, DeKalb, Greene, Harrison, Holt, Henderson and Worth counties to find the best way to distribute water to areas that might someday have a shortage. Sketch No. 7, a combination of eight plans the group considered, calls for seven sustainable water districts to become hubs that distribute water to smaller districts. According to the water partnership, 48 of the 83 districts in Northwest Missouri currently buy water from an outside source.

The seven hubs would be Bellamy, Cameron, Maryville, Middle Fork Water Co. in Grundy County, Plattsburg, Savannah and Missouri American Water in St. Joseph.

Bill Hills, who presented the plan for the water partnership, explained that the plan doesn't take any money away from water districts.

"Each and every system will remain their own and become part of the system by choice," Mr. Hills said. "They would still control all of the installation within their district with their own lines. The only difference would be the source."

Mr. Hills noted multiple times that the plan is not set in stone but a guideline to be studied further. The plan would call for 560 miles of pipeline to be laid in five phases. The first phase could call

B2 St. Joseph News-Press

METRO REGION

## Water partnership unveils plan

CLINTON THOMAS/ST. JOSEPH NEWS-PRESS

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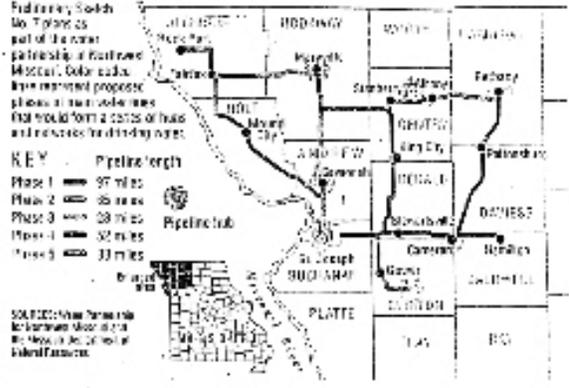
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"Each and every system will remain their own and become part of the system by choice," Mr. Hills said. "They would still control all of the installation within their district with their own lines. The only difference would be the source."

Mr. Hills noted multiple times that the plan is not set in stone but a guideline to be studied further. The plan would call for 560 miles of pipeline to be laid in five phases. The first phase could call

### Proposed Northwest Missouri transmission lines



for the lines running along U.S. Highway 80 from St. Joseph to Cameron and north from that line to Stanberry. It also would include lines linking Rock Port, Plattsburg and Craig, along with Atchison District No. 1.

Dr. Mark Hignight was chairman of the water partnership, and he hopes the plan draws interest so municipalities will start to vote its pieces into action. The

water partnership already has collected letters from several organizations endorsing their support.

"A unified front will help secure funding for the plan," Dr. Hignight said. "It's time to receive letters from all 12 county commissioners."

After conducting feasibility studies, the water partnership hopes to confirm its plans or make any needed alterations.

# NODAWAY NEWS LEADER

Water Partnership for NWMO seeks commitment  
Published Online Jul 27, 2007 - 11:09 AM

After two years of studying the needs and possible production of quality water for residents and businesses, the Water Partnership for Northwest Missouri called for a declaration of unity from the major water forces of the 12-county area at their symposium III held July 24 on the Northwest Missouri State University campus.

There were eight entities including the cities of Maryville, Cameron, Tarkio and Rock Port as well as the Public Water Supply District #1 in Nodaway County, Public Water Supply District #1 in Atchison County and Middle Fork Water Company who sent letters of commitment for the process to proceed. The Northwest Missouri Wholesale Water Commission and the Atchison County Wholesale Water Commission also noted their willingness to work cooperatively.

The Water Partnership for NWMO has a goal of generating a plan for a regional type water system that will provide for transmitting large quantities of water throughout this area of the state. The plan details the transportation to and between the major water sources of Atchison County Wholesale Water Commission's new plant and the seven hubs of Cameron, Bellamy, Maryville, Missouri American Water Company, Middle Fork Water Company and Savannah. The water, which is transmitted through large lines, will allow cities and water districts to obtain water through a master meter.

Cities and water districts will then serve their individual customers through their own existing and possibly expanded distribution systems. The plan calls for all 83 existing community public water systems to continue to function as political subdivisions, being responsible both managerially and financially to serve their customers. The overall plan is broken into five phases of development, equaling 280 miles of water transmission lines to be constructed. Grants will be a primary source of funding.

Other speakers at the day-long event were Department of Natural Resources Director Doyle Childers, Dr. Cornelia Burdor Flora, Iowa State University agriculture professor, Marsha Boone, Water Partnership project coordinator and Bill Hills, Water Partnership consultant. Local leaders included Nodaway County Associate Commissioner Bob Siens and Dr. Mark Hignight, Water Partnership chair.

**MONDAY**  
JUL 24, 2006

Share your ideas  
The News Press welcomes letters of opinion from you. The editor chooses what to print. Letters should be 250 words or less.

## Hard work starts now

Water partnership forges a grand plan that can work

The task was gargantuan. The Water Partnership for Northwest Missouri began sketching some 18 months ago a plan to deliver a dependable water source to 83 Northwest Missouri water districts.

The partnership unveiled this week its plan — called Sketch 7 — during a meeting in Maryville. We like the plan.

Sketch 7, actually a combination of eight plans the group considered, calls for seven sustainable water districts to become hubs that distribute water to smaller districts. According to the water partnership, 48 of the 83 districts in Northwest Missouri currently buy water from an outside source.

The seven hubs would be Bellamy, Cameron, Maryville, Middle Fork Water Co. in Grundy County, Plattsburg, Savannah and Missouri American Water in St. Joseph.

The backbone of the new system would be 560 miles of pipeline to be laid in five phases.

The first phase would call for lines running along U.S. Highway 80 from St. Joseph to Cameron and north from that line to Stanberry. It also would include lines linking Rock Port, Plattsburg and Craig, along with Atchison District No. 1.

The plan's charm is that all water districts will still control all of the distribution within their district with their own lines, Bill Hill, who presented the plan, explained. The only difference would be the source.

The heavy lifting is done. Now the hard work begins. The partnership will next refine the plan to adjust for concerns from the participating water districts. Finally, water district officials will have to tell the plan to voters in their district.

Water conservation voters will also love the plan once they understand that dependable water is the key to continued growth for Northwest Missouri.

# Appendix C

## Other Proposed Sketches

A number of options - referred to as “sketches”- were considered before the engineering subcommittee recommended - and the partnership accepted Sketch 7. In actuality, Sketch No. 7 was not a unique plan, but a hybrid of several of the other options considered.

**Sketch No. 1: Regional Reservoir** - This is similar to the approach taken by the Clarence Cannon Wholesale Water Commission, which draws its water from Mark Twain Lake and serves water systems in northeast Missouri. It would call for a large regional reservoir with its own water treatment plant and water transmission lines.

**Sketch No. 2: Northwest Missouri Wholesale Water Commission** - This would involve supporting the commissions plan to develop its well field in the Missouri River alluvium, building a plant to process the water and link that plant via transmission lines to Andrew County PWSD #2, Andrew County PWSD #3, Buchanan County PWSD #1, Clay County PWSD #8, Gentry County PWSD #1, Gentry County PWSD #2, Harrison County PWSD #2, Platte County PWSD #3 and the communities of King City and Polo.

**Sketch No. 3: Atchison County Wholesale Water Commission** - Like Sketch No. 2, this would encourage a wholesale water commission, Atchison County Wholesale Water Commission, to develop a well field and build a water treatment plant. They would sell wholesale water to Atchison County PWSD #1. Atchison County PWSD #1 would expand its boundaries to include the entire county. Atchison County would also construct transmission mains to wheel water from the Atchison County Wholesale Water Commission to themselves, and the water systems of Rock Port, Tarkio, Fairfax, and Craig. They could later wheel water through to Nodaway County, Holt County and other systems that connect to the ultimate regional water transmission lines.

**Sketch No. 4: Maximizing 7 Hubs** - Take advantage of existing water systems that meet the needs of current customers and that have the capacity for expansion. The systems identified include Bethany, Cameron, Maryville, Middlefork Water Company, Missouri American Water Company, Plattsburg and Savannah.

**Sketch No. 5: Small Reservoir System** - Rather than have a regional reservoir as suggested in Sketch No. 1, this plan would involve a series of reservoirs – one in each of the 12 counties. Each reservoir would have its own water treatment plant and water transmission lines.

**Sketch No. 6: Unserved Area Focus** - Change the focus from serving the region to finding ways to serve currently unserved areas by extending existing systems.

**Sketch No. 7: Regional Water Plan** - Sketch No. 7 is a hybrid of sketches No. 2, 3, 4 and 5. The Sketch No. 5 element includes support of the development of the Little Otter Creek reservoir in Caldwell County. See main article for details.

**Sketch No. 8: Do Nothing** - While many communities have seen how quickly water supplies can dwindle and many of those communities also face expensive construction in the near future to meet drinking water quality standards, the option of doing nothing regionally and leaving each community to its own means still remains.

# Appendix D

## Capacity Development

*Adapted from "Local Water Distribution Systems: Planning for the Future," a presentation by Beverly Maltberger, community development specialist, University of Missouri Extension, given at the July 2007 water symposium.*

As we all know, an adequate safe water supply is essential to the human and economic development of our communities. Therefore good management practices are of utmost importance.

Our small community water systems are facing many problems. The lowering water levels in aquifers and droughts of the past several years have reduced available water supplies in some parts of our region, at the same time that demand for water has increased. Communities are facing increased legal mandates and regulations, problems with aging infrastructure, rising costs of equipment and chemicals, and rates too low to fix those problems. It costs systems money to adhere to new mandates.

In a regional water plan, local water plants play a vital role in making sure safe water reaches their customers.

Water companies are businesses, and rate structure is the engine that keeps the water system in business. Some water systems do not raise rates because they believe their customers can not pay any more for water and some fear having to face their customers if there were a rate increase. In rural areas, they go to church with their customers and they are neighbors.

It is also important to establish and follow written rules and policies that dictate how the board will operation and conduct business. If policies are inconsistent, people will lose confidence in the board and its decisions.

There are potential legal problems concerning the quality of water supplies and with the way boards conduct business. Consumers are becoming more fearful of harmful chemicals and bacteria in their water supplies and law suites are becoming more prevalent.

If boards don't understand their responsibilities, they are leaving themselves open to huge liabilities. Imagine what would happen if a town was sickened or a person died because of a preventable problem with the water system. To protect communities and to protect water boards, we believe more education is needed.

EPA requires all states and communities to engage in capacity development, including technical capacity, managerial capacity and financial capacity.

### **Technical:**

- Source quality, capacity, protection and production
- Project site, potential pollution sources and location with respect to other establishments
- Water use data
- Proper operator certification
- Plan for the continuous operation, management and maintenance of the facility



*“A good dependable water supply is the key to economic development. If our communities are to grow and prosper, they must have a water supply available. Without it, they will only experience decline.”*

*Beverly Maltberger  
University of Missouri -  
Community Development*

- Water use data
- Updated distribution map and schematic
- Planning for future regulatory requirements
- Emergency response and back-up plan

**Managerial:**

- Organizational charts
- Designated customer complaint person
- Written rate structure and service fee
- Public meetings with advanced notice to customers
- Designated compliance person
- Planning for future regulatory impacts
- Establish a public information process

**Financial:**

- Standard accounting principals and practices
- System for fee collection
- Annual budget with revenues and expenditures

Most of these capacities are developed through proper training, and training for water systems typically fall into two categories: operator training and manager training.

Operating is the technical side of a water system. There are several operator training and certification programs in Missouri, offered by the Missouri Rural Water Association, Missouri Department of Natural Resources, Missouri Water/Wastewater Conference, Midwest Assistance Program, Crowder College and others. These courses give operators the scientific, technological and mechanical background to maintain systems and comply with requirements.

There is still a gap in the availability of board and leadership training on the management and business side of community water systems.

In 1998, Mississippi began requiring eight hours of management training for members of all public water governing boards. Mississippi Extension trains water board members on the various aspects of the water system: the latest laws and regulations; duties and responsibilities of a board member, including how to properly conduct meetings; ethics, such as avoiding nepotism; and basic technical information including the operator's duties. The course also includes instruction on basic management and finance skills, including rate setting; dealing with customers and the public; and assessing a system's ability to provide water following a disaster, such as a tornado, flood or ice storm.

Similar training sessions for northwest Missouri could be developed and offered as one-day training sessions or as a series of night training sessions to accommodate board members who have other jobs or obligations.

# Appendix E

## Water Demand Projections

Report by Steve McIntosh, Hydrologist

### Introduction

Since 2000, the Department of Natural Resources' Water Resources Center has been performing surface water firm yield studies in Missouri. These studies were initiated by the Missouri Drought Assessment Committee to assist in the evaluation of water supplies that are prone to drought impacts. The United States Department of Agriculture - Natural Resources Conservation Service conducted similar studies during the drought of 1988-1989. Unfortunately, these studies were never published and the technical reports were lost. Missouri's drought prone public surface water supplies have, or are currently being evaluated by the department and the United States Geological Survey. These studies have proven that many water supply sources in western and northern Missouri are not sustainable or have little room for additional water demands.

In 2005, at the request of the Northwest Regional Council of Governments located in Maryville, Missouri, the department and the Water Resources Center began investing staff resources to explore viable options to meet the future water supply needs of the region. Several cities and water districts have succeeded in providing for their immediate and future water needs, but some remote areas and less prosperous communities still struggle with non-sustainable water supplies and an infrastructure that is badly in need of replacement. Consolidation and regional systems created by progressive water purveyors such as the Clarence Cannon Wholesale Water Commission appear to be the future water supply standard.

Employment, transportation, and infrastructure in part determine the economic vitality of a region. The Missouri Department of Natural Resources understands that infrastructure impacts the quality of life, and opportunity for local employment. The availability of water resources, for example, provides opportunities for industrial and agricultural uses that in turn provide employment opportunities.

By providing water supply through a phased regional transmission system, the state envisions stimulus to population growth and sustainability can be achieved in the more remote areas of northwest Missouri.



*“The regions lack of modern infrastructure has severely hamstrung the local economy, creates an out migration of human resources, and causes unreasonable personal stress on people and the environment”*

**Steve McIntosh,  
Hydrologist**

Northwest Regional Water Withdrawls Forecast  
Water Withdrawls (Mgal/d)

County	Public Supply 1985	Public Supply 1990	Public Supply 1995	Public Supply 2000	Survey-2006	Public Supply 2010	Public Supply 2020	Public Supply 2030
Andrew	0.90	1.02	0.65	0.65	1.61	1.66	1.72	1.78
Atchinson	0.58	0.52	0.61	0.65	0.62	0.61	0.60	0.59
Buchanan	13.88	17.62	16.70	15.80	15.16	15.31	15.47	15.62
Caldwell	0.40	0.47	0.46	0.46	0.54	0.56	0.58	0.61
Clinton	1.02	0.97	1.48	2.06	3.52	4.50	5.00	5.50
Daviess	0.44	0.44	1.13	0.82	1.06	1.13	1.13	1.13
DeKalb	0.44	0.44	0.13	0.03	1.17	1.27	1.30	1.37
Gentry	0.55	0.58	0.55	0.82	1.16	1.20	1.27	1.30
Harrison	0.72	0.74	0.59	0.49	0.94	0.94	0.94	0.94
Holt	0.41	0.40	0.47	0.52	0.52	0.52	0.52	0.52
Nodaway	1.69	1.89	2.09	2.00	3.40	3.40	3.40	3.40
Worth	0.14	0.15	0.15	0.01	0.20	0.20	0.20	0.20
Total	21.17	25.24	25.01	24.31	29.90	31.30	32.13	32.96

Areas of suburban population growth are evident in counties near Kansas City, St. Joseph and St. Louis. More central urban core growth is evident in the cities of Columbia, Joplin and Springfield. Some rural and remote areas, such as northwest Missouri, are experiencing population declines.

### **Future Growth Without a Project**

United States Geological Survey water use estimates were used to estimate future water use without a project. Projections for northwest Missouri without project conditions used the existing growth for future years. Nine of twelve counties had communities with negative population growth from 2005 to 2006. Those counties with negative growth were manipulated to exhibit zero growth through 2030 in the absence of the project. The expected population growth, or in several cases, zero growth, through 2030 was the basis for determining future county water needs without the project.

### **Future Growth With a Project**

The Water Resources Center used our own departmental 2006 water system survey as a starting point from which to make water use projections. Projections were then made for public water supply demands through 2030. The Water Resources Center felt that extending possible growth scenarios past 2030 was not justified by the comparative data from northeast Missouri or census information. It should be noted that recent demands for ethanol and the corresponding farm produce price increases might change rural demographics. Therefore, long-term projections based solely upon past performance are likely to be inaccurate.

### **Comparison with northeast Missouri Project**

In the late 1980s the State of Missouri and Clarence Cannon Wholesale Water Commission contracted with the U.S. Army Corps of Engineers for water storage within Mark Twain Reservoir in northeast Missouri. What started as a few water districts interested in a sustainable water supply has grown to 20 water districts in a nine county area and has reversed a trend of declining population evident from the 1980 to 1990.

To estimate the future water demands with the project in northwest Missouri, the Water Resources Center staff determined that examining water use data from Clarence Cannon Wholesale Water Commission since 1994 would be an effective comparison. We examined the impacts of future water demands in northeast Missouri. We found that a more stable and surplus water supply can be expected to lead to increases in population and water needs. Creating a stable and surplus regional water supply with an adequate water transmission system in northwest Missouri should lead to a similar growth pattern that has already occurred at northeast Missouri.

The anticipated growth in water use in northwest Missouri, should a regional distribution system be built, was calculated based on the observed growth in water use in northeast Missouri after the Clarence Cannon Wholesale Water Commission began supplying water. This calculated annual growth rate of 2.6 percent was applied uniformly to all public water supply districts in northwest Missouri. This uniform rate of growth includes industrial, commercial, and agribusiness growth. The growth rate of 2.6 percent was added to any positive or negative growth that a district had experienced from 2005 to 2006. Populations that were declining or not growing from 2005 to 2006 were assumed to increase their growth rate by 2.6 percent per year. For example, the City of Rockport had a negative 1.5 percent growth rate in 2005-2006, thus Rockport's growth with the project is estimated to be 1.1 percent per year. Until the transmission phase came on line, the affected community water demands were projected to grow as a without project conditions.

Baseline water use growth was calculated from county and city population data, assuming a linear relationship between population and water use. The population estimates were taken from U.S. Census Bureau data provided by the Missouri Census Data Center at the University of Missouri-Columbia.

Water needs projections with the system in place were based upon the project phases projected by Breck Summerford, Drinking Water Permits chief. The most likely of the communities to be connected were included in the projected water demands. St. Joseph and Buchanan County were not included due to the proximity of the Missouri-American Water Service. Some smaller communities were not separated out as they have or are predicted to have service from another sustainable source.

The people not currently served by public water supply systems are typically rural water users whose systems are off-line due to inadequate local water supplies or inadequate water distribution lines within their water supply districts. The projected water use of these potential rural customers was added to the future water demands of one of the rural water districts serving the county in question. Estimates of un-served customers were made using information from the 2006 departmental survey, additional phone surveys, 2006 county census data, and professional judgement.

The technical sub-committee was initiated by Breck Summerford of the department, and later chaired by Bill Hills, consultant and retired Department public water supply expert. The technical sub-committee and later the Northwest Missouri Water Partnership adopted the recommendation of a phased regional pipeline implementation, as the most likely to succeed alternative, to providing the region with an improved and sustainable water supply.

### County Population and Municipal and Industrial Water Needs Projections Summary

#### Without project condition:

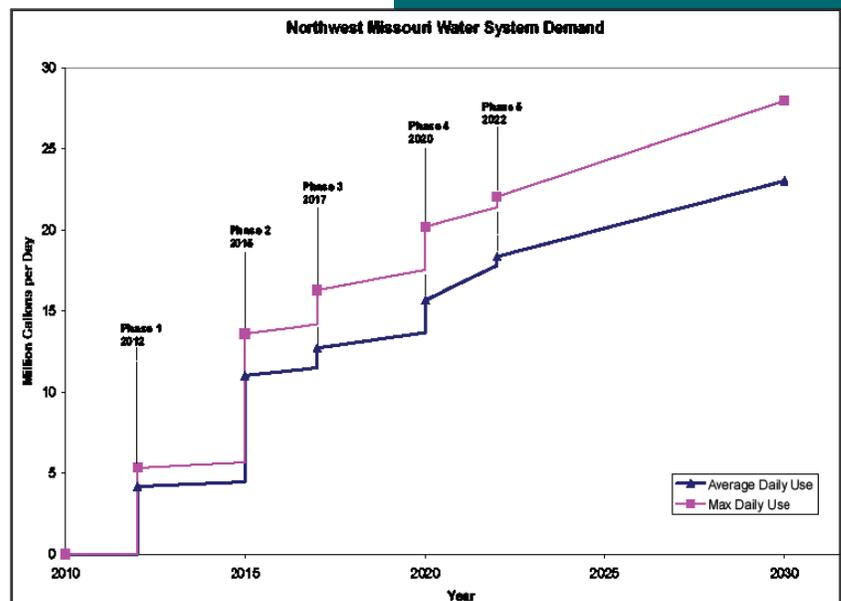
Northwest Regional Water Withdrawals Forecast shows a actual total surveyed water use of 29.9 million gallons per day (mgd) in 2006. County water demands are projected to increase to 32.95 mgd by 2030 without major water system improvements. St. Joseph and Buchanan County were not included in the projections because it is assumed that Missouri-American Water Company will continue to service Buchanan County and St. Joseph. With Buchanan County omitted total average annual forecast water needs are for 17.3 mgd. Buchanan's present needs are about 15.16 mgd and their water demand. is expected to grow to 15.62 mgd.

#### With project condition:

The with project condition is shown with the progressive water demands in detail in the NW Public Water Demand Projection System. The chart and table shows the expected community water demands for each of the five possible expansion phases.

Total average daily use by 2030 excluding Buchanan County is 23.0 mgd or an additional 5.7 mgd above future water needs without the project or about 8.3 mgd above today's 14.7 mgd water use.

Additional information related to this study is available online at: <http://water.nwmorcog.org>



# Appendix F

## Resource Alternatives

Types of untreated source water are generally the same regardless of where you are within Missouri. The potential for each of the alternatives differs depending on which geographic or geological area of the state in which you are located. Potential sources related to glacial activity are available only in the northern portion where there was glacial activity. Fresh water from deep rock formations is available only in the southern portion of the state where there has not been saltwater intrusion.

There are two basic sources: ground water and surface water. Within these two sources there are several slightly different ways of obtaining the water.

### **Surface water can be obtained by:**

- Pumping water from a continuous flowing stream directly to a water treatment plant.
- Pumping water from a continuous or intermittent flowing stream to a storage basin and then pumping it to a water treatment plant.
- Construction of a reservoir to collect and store runoff water from a large land area and then pumping it to a water treatment plant.

### **Ground water can be obtained by drilling the following type wells:**

- Deep wells into underground water bearing formations.
- Shallow gravel walled wells into the alluvial deposits of small streams.
- Shallow gravel walled wells into the alluvial deposits of large rivers.
- Shallow gravel walled wells into glacial deposits.
- Shallow gravel walled wells into pre-glacial stream channels and valleys.

The engineering subcommittee investigated and discussed the various alternatives that are available within the 12 counties and have come to the following conclusions:

Constructing reservoirs takes a lot of time to be able to locate a suitable place to build one and much effort and money to acquire the land necessary. Also, the cost to build and operate a surface water treatment plant is greater than that of one to treat ground water. It was determined that there was not likely a location within the 12 counties that would allow a reservoir to build that was large enough to provide the amount of water that will be required for a regional water system. Water obtained from a surface water reservoir within the region present unique problems with treating the water to produce consistently good tasting water that meets public drinking water standards. It is expected the future will bring drinking water standards will be increasingly more difficult and costly to meet.

It was determined that deep wells would not be suitable since the water that would be obtained would contain excessive amounts of minerals, especially sodium chloride resulting in the water being salty.

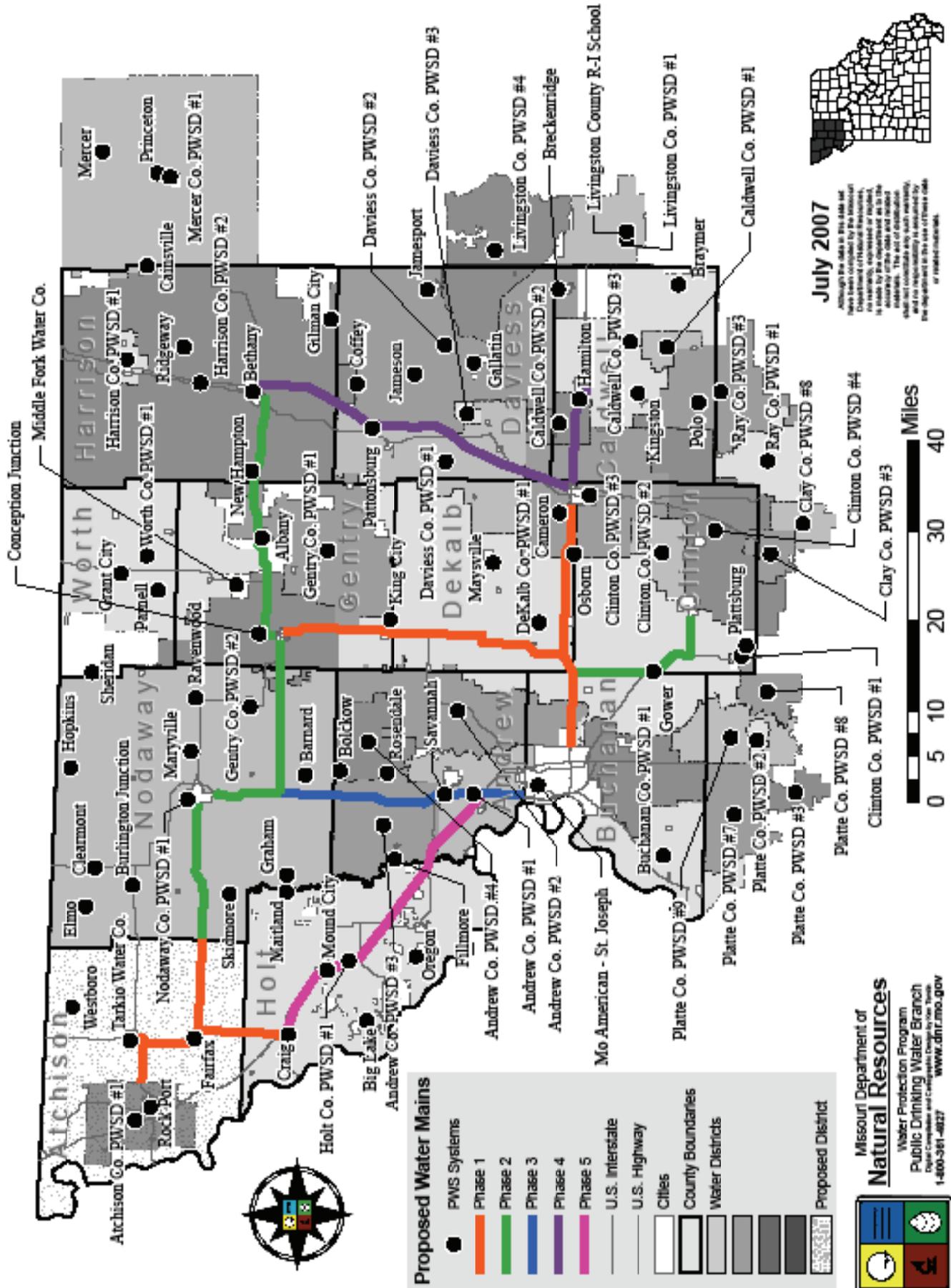
It was determined that shallow gravel walled wells in the alluvial deposits of small streams, glacial deposits and pre-glacial channels and valleys would not provide an adequate volume of water required for a regional water system.

It was determined that drilling of wells in the Missouri River alluvium anywhere from the Iowa, Missouri border to as far south as southern Andrew County would provide for obtaining sufficient water to serve a multi-million gallon per day water treatment facility.

Water obtained from drilling wells in the Missouri River alluvium will require treatment for softening and iron removal which can be easily done by utilizing a lime softening treatment facility. This type facility is presently utilized by numerous water systems providing good quality water at a reasonable cost. This type facility is relatively easy to operate and should have no difficulty in producing water that will meet public drinking water standards.

Water produced by this process should be easily transported from system to system and mix with the other water of the region without causing any adverse reactions.

# Northwest Missouri Public Water Supplies - Proposed Transmission Lines

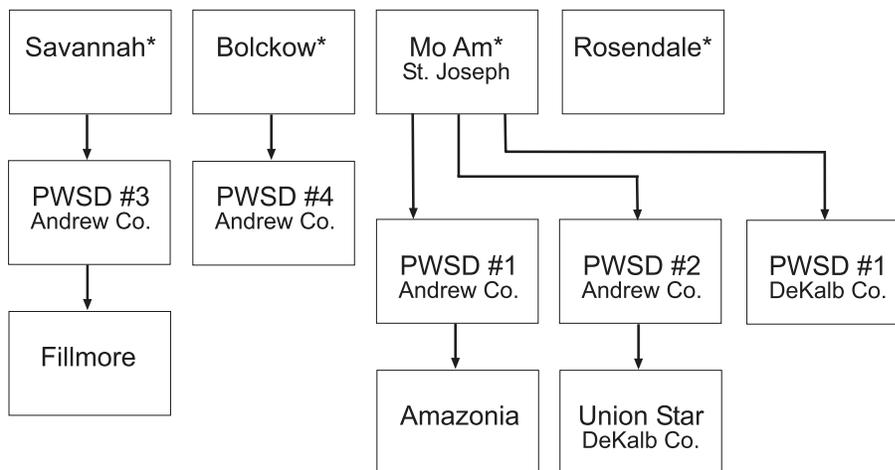


# Appendix H

## County Water Statistics

### Andrew County

System/ID #	Connections	Population	Avg Daily Use MGD	Max Daily Use MGD	Monthly Cost 5,000 Gal	Design Capacity or Contract GPD	Source	Source Capacity MGD	Water Loss Percentage	Storage Capacity Gallons
Amazonia MO1010013	136	300	0.023	0.044	\$37.00	No limit contract	Purchase	Purchase	?	75,000
Andrew Co. PWSD #1 MO1024004	1935	6000	0.412	0.784	\$43.25	No limit contract	Purchase	Purchase	17	526,000
Andrew Co. PWSD #2 MO1024005	1330	3000	0.300	0.600	\$43.00	864,000 GPD Contract Limit (Expires 2011)	Purchase	Purchase	4-16	150,000
Andrew Co. PWSD #3 MO1024006	400	1000	0.080	0.152	\$35.00	6 MGD contract	Purchase	Purchase	4-7	0
Andrew Co. PWSD #4 MO1024007	243	732	0.035	0.085	\$51.50	No limit contract	Purchase	Purchase	6	33,000
Bolckow MO1010084	78	240	0.050	0.084	\$34.50	144,000 GPD	4 wells	0.134 MGD	9.3	30,000
Fillmore MO1010277	102	211	0.154	0.028	\$27.00	No limit contract	Purchase	Purchase	11	50,000
Rosendale MO1010757	65	200	0.008	0.019	\$80.00	contract amount	Purchase	Purchase	20-30	33,000
Savannah MO1010724	2000	5000	0.550	0.881	\$29.38	1,500,000	1 lake, 2 wells	Wells - 0.792 MGD Lake 0.756 MGD	10	1,150,000
<b>Total:</b>	6,289	16,683	1.612	2.677						2,047,000



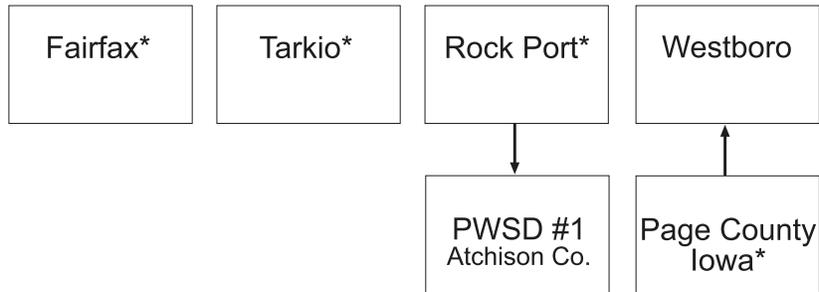
### Others supplying individual customers within the county

- PWSD #1 DeKalb Co.
- Mo/Am

\* Indicates Source

## Atchison County

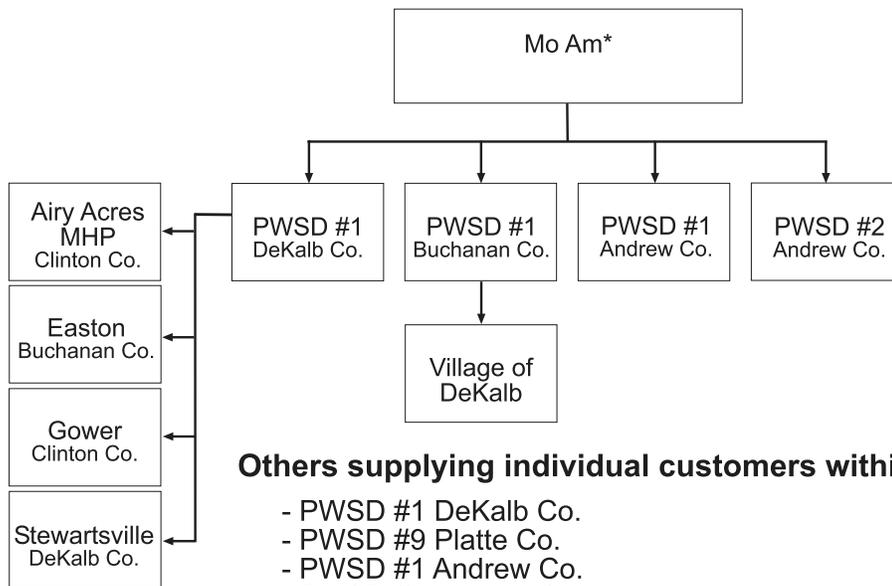
System/ID #	Connections	Population	Avg Daily Use MGD	Max Daily Use MGD	Monthly Cost 5,000 Gal	Design Capacity or Contract GPD	Source	Source Capacity MGD	Water Loss Percentage	Loss Capacity Gallons
Atchison Co. PWSD #1 MO1024009	329	987	0.066	0.083	\$45.80	3,250,000 contract limit (monthly)	Purchase	Purchase	40	0
Fairfax MO1010265	349	645	0.093	0.169	\$29.00	288,000 GPD	2 wells	0.201 MGD	?	238,000
Rock Port MO1010696	837	1395	0.280	0.400	\$28.75	750,000 GPD	3 wells	1.44 MGD	12-27	500,000
Tarkio MO1010786	826	1985	0.161	0.240	\$25.90	750,000 GPD	4 wells	0.864 MGD	6	630,000
Westboro MO1010850	81	162	0.020	0.025	\$21.64	600,000 Gal contract limit (monthly)	Purchase	Purchase	<5	43,000
<b>Total:</b>	2,422	5,174	0.62	0.917						1,411,000



\* Indicates Source

# Buchanan County

System/ID #	Connections	Population	Avg Daily Use MGD	Max Daily Use MGD	Monthly Cost 5,000 Gal	Design Capacity or Contract GPD	Source	Source Capacity MGD	Water Loss Percentage	Storage Capacity Gallons
Buchanan Co. PWSD #1 MO1024064	859	2000	0.132	0.210	\$49.00	No limit contract	Purchase	Purchase	24	188,000
Dekalb MO1011181	106	256	0.016	0.030	\$55.00	No limit contract	Purchase	Purchase	20	0
Easton MO1010234	105	258	0.015	0.016	\$34.55	No limit contract	Purchase	Purchase	10	50,000
MO AM Water MO1010714	0	0	15.000	23.460	\$24.51	30,000,000	10 wells	44.8MGD	?	14,000,000
<b>Total:</b>	1,070	2,514	15.163	23.716						14,238,000



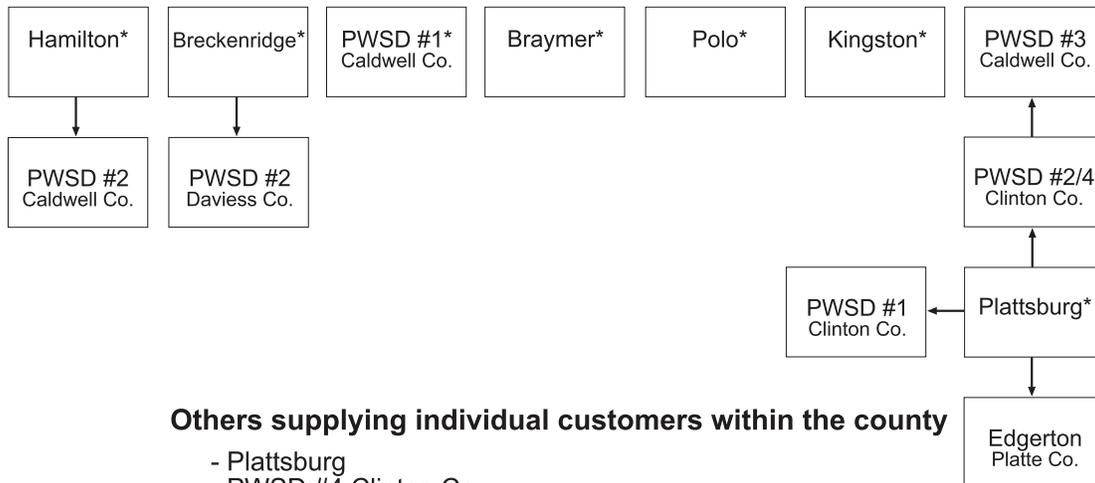
**Others supplying individual customers within the county**

- PWSD #1 DeKalb Co.
- PWSD #9 Platte Co.
- PWSD #1 Andrew Co.
- PWSD #2 Andrew Co.

\* Indicates Source

# Caldwell County

System/ID #	Connections	Population	Avg Daily Use MGD	Max Daily Use MGD	Monthly Cost 5,000 Gal	Design Capacity or Contract GPD	Source	Source Capacity MGD	Water Loss Percentage	Loss Capacity Gallons
Braymer MO1010098	450	980	0.080	0.146	\$30.50	201,600 GPD	4 wells	0.115 MGD	9.65	250,000
Breckenridge MO1010099	206	490	0.048	0.107	\$52.00	151,000	1 res., 1 well	0.052 MGD	2 ?	64,000
Caldwell Co. PWSD #1 MO1024078	168	504	0.030	0.040	\$46.00	68,000 GPD	2 wells	0.065 MGD	8	85,000
Caldwell Co. PWSD #2 MO1024079	256	493	0.043	0.053	\$42.00	2.5 MG Contract limit (monthly)	Purchase	Purchase	6	47,300
Caldwell Co. PWSD #3 MO1021318	464	1548	0.069	0.143	\$56.00	3.0 MG Contract limit (monthly)	Purchase	Purchase	23	230,000
Hamilton MO1010342	855	1850	0.185	0.225	\$43.00	648,000 GPD	1 Lake	0.190 MGD	4.2	450,000
Kingston MO1010426	140	387	0.033	0.055	\$50.00	72,000 GPD	3 wells	0.158 MGD	10.9	30,000
Polo MO1010653	289	582	0.055	0.075	\$32.40	108,000 GPD	2 wells	0.216 MGD	5.45	40,000
<b>Total:</b>	2,828	6,834	0.543	0.844						1,196,300



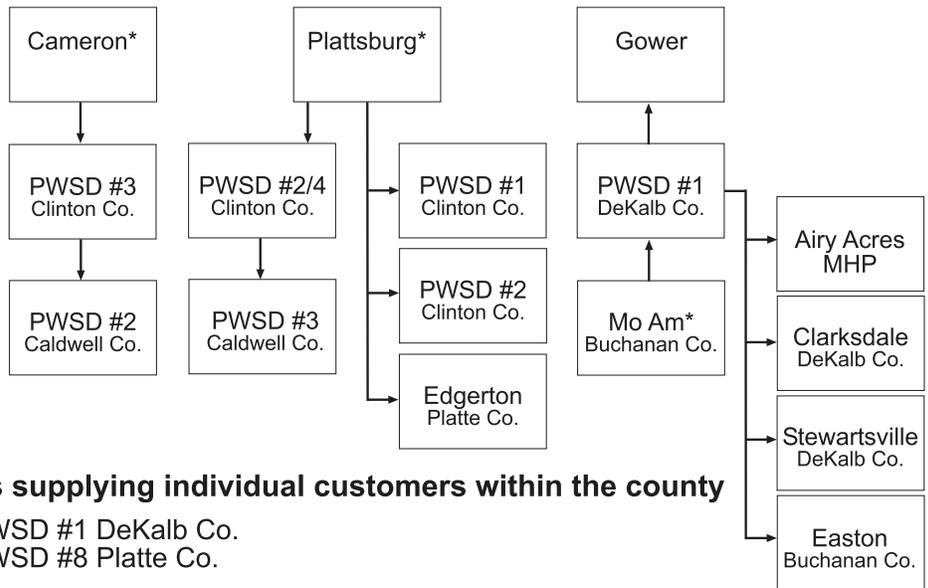
**Others supplying individual customers within the county**

- Plattsburg
- PWSD #4 Clinton Co.
- PWSD #2 Daviess Co.
- PWSD #3 Ray Co.

\* Indicates Source

# Clinton County

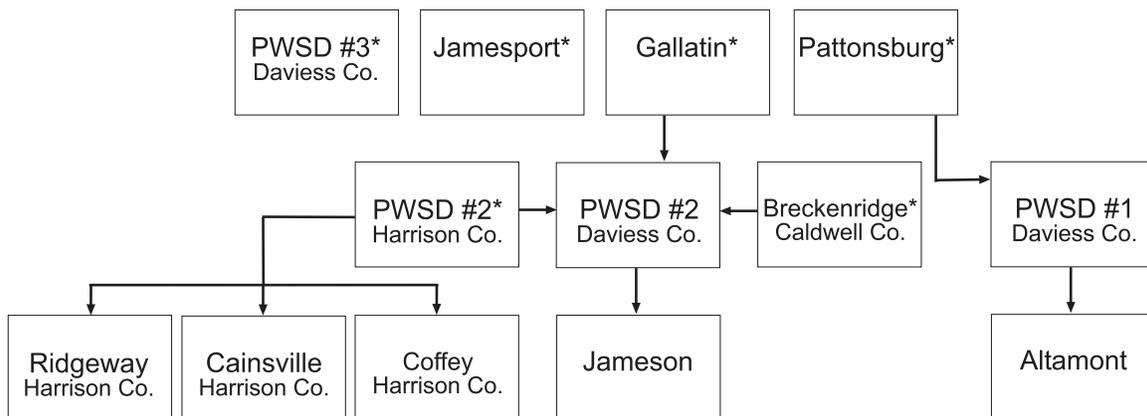
System/ID #	Connections	Population	Avg Daily Use MGD	Max Daily Use MGD	Monthly Cost 5,000 Gal	Design Capacity or Contract GPD	Source	Source Capacity MGD	Water Loss Percentage	Storage Capacity Gallons
Airy Acres MHP MO1048236	20	60	0.003	0.006	\$50.00	No limit contract	Purchase	Purchase	?	0
Cameron MO1010131	2840	9788	1.592	2.044	\$23.01	2,880,000 GPD	4 lakes	5.76 MG	3 to 6	1,900,000
Clinton Co. PWSD #1 MO1024153	380	950	0.064	0.095	\$52.00	No limit contract	Purchase	Purchase	10 to 14	200,000
Clinton Co. PWSD #3 MO1024155	1286	3858	0.267	0.332	\$35.00	10 MG per Month	Purchase	Purchase	11 to 13	0
Clinton co. PWSD #4 MO1024156	1986	5960	0.387	0.624	\$61.00	NA	Purchase	Purchase	8 to 9	400,000
Clinton Co. PWSD #4 MO1024154	0	0	0.000	0.000	\$0.00	included with MO1024156	Purchase	Purchase		0
Gower MO1010318	600	1399	0.095	0.112	\$53.70	No limit contract	Purchase	Purchase	5.8	225,000
Lathrop MO1010453	1181	3500	0.185	0.355	\$30.71	No limit contract	Purchase	Purchase	4.4	350,000
Plattsburg MO1010648	1227	2354	0.923	1.260	\$24.35	1,453,000 GPD	1 lake	10.5 MGD	7.9	1,975,000
<b>Total:</b>	9,520	27,869	3.516	4.828						5,050,000



\* Indicates Source

# Daviess County

System/ID #	Connections	Population	Avg Daily Use MGD	Max Daily Use MGD	Monthly Cost 5,000 Gal	Design Capacity or Contract GPD	Source	Source Capacity MGD	Water Loss Percentage	Storage Capacity Gallons
Altamont MO1010010	97	225	0.010	0.163	\$59.00	no limit contract	Purchase	Purchase	?	50,000
Coffey MO1010179	81	140	0.009	0.010	\$31.50	No limit contract	Purchase	Purchase	6	0
Daviess Co. PWSD #1 MO1024186	876	2628	0.150	0.220	\$46.00	No limit contract	Purchase	Purchase	18	466,500
Daviess Co. PWSD #2 MO1021080	815	2445	0.139	0.183	\$52.00	3,780,000 GP month	Purchase	Purchase	8	233,000
Daviess Co. PWSD #3 MO1036130	582	350	0.058	0.180	\$43.50	200,000 GPD	1 lake	?	9.37	475,000
Gallatin MO1010299	883	1834	0.377	0.532	\$20.37	400,000 GPD	2 wells	0.403 MGD	30	625,000
Jameson MO1010405	65	120	0.011	0.133	\$43.00	1,140,000 GPD	Purchase	Purchase	35	38,000
Jamesport MO1010406	337	600	0.060	0.095	\$28.00	144,000 GPD	1 lake	0.069MGD	3.3	50,000
Pattonsburg MO1010632	165	261	0.250	0.340	\$19.50	432,000 GPD	4 wells	0.684 MGD	5.7	150,000
<b>Total:</b>	3,901	8,603	1.064	1.856						2,087,500



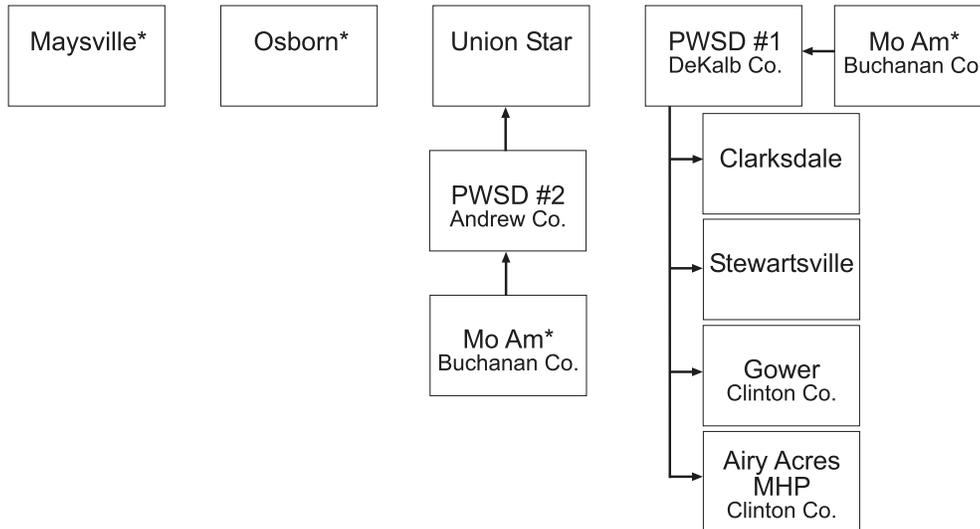
### Others supplying individual customers within the county

- PWSD #4 Livingston Co.
- PWSD #1 Gentry Co.
- PWSD #3 Clinton Co.
- PWSD #2 Clinton Co.

\* Indicates Source

# Dekalb County

System/ID #	Connections	Population	Avg Daily Use MGD	Max Daily Use MGD	Monthly Cost 5,000 Gal	Design Capacity or Contract GPD	Source	Source Capacity MGD	Water Loss Percentage	Storage Capacity Gallons
Clarksdale MO1010167	130	351	0.016	0.025	\$38.00	1,116,000 Gallons per month	Purchase	Purchase	14.1	50,000
Dekalb Co. PWSD #1 MO1024191	2750	1E+04	0.809	0.885	\$52.00	No limit contract	Purchase	Purchase	15.9	469,250
Maysville MO1010510	488	1212	0.115	0.215	\$35.78	576,000 GPD	3 lakes	0.450	21	209,600
Osborn MO1010609	200	480	0.030	0.041	\$37.35	86,400 GPD	2 wells	0.047 MGD	4.3	100,000
Stewartsville MO1010762	382	759	0.057	0.087	\$46.85	1,250,000 monthly limit	Purchase	Purchase	2.8	200,000
Union Star MO1010802	190	470	0.002	0.005	\$28.50	No limit contract	Purchase	Purchase	?	50,000
<b>Total:</b>	4,140	14,272	1.029	1.258						1,078,850



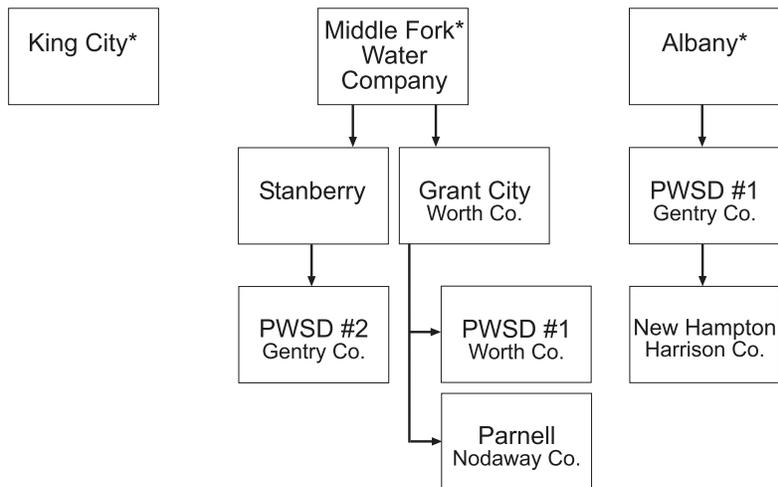
### Others supplying individual customers within the county

- PWSD #1 Daviess Co.
- PWSD #2 Andrew Co.
- PWSD #3 Clinton Co.

\* Indicates Source

## Gentry County

System/ID #	Connections	Population	Avg Daily Use MGD	Max Daily Use MGD	Monthly Cost 5,000 Gal	Design Capacity or Contract GPD	Source	Source Capacity MGD	Water Loss Percentage	Storage Capacity Gallons
Albany MO1010006	871	3600	0.430	0.608	\$16.10	1,000,000 GPD	6 wells	0.660 MGD	3.65	711,000
Gentry Co. PWSD #1 MO1024223	500	2000	0.120	0.130	\$43.15	4 MG per month	Purchase	Purchase	30	300,000
Gentry Co. PWSD #2 MO1021221	200	600	0.033	0.040	\$55.00	No limit contract	Purchase	Purchase	5	45,000
King City MO1010425	460	1012	0.100	0.156	\$24.50	300,000 GPD	4 lakes	0.128 MGD	10	140,000
Middle Fork Water Co. MO1070639	2	0	0.335	0.497	\$0.00	1,008,000 GPD	2 lakes	0.381 MGD	3.5	284,000
Stanberry MO1010755	607	1243	0.142	0.207	\$32.94	No limit contract	Purchase	Purchase	14.8	278,000
<b>Total:</b>	2,640	8,455	1.16	1.638						1,758,000



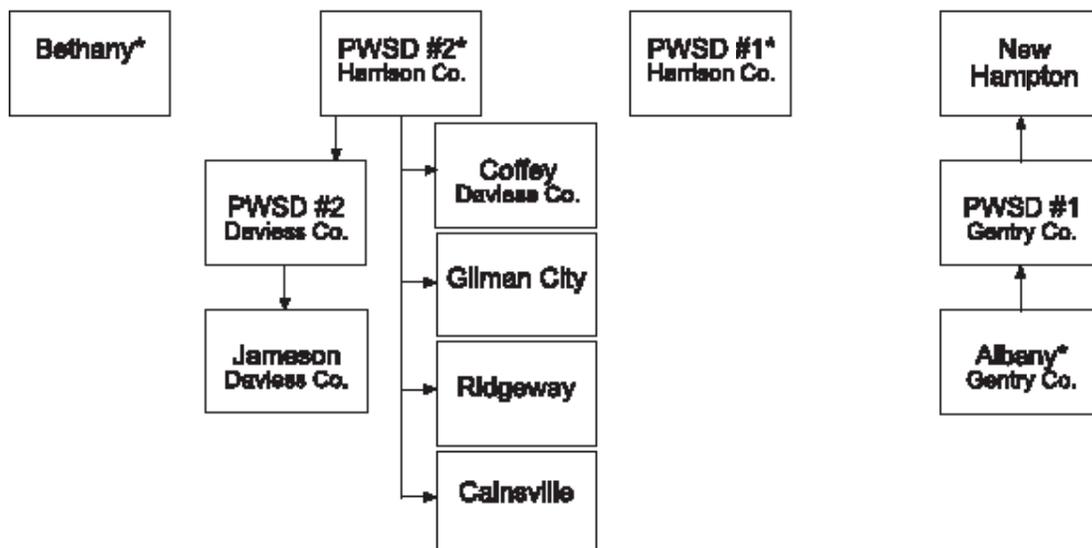
### Others supplying individual customers within the county

- PWSD #2 Harrison Co.
- PWSD #1 Worth Co.

\* Indicates Source

## Harrison County

System/ID #	Connections	Population	Avg Daily Use MGD	Max Daily Use MGD	Monthly Cost \$,000	Design Capacity or Contract GPD	Source	Source Capacity MGD	Water Loss Percentage	Storage Capacity Gallons
Bethany MO1010086	180	510	0.525	0.708	\$22.15	1,000,000 GPD	5 wells	1.4 MGD	52	500,000
Calneville MO1010122	100	400	0.025	0.033	\$55.00	No limit contract	Purchase	Purchase	10	75,000
Gilman City MO1010308	105	425	0.051	0.054	\$56.50	No limit contract	Purchase	Purchase	11	50,000
Harrison Co. PWSD #1 MO1024241	407	1221	0.062	0.139	\$39.00	172,800 GPD	1 well	0.067 MGD	12	100,000
Harrison Co. PWSD #2 MO1024242	1255	3785	0.450	0.815	\$49.00	400,000 GPD	5 wells	0.891 MGD	4	544,000
New Hampton MO1010887	150	525	0.018	0.023	\$42.80	No limit contract	Purchase	Purchase	>2	50,000
Ridgeway MO1010656	255	550	0.029	0.102	\$56.81	1.5 MG per month	Purchase	Purchase	?	45,000
<b>Total:</b>	<b>4,004</b>	<b>9,529</b>	<b>0.936</b>	<b>1.669</b>						<b>1,394,000</b>



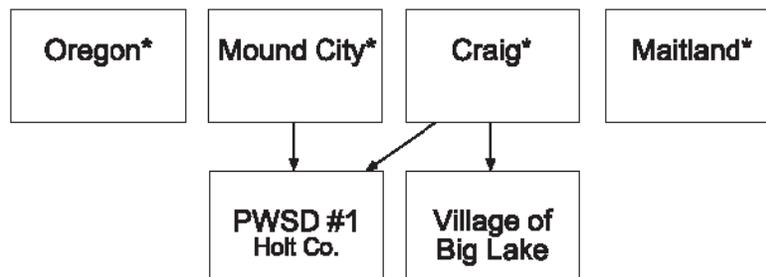
### Others supplying individual customers within the county

- PWSD #1 Mercer Co.
- PWSD #1 Gentry Co.

\* Indicates Source

## Holt County

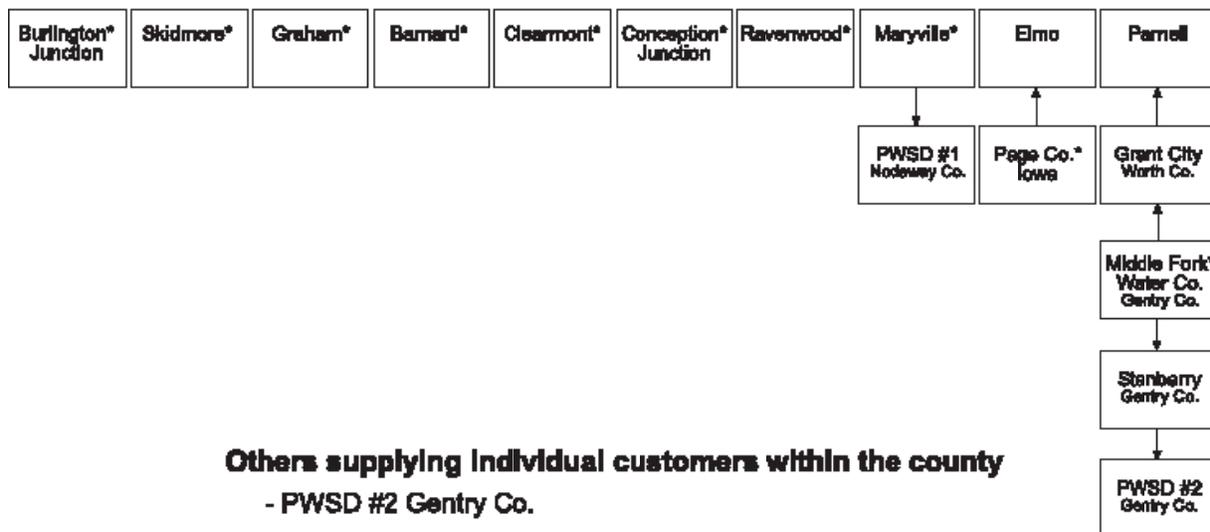
<i>System/ID #</i>	<i>Connections</i>	<i>Population</i>	<i>Avg Daily Use MGD</i>	<i>Max Daily Use MGD</i>	<i>Monthly Cost 5,000 Gal</i>	<i>Design Capacity or Contract GPD</i>	<i>Source</i>	<i>Source Capacity MGD</i>	<i>Water Loss Percentage</i>	<i>Storage Capacity Gallons</i>
Craig MO1010181	132	509	0.074	0.180	\$27.50	200,000 GPD	2 wells	0.155 MGD	<1	170,000
Holt Co. PWSD #1 MO1021304	985	1155	0.049	0.059	\$70.00	200,000 GPD contract limit	Purchase	Purchase	4 to 12	100,000
Maitland MO1010456	180	540	0.025	0.031	\$50.50	100,000 GPD	2 wells	0.100 MGD	5.74	50,000
Mound City MO1010546	625	1195	0.170	0.230	\$34.00	720,000 GPD	2 wells	0.720 MGD	20	485,000
Oregon MO1010605	625	1275	0.175	0.194	\$22.00	432,000 GPD	2 wells	0.590 MGD	6	250,000
Village of Big Lake MO1010182	569	2500	0.028	0.049	\$25.85	No limit contract	Purchase	Purchase	?	150,000
<b>Total:</b>	<b>2,546</b>	<b>9,770</b>	<b>0.519</b>	<b>0.775</b>						<b>1,185,000</b>



\* Indicates Source

# Nodaway County

System #	Connections	Population	Avg Daily Use MGD	Max Daily Use MGD	Monthly Cost \$,000	Design Capacity or Contract GPD	Source	Source Capacity MGD	Water Loss Percentage	Storage Capacity Gallons
Barnard MO101008	120	300	0.022	0.029	880.00	80,000 GPD	2 wells	0.028 MGD	10.2	100,000
Burlington Junction MO101017	291	636	0.045	0.060	852.00	130,000 GPD	3 wells	0.130 MGD	12	50,000
Clearmont MO101073	100	161	0.017	0.030	894.00	80,000 GPD	2 wells	0.040 MGD	10 to 15	57,000
Conception Junction MO101082	80	228	0.019	0.021	888.00	80,400 GPD	2 wells	0.088 MGD	<6	70,000
Elmo MO101090	80	150	0.008	0.014	800.00	25,000 GPD contract/Purchase Well	Purchase		7	100,000
Graham MO101083	80	160	0.016	0.035	828.00	84,000 GPD	1 well	0.064 MGD	?	50,000
Hopkins MO101078	280	570	0.041	0.108	821.00	140,000 GPD	8 wells	0.130 MGD	7	80,000
Maryville MO101009	4800	28+04	2.800	3.200	801.00	5,000,000 GPD	1 Well	8 MGD	10 to 12	1,200,000
Nodaway Co. PWSD #1 MO102420	1700	8000	0.074	0.500	893.00	No Well installed	Purchase	Purchase	20	700,000
Parnell MO101087	88	187	0.002	0.002	840.00	No Well installed	Purchase	Purchase	<1	80,000
Ravenwood MO101075	238	408	0.008	0.070	821.00	100,000 GPD	2 wells	0.088 MGD	28	100,000
Shelburne MO101074	180	342	0.020	0.040	893.00	172,000 GPD	3 wells	0.144 MGD	8	81,000
<b>Total</b>		<b>8,070</b>	<b>21,881</b>	<b>2,388</b>	<b>4148</b>					<b>2,718,000</b>

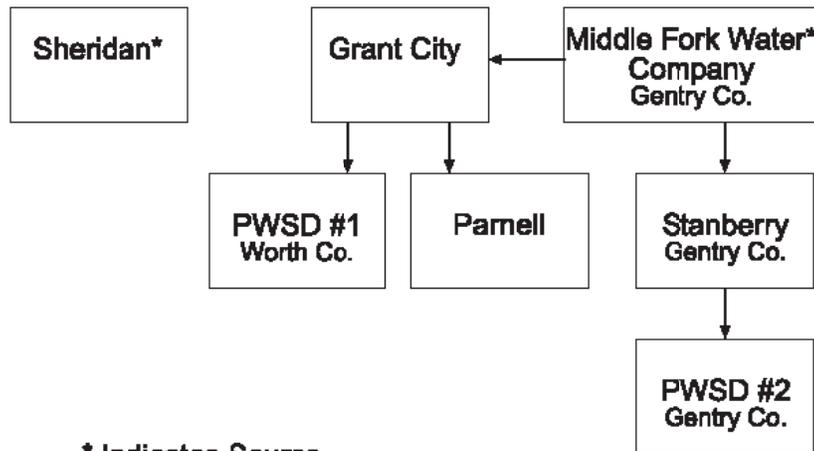


Others supplying individual customers within the county  
- PWSD #2 Gentry Co.

\* Indicates Source

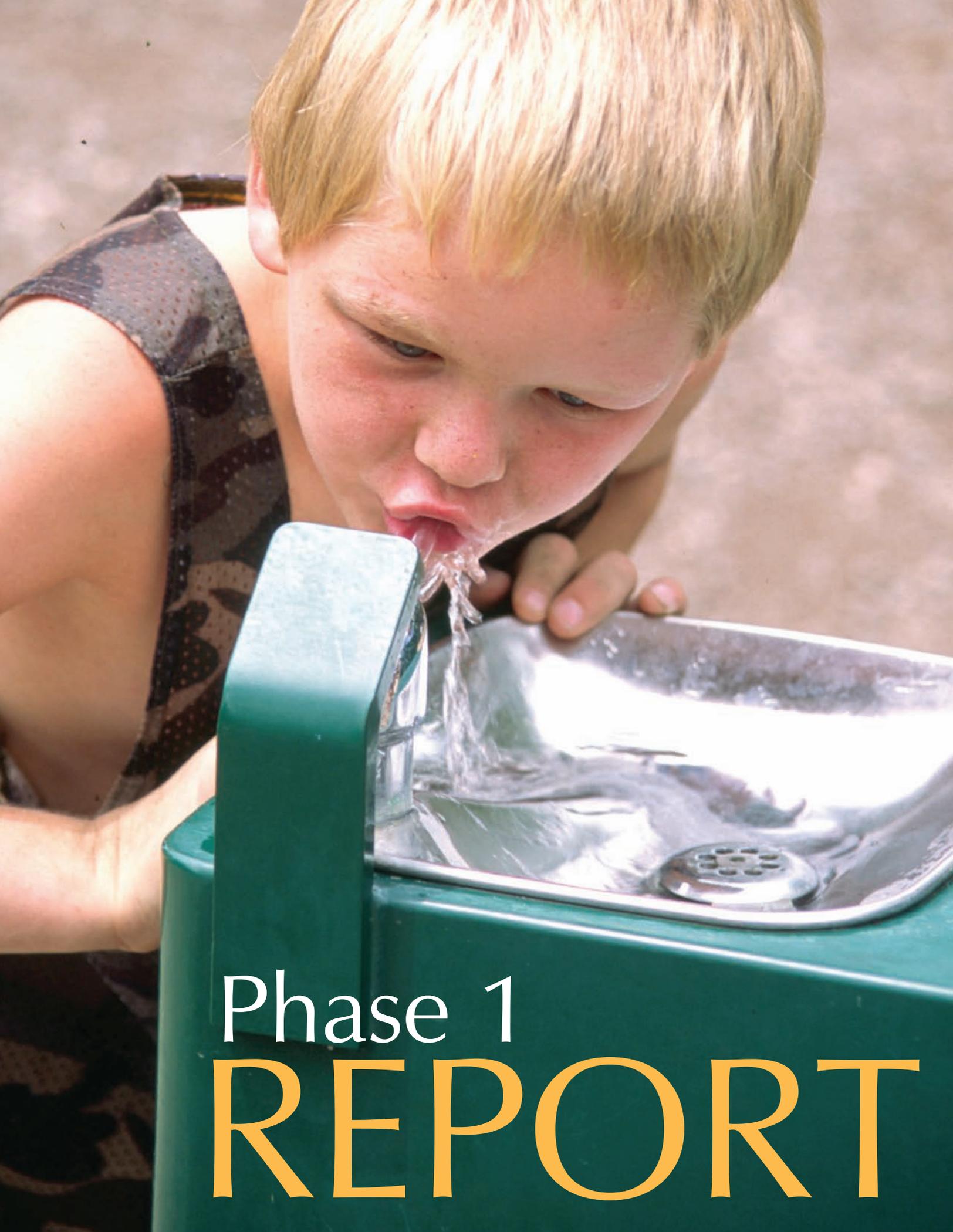
## Worth County

<i>System/ID #</i>	<i>Connections</i>	<i>Population</i>	<i>Avg Daily Use MGD</i>	<i>Max Daily Use MGD</i>	<i>Monthly Cost 5,000 Gal</i>	<i>Design Capacity or Contract GPD</i>	<i>Source</i>	<i>Source Capacity MGD</i>	<i>Water Loss Percentage</i>	<i>Storage Capacity Gallons</i>
Grant City MO1010324	447	1541	0.125	0.225	\$51.28	No limit contract	Purchase	Purchase	6.5	281,000
Sheridan MO1010759	109	327	0.024	0.052	\$24.00	45,200 GPD	2 wells	0.072MGD	12	100,000
Worth Co. PWSD #1 MO1024848	489	1880	0.080	0.085	\$85.00	1.2 MG per month	Purchase	Purchase	10 to 15	150,000
<b>Total:</b>	<b>1,045</b>	<b>3,516</b>	<b>0.189</b>	<b>0.34</b>						<b>531,000</b>









Phase 1  
**REPORT**



The Water Partnership of Northwest Missouri is a coalition of local and regional stakeholders working to identify a long-term affordable, abundant high-quality water supply for the citizens of Northwest Missouri.

The partnership includes county, municipal and water system representatives, Northwest Missouri State University, University of Missouri Extension and the Missouri Department of Natural Resources.

For more information on the Water Partnership of Northwest Missouri, contact:

Missouri Department of Natural Resources  
**Northwest Missouri Satellite Office**  
Northwest Missouri State University- Environmental Services  
800 University Dr.  
Maryville, MO 64468-6015  
(660) 562-1014



## Preliminary Sketch

No. 7 plans as part of the water partnership in Northwest Missouri. Color-coded lines represent proposed phases of main water lines that would form a series of hubs and networks for drinking water.

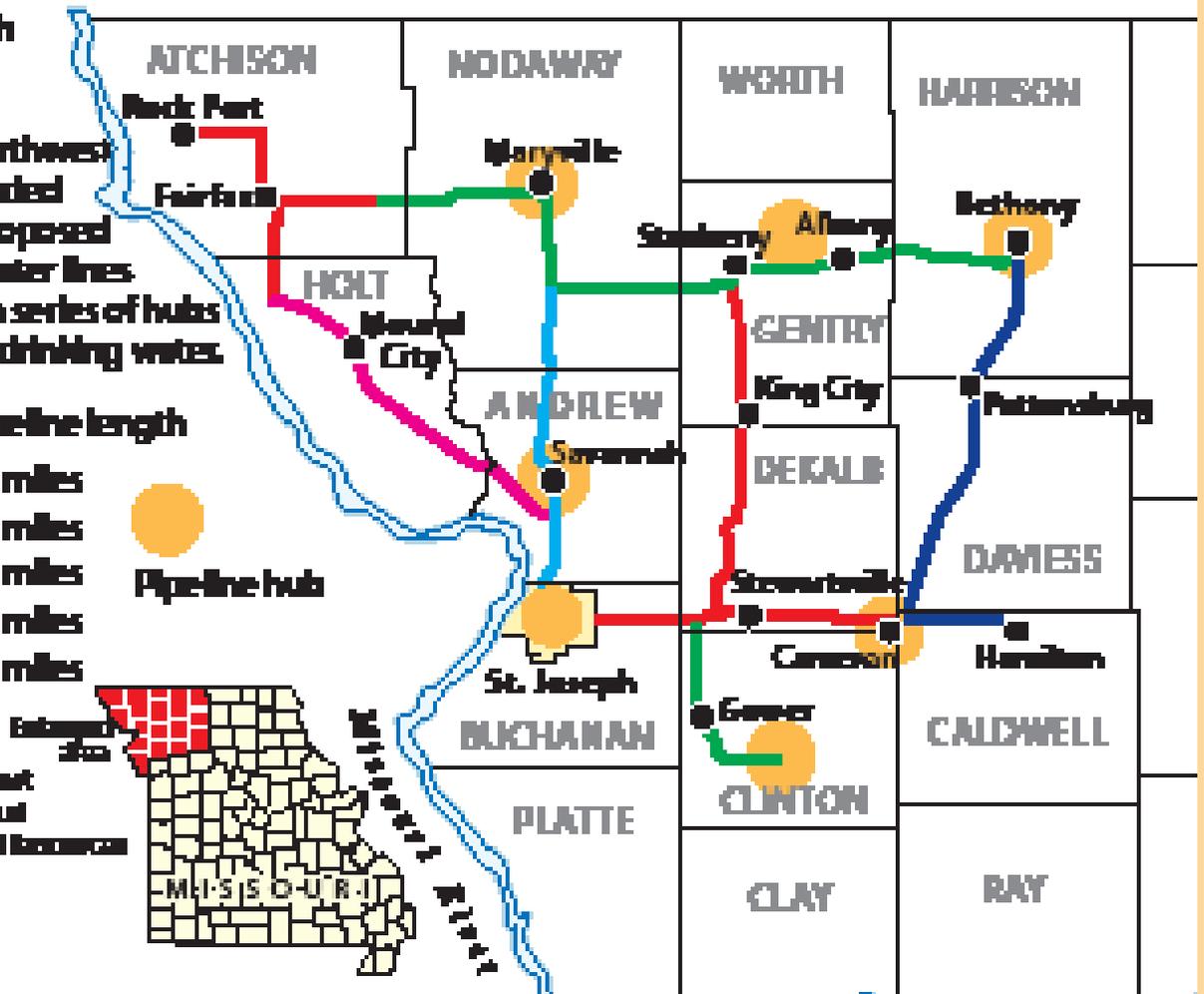
## KEY

- | Phase   | Pipeline length |
|---------|-----------------|
| Phase 1 | 97 miles        |
| Phase 2 | 65 miles        |
| Phase 3 | 28 miles        |
| Phase 4 | 52 miles        |
| Phase 5 | 34 miles        |

 Pipeline hub

SOURCES: Water Partnership for Northwest Missouri and the Missouri Department of Natural Resources

GEORGE L. STANTON  
St. Joseph News-Press



## *Declaration of Unity:*

These organization have committed to work in unison to achieve the mission of the Water Partnership of Northwest Missouri, and

- Work in a cooperative spirit to develop the Concept Plan Sketch No. 7
- Regularly attend Water Partnership meetings
- Bring forth ideas for discussion rather than positions set in stone
- Provide input during the planning process

## *Mission Statement*

The Water Partnership is a coalition of local and regional stakeholders to identify solutions for a long term, affordable, abundant, high quality water supply for the citizens of northwest Missouri.

## *Signators*

Atchison County, PWSD #1  
Rock Port Municipals Utilities  
Atchison Co. Wholesale Water Commission  
Northwest Wholesale Water Commission  
Tarkio Board of Public Works  
Middlefork Water Company  
City of Hopkins

City of Maryville  
City of Fairfax  
City of Craig  
City of Cameron  
Nodaway County  
Caldwell County